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

| **7.** | **General information about the module** |
|---|---|
| **Module name** | **Astrophysics** |
| Module code | W4-FZ-S1-6-23-26 |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to the basic concepts of astrophysics and to present the current state of knowledge in this field. During the classes, by solving selected problems related to astrophysics, the student deepens their understanding of the topics covered in the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows the basics of astrophysics. | W02 | 1 |
| E2 | The student is familiar with current research problems in astrophysics. | W02 | 1 |
| E3 | The student is prepared for further studies in astrophysics. | K01<br>W02 | 1<br>1 |

**9. Methods of conducting classes**

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

| 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** |
| FZ1 | workshop | 30 | exam | E1, E2, E3 | a01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Classical Electrodynamics** |
| Module code | W4-FZ-S1-4-23-17 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to the elements of special relativity and the classical theory of electromagnetic field based on the covariant formulation of Maxwell's equations in Minkowski spacetime. The aim of the classes is to acquire the skills of analyzing problems of classical field theory, particularly in electrodynamics and electro- and magnetostatics, using Maxwell's equations. |
| 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) |
|---|---|---|---|
| E1 | The student knows the elements of special relativity and Maxwell's equations in vacuum and matter. | W04<br>W05 | 1<br>1 |
| E2 | The student is able to solve Maxwell's equations with imposed boundary conditions to describe the properties of the electromagnetic field. | U01<br>U02 | 1<br>1 |
| E3 | The student is prepared to study further fields of physics, such as quantum mechanics, quantum field theory, and statistical physics. | K01<br>K04<br>W04<br>W05 | 1<br>1<br>1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion |

| | | |
|---|---|---|
| | | *transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 30 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 30 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Classical Mechanics** |
| Module code | W4-FZ-S1-3-23-14 |
| Number of the ECTS credits | 6 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to familiarize students with the description of the dynamics of classical mechanical systems using Newton's, Lagrange's, and Hamilton's approaches. The aim of the classes is to acquire the skills of analyzing the dynamics of classical mechanical systems based on the content presented in the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows the formalism of Newton's, Lagrange's, and Hamilton's descriptions of the dynamics of classical mechanical systems. | W04<br>W05 | 1<br>1 |
| E2 | The student Is able to characterize the dynamics of a classical mechanical system, including formulating equations of motion, solving them, and analyzing the results. | U02 | 1 |
| E3 | The student Is prepared to study further fields of physics, such as quantum mechanics, field theory, and statistical physics. | K01<br>K04<br>W04<br>W05 | 1<br>1<br>1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its* |

| | | |
|---|---|---|
| | | *elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 30 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 30 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Computer Science Repetitory** |
| Module code | W4-FZ-S1-1-23-04 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the laboratory is to systematize and supplement students' knowledge of programming at the level of extended secondary school graduation exam in computer science. |
| 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) |
|---|---|---|---|
| E1 | The student understands the civilizational importance of computer science. | W06 | 1 |
| E2 | The student is able to independently write a program and run it. | U04 | 1 |
| E3 | The student is able to independently solve simple problems using computer algorithms. | U05 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| d01 | Programmed learning methods | Working with a computer<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 30 | course work | E1, E2, E3 | d01, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Data Analysis** |
| Module code | W4-FZ-S1-3-23-29B |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The course "Data Analysis" has the objective of familiarizing students with the field of data analysis and enhancing their skills in data processing, interpretation, and visualization. Throughout this course, students will be exposed to a variety of data analysis techniques using practical, computer-based methods. They will acquire hands-on experience in utilizing tools and software commonly employed in data analysis, including spreadsheets and programming languages. |
| 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) |
|---|---|---|---|
| E1 | The student is familiar with computer techniques used in data analysis. | W06 | 1 |
| E2 | The student is able to utilize computer tools for data analysis. | U04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 30 | course work | E1, E2 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Foreign language course 1** |
| Module code | LJO-2023-01 |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The module aims to develop communicative language competences and to stimulate the acquisition of skills in oral and written language reception and production as well as in language interaction and mediation, taking into account different varieties and registers of the foreign language and the necessary language strategies. The module develops the ability to learn, to independently search for and select information and sources of knowledge, and to work in a team. The main emphasis is placed on strengthening the skills of effective communication with others and the fluent use of foreign language in social, educational or professional contacts in accordance with the criteria laid out in the Common European Framework of Reference for Languages (CEFR). |
| 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) |
|---|---|---|---|
| LJO1_1 | Can, following the teacher's instructions, use his/her general knowledge in order to develop and practice the listening, reading, writing and speaking skills in a foreign language, can formulate clearly and correctly, moderately complex oral and written texts on various topics, effectively and properly using the relevant vocabulary and rules for the organization of statements, in accordance in accordance with the criteria laid out in the Common European Framework of Reference for Languages (CEFR). | KJ.2023_U | 2 |
| LJO1_2 | Can search, collect and make use of general information contained in foreign texts of various levels of difficulty, can present their opinions using correct language constructions. | KJ.2023_U | 2 |
| LJO1_3 | Can, following general instructions, properly select sources and general information needed to learn a foreign language. | KJ.2023_U | 2 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a03 | Lecture methods / expository methods | Description<br>*a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object* |

| | | |
|---|---|---|
| | | *or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison* |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| b06 | Problem-solving methods | Activating method – staged drama/drama<br>*experiential learning; solving a problem by acting out a role; a.k.a. a role-playing method; role-players interpret their roles in an individual way; the identification with the role is achieved through the activation of the senses, imagination and speech, the stimulation of gesture and movement, etc.; the aim of drama is to experience situations, problems and events mediated by the role; staged drama is a role-playing method enriched with props and stage scenery illustrating a theme* |
| c02 | Demonstration methods | Video show<br>*reproducing a film or video material in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as an exercise in image perception; a film/video can be a work of art, an illustration (also technical illustration) of a content/phenomenon/object, a private record of an action, a media image, etc.* |
| c03 | Demonstration methods | Audio playback / audio drama<br>*preparation and reproduction of sound material (audio recording) in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as a method of sound perception, including the appreciation of a musical piece, an artistic audio drama, an oral presentation of an artistic or scientific text as well as a media text; analysis of the sound material recorded on a carrier with a view to studying a sound-related phenomenon* |
| c06 | Demonstration methods | Demonstration-imitation<br>*a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours* |
| c07 | Demonstration methods | Screen presentation<br>*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* |
| d02 | Programmed learning methods | Working with a programmed textbook<br>*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.* |
| d03 | Programmed learning methods | Working with another teaching tool<br>*e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools* |
| d04 | Programmed learning methods | Reconstruction / reproduction<br>*proceeding according to the indicated/displayed pattern/model; e.g., the reconstruction of a structure, model, image, etc.* |
| e07 | Practical methods | Simulation<br>*an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on “replacement” material* |
| f01 | Methods of self-learning | Self-education<br>*a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one’s own; self-study* |
| f02 | Methods of self-learning | Individual work with a text |

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

**10. Forms of teaching**

| Code | Name | Number of hours | Assessment of the learning outcomes of the module | Learning outcomes of the module | Methods of conducting classes |
|---|---|---|---|---|---|
| LJO1_lekt | language classes | 30 | course work | LJO1_1, LJO1_2, LJO1_3 | a03, a05, b06, c02, c03, c06, c07, d02, d03, d04, e07, 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<br>*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<br>*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<br>*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)* | No |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| 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<br>*reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | Yes |
| d02 | Consulting the results of the verification of learning outcomes | Development of a corrective action plan as well as supplementary/corrective tasks<br>*reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Foreign language course 2** |
| Module code | LJO-2023-02 |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The module aims to develop communicative language competences and to stimulate the acquisition of skills in oral and written language reception and production as well as in language interaction and mediation, taking into account different varieties and registers of the foreign language and the necessary language strategies. The module develops the ability to learn, to independently search for and select information and sources of knowledge, and to work in a team. The main emphasis is placed on strengthening the skills of effective communication with others and the fluent use of foreign language in social, educational or professional contacts in accordance with the criteria laid out in the Common European Framework of Reference for Languages (CEFR). |
| 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) |
|---|---|---|---|
| LJO2_1 | Can effectively use the possessed detailed knowledge in order to develop and practice the listening, reading, writing and speaking skills in a foreign language, can formulate clear and correct more complex oral and written texts on various topics, effectively and properly using the relevant vocabulary, rules of text organization, in accordance in accordance with the criteria laid out in the Common European Framework of Reference for Languages (CEFR). | KJ.2023_U | 2 |
| LJO2_2 | Can search, analyse, evaluate and make use of specific information contained in foreign texts of more complex difficulty on topics specified in the module syllabus. | KJ.2023_U | 2 |
| LJO2_3 | Can, to some extent independently, select the appropriate sources, specific information and tools for learning a foreign language and formulate his/her own opinions in a foreign language. | KJ.2023_U | 2 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a03 | Lecture methods / expository methods | Description<br>*a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object* |

| | | |
|---|---|---|
| | | *or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison* |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| b06 | Problem-solving methods | Activating method – staged drama/drama<br>*experiential learning; solving a problem by acting out a role; a.k.a. a role-playing method; role-players interpret their roles in an individual way; the identification with the role is achieved through the activation of the senses, imagination and speech, the stimulation of gesture and movement, etc.; the aim of drama is to experience situations, problems and events mediated by the role; staged drama is a role-playing method enriched with props and stage scenery illustrating a theme* |
| c02 | Demonstration methods | Video show<br>*reproducing a film or video material in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as an exercise in image perception; a film/video can be a work of art, an illustration (also technical illustration) of a content/phenomenon/object, a private record of an action, a media image, etc.* |
| c03 | Demonstration methods | Audio playback / audio drama<br>*preparation and reproduction of sound material (audio recording) in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as a method of sound perception, including the appreciation of a musical piece, an artistic audio drama, an oral presentation of an artistic or scientific text as well as a media text; analysis of the sound material recorded on a carrier with a view to studying a sound-related phenomenon* |
| c06 | Demonstration methods | Demonstration-imitation<br>*a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours* |
| d02 | Programmed learning methods | Working with a programmed textbook<br>*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.* |
| d03 | Programmed learning methods | Working with another teaching tool<br>*e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools* |
| d04 | Programmed learning methods | Reconstruction / reproduction<br>*proceeding according to the indicated/displayed pattern/model; e.g., the reconstruction of a structure, model, image, etc.* |
| e07 | Practical methods | Simulation<br>*an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on “replacement” material* |
| f01 | Methods of self-learning | Self-education<br>*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<br>*searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue* |

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| LJO2_lekt | language classes | 30 | course work | LJO2_1, LJO2_2, LJO2_3 | a03, a05, b06, c02, c03, c06, d02, d03, d04, e07, 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<br>*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<br>*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<br>*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)* | No |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| 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<br>*reading through the academic teacher’s comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | Yes |
| d02 | Consulting the results of the verification of learning outcomes | Development of a corrective action plan as well as supplementary/corrective tasks<br>*reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Foreign language course 3** |
| Module code | LJO-2023-03 |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The module aims to develop communicative language competences and to stimulate the acquisition of skills in oral and written language reception and production as well as in language interaction and mediation, taking into account different varieties and registers of the foreign language and the necessary language strategies. The module develops the ability to learn, to independently search for and select information and sources of knowledge, and to work in a team. The main emphasis is placed on strengthening the skills of effective communication with others and the fluent use of foreign language in social, educational or professional contacts in accordance with the criteria laid out in the Common European Framework of Reference for Languages (CEFR). |
| 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) |
|---|---|---|---|
| LJO3_1 | Can independently use the acquired knowledge in order to develop and practice listening comprehension, reading, writing and speaking skills in a foreign language at an appropriate level. | KJ.2023_U | 3 |
| LJO3_2 | Can effectively search, select, synthesize and use information contained in foreign texts of varying levels of difficulty on topics specified in the syllabus of the module. | KJ.2023_U | 3 |
| LJO3_3 | Can communicate in a foreign language in speech and writing, producing texts on the topics specified in the module syllabus using various communication channels and techniques, can participate in a debate, present his/her own and other people's positions and discuss them in a foreign language. | KJ.2023_U | 3 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a03 | Lecture methods / expository methods | Description<br>*a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison* |

| | | |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| b06 | Problem-solving methods | Activating method – staged drama/drama<br>*experiential learning; solving a problem by acting out a role; a.k.a. a role-playing method; role-players interpret their roles in an individual way; the identification with the role is achieved through the activation of the senses, imagination and speech, the stimulation of gesture and movement, etc.; the aim of drama is to experience situations, problems and events mediated by the role; staged drama is a role-playing method enriched with props and stage scenery illustrating a theme* |
| c02 | Demonstration methods | Video show<br>*reproducing a film or video material in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as an exercise in image perception; a film/video can be a work of art, an illustration (also technical illustration) of a content/phenomenon/object, a private record of an action, a media image, etc.* |
| c03 | Demonstration methods | Audio playback / audio drama<br>*preparation and reproduction of sound material (audio recording) in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as a method of sound perception, including the appreciation of a musical piece, an artistic audio drama, an oral presentation of an artistic or scientific text as well as a media text; analysis of the sound material recorded on a carrier with a view to studying a sound-related phenomenon* |
| c06 | Demonstration methods | Demonstration-imitation<br>*a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours* |
| d02 | Programmed learning methods | Working with a programmed textbook<br>*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.* |
| d03 | Programmed learning methods | Working with another teaching tool<br>*e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools* |
| d04 | Programmed learning methods | Reconstruction / reproduction<br>*proceeding according to the indicated/displayed pattern/model; e.g., the reconstruction of a structure, model, image, etc.* |
| e07 | Practical methods | Simulation<br>*an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on “replacement” material* |
| f01 | Methods of self-learning | Self-education<br>*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<br>*searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue* |

**10. Forms of teaching**

| Code | Name | Number of hours | Assessment of the learning outcomes of the module | Learning outcomes of the module | Methods of conducting classes |
|---|---|---|---|---|---|
| LJO3_lekt | language classes | 30 | course work | LJO3_1, LJO3_2, LJO3_3 | a03, a05, b06, c02, c03, c06, |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | d02, d03, d04, e07, 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<br>*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<br>*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<br>*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)* | No |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| 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<br>*reading through the academic teacher’s comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | Yes |
| d02 | Consulting the results of the verification of learning outcomes | Development of a corrective action plan as well as supplementary/corrective tasks<br>*reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Foreign language course 4** |
| Module code | LJO-2023-04 |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The module aims to develop communicative language competences and to stimulate the acquisition of skills in oral and written language reception and production as well as in language interaction and mediation, taking into account different varieties and registers of the foreign language and the necessary language strategies. The module develops the ability to learn, to independently search for and select information and sources of knowledge, and to work in a team. The main emphasis is placed on strengthening the skills of effective communication with others and the fluent use of foreign language in social, educational or professional contacts in accordance with the criteria laid out in the Common European Framework of Reference for Languages (CEFR). |
| 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) |
|---|---|---|---|
| LJO4_1 | Can effectively formulate complex problems in a foreign language, including those related to the field of study in order to practice listening, reading, writing and speaking skills in a foreign language. | KJ.2023_U | 3 |
| LJO4_2 | Can independently search, analyze, evaluate, select, synthesize and use general and specific information contained in foreign texts of varying complexity. | KJ.2023_U | 3 |
| LJO4_3 | Has the ability to understand, reproduce and create various types of written and oral texts that require advanced systemic knowledge of a foreign language, including specialist knowledge, using grammatical structures and vocabulary, specified in the syllabus of the module. Can use a foreign language at B2 level or higher (or lower, as specified in the syllabus, depending on the language and the level of the group chosen by a student who already has proof of his/her competence in one foreign language at B2 level) in accordance with the Common European Framework of Reference for Languages (CEFR) ) using various communication channels and techniques to the extent appropriate for a given area of knowledge. | KJ.2023_U | 3 |

| 9. | Methods of conducting classes | |
|---|---|---|
| **Code** | **Category** | **Name (description)** |
| a03 | Lecture methods / expository methods | Description<br>*a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison* |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| b06 | Problem-solving methods | Activating method – staged drama/drama<br>*experiential learning; solving a problem by acting out a role; a.k.a. a role-playing method; role-players interpret their roles in an individual way; the identification with the role is achieved through the activation of the senses, imagination and speech, the stimulation of gesture and movement, etc.; the aim of drama is to experience situations, problems and events mediated by the role; staged drama is a role-playing method enriched with props and stage scenery illustrating a theme* |
| c02 | Demonstration methods | Video show<br>*reproducing a film or video material in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as an exercise in image perception; a film/video can be a work of art, an illustration (also technical illustration) of a content/phenomenon/object, a private record of an action, a media image, etc.* |
| c03 | Demonstration methods | Audio playback / audio drama<br>*preparation and reproduction of sound material (audio recording) in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as a method of sound perception, including the appreciation of a musical piece, an artistic audio drama, an oral presentation of an artistic or scientific text as well as a media text; analysis of the sound material recorded on a carrier with a view to studying a sound-related phenomenon* |
| c06 | Demonstration methods | Demonstration-imitation<br>*a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours* |
| d02 | Programmed learning methods | Working with a programmed textbook<br>*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.* |
| d03 | Programmed learning methods | Working with another teaching tool<br>*e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools* |
| d04 | Programmed learning methods | Reconstruction / reproduction<br>*proceeding according to the indicated/displayed pattern/model; e.g., the reconstruction of a structure, model, image, etc.* |
| e07 | Practical methods | Simulation<br>*an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on “replacement” material* |
| f01 | Methods of self-learning | Self-education<br>*a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one’s own; self-study* |
| f02 | Methods of self-learning | Individual work with a text |

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

**10. Forms of teaching**

| Code | Name | Number of hours | Assessment of the learning outcomes of the module | Learning outcomes of the module | Methods of conducting classes |
|---|---|---|---|---|---|
| LJO4_lekt | language classes | 30 | course work | LJO4_1, LJO4_2, LJO4_3 | a03, a05, b06, c02, c03, c06, d02, d03, d04, e07, 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<br>*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<br>*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<br>*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)* | No |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| 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<br>*reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | Yes |
| d02 | Consulting the results of the verification of learning outcomes | Development of a corrective action plan as well as supplementary/corrective tasks<br>*reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade* | Yes |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Fundamentals of Physics: Electricity and Magnetism** |
| Module code | W4-FZ-S1-3-23-12 |
| Number of the ECTS credits | 7 |
| Language of instruction | Polish |
| Purpose and description of the content of education | As part of the module, students will participate in lectures with demonstrations and seminar classes. The aim of the lecture is to familiarize students with electrostatics, static current, magnetic field, alternating current, electrical and magnetic properties of matter, Maxwell's Equations and electromagnetic waves. The aim of the seminar is to acquire problem solving skills, checking the understanding of the issues discussed during the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows and uses the laws of electromagnetism to formulate a physical problem and find its solution. | U02<br>W03 | 1<br>1 |
| E2 | The student is able to explain the importance of experiments for the progress of science. | K04<br>W03 | 1<br>1 |
| E3 | The student can obtain information from literature, databases and other sources to deepen his understanding of the laws of physics. | K03<br>U05 | 1<br>1 |
| E4 | The student is prepared to study further fields of physics, such as optics and structure of matter, classical electrodynamics. | U02 | 1 |

**9. Methods of conducting classes**

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

| | | |
|---|---|---|
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 60 | exam | E2, E4 | a01 |
| FZ2 | discussion classes | 60 | course work | E1, E3 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Fundamentals of Physics: Mechanics** |
| Module code | W4-FZ-S1-2-23-08 |
| Number of the ECTS credits | 7 |
| Language of instruction | Polish |
| Purpose and description of the content of education | As part of the module, students will participate in lectures with demonstrations and seminar classes. The aim of the lecture is to familiarize students with issues related to kinematics, dynamics, and conservation law of a material point and a rigid body, oscillations of simple and complex physical systems, mechanical waves as well as elements of relativistic mechanics. The aim of the seminar is to acquire problem solving skills, checking the understanding of the issues discussed during the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows and uses the laws of mechanics to formulate a physical problem and find its solution. | U02<br>W03 | 1<br>1 |
| E2 | The student is able to explain the importance of experiments for the progress of science. | K04<br>W03 | 1<br>1 |
| E3 | The student can obtain information from literature, databases and other sources to deepen his understanding of the laws of physics. | K03<br>U05 | 1<br>1 |
| E4 | The student is prepared to study further fields of physics, such as electricity and magnetism, classical mechanics. | U02 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion |

| | | |
|---|---|---|
| | | *transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 60 | exam | E2, E4 | a01 |
| FZ2 | discussion classes | 60 | course work | E1, E3 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Fundamentals of Physics: Optics and Structure of Matter** |
| Module code | W4-FZ-S1-4-23-15 |
| Number of the ECTS credits | 7 |
| Language of instruction | Polish |
| Purpose and description of the content of education | As part of the module, students will participate in lectures with demonstrations and seminar classes. The aim of the lecture is to familiarize students with the issues related to electromagnetic waves, interaction of light with matter, geometric and wave optics, as well as quantization of electromagnetic radiation, particle-wave duality of matter, and the basics of quantum physics, especially the Schrödinger equation. The aim of the classes is to acquire problem solving skills, checking the understanding of the issues discussed during the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows and uses the principles of optics and structure of matter to formulate a physical problem and find its solution. | U02<br>W03 | 1<br>1 |
| E2 | The student is able to explain the importance of experiments for the progress of science. | K04<br>W03 | 1<br>1 |
| E3 | The student can obtain information from literature, databases and other sources to deepen his understanding of the laws of physics. | K03<br>U05 | 1<br>1 |
| E4 | The student is prepared to study further fields of physics, such as quantum mechanics. | U02 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion |

| | | |
|---|---|---|
| | | *transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 60 | exam | E2, E4 | a01 |
| FZ2 | discussion classes | 60 | course work | E1, E3 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Fundamentals of Physics: Thermodynamics** |
| Module code | W4-FZ-S1-5-23-19 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | As part of the module, students will participate in lectures with demonstrations and seminar classes. The aim of the lecture is to familiarize students with topics related to thermodynamic systems, principles of thermodynamics, thermodynamics of fluids, phase transitions theory and transport phenomena.. The aim of the classes is to acquire problem solving skills, checking the understanding of the issues discussed during the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows and uses the laws of thermodynamics to formulate a physical problem and find its solution. | U02<br>W03 | 1<br>1 |
| E2 | The student is able to explain the importance of experiments for the progress of science. | K04<br>W03 | 1<br>1 |
| E3 | The student can obtain information from literature, databases and other sources to deepen his understanding of the laws of physics. | K03<br>U05 | 1<br>1 |
| E4 | The student is prepared to study further fields of physics, such as statistical physics. | U02 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion |

| | | |
|---|---|---|
| | | *transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 45 | exam | E2, E4 | a01 |
| FZ2 | discussion classes | 45 | course work | E1, E3 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Individual Practice in a Research Group or Business Environment** |
| Module code | W4-FZ-S1-5-23-PRAKT |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | Professional internship in physics is an extremely important element of the educational process, aimed at preparing students for professional work in the field of physics. The internships are organized in renowned scientific institutions and companies, which allows students to gain practical experience and knowledge in their future work.<br><br>As part of the professional internship course in physics, students have the opportunity to become familiar with the practical aspects of working in the field of physics. The internships cover various topics, such as designing and implementing new technological solutions, conducting scientific research, and analyzing and interpreting research results.<br><br>During the internships, students learn how to use the latest technologies and tools applied in the field of physics, such as measurement systems, computer programs for data analysis, etc. Students also have the opportunity to become familiar with various research methods and ways of presenting their research results.<br><br>Professional internships in physics allow students to gain valuable experience that will help them better understand the specifics of working in this field. Thanks to the internships, students also gain valuable interpersonal skills, such as teamwork, communication, and problem-solving. |
| 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) |
|---|---|---|---|
| E1 | The student is familiar with various research methods and ways of presenting research results. | K02<br>U03 | 1<br>1 |
| E2 | The student is able to apply the latest technologies and tools used in the field of physics, such as measurement systems and computer programs for data analysis. | U04 | 1 |
| E3 | The student is prepared for work in the field of physics, thanks to practical experience gained and skills in teamwork and problem-solving. | K02 | 1 |

| | | | |
|---|---|---|---|
| E4 | The student is able to analyze research results and implement new technological solutions. | U03 | 1 |
| E5 | The student is aware of the specifics of working in the field of physics and has knowledge of various fields of physics, which enables them to choose an appropriate career path. | K02<br>K03<br>W10 | 2<br>2<br>2 |

**9. Methods of conducting classes**

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

**10. Forms of teaching**

| Code | Name | Number of hours | Assessment of the learning outcomes of the module | Learning outcomes of the module | Methods of conducting classes |
|---|---|---|---|---|---|
| FZ1 | internship | 90 | course work | E1, E2, E3, E4, E5 | e05 |

**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<br>*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<br>*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<br>*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)* | No |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | No |
| d03 | Consulting the results of the verification of learning outcomes | Review of internship documentation<br>*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* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Introduction to Atomic, Molecular and Condensed Matter Physics** |
| Module code | W4-FZ-S1-6-23-25 |
| Number of the ECTS credits | 5 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to the fundamental concepts of atomic and molecular physics, condensed matter physics, and to present the current state of knowledge in these areas. In the accompanying tutorial, students solve selected problems related to atomic and molecular physics and condensed matter physics in order to deepen their understanding of the lecture material. |
| 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) |
|---|---|---|---|
| E1 | The student knows the basics of atomic, molecular and condensed matter physics. | W01<br>W02 | 1<br>1 |
| E2 | The student is familiar with current research problems in atomic, molecular and condensed matter physics. | K01<br>U05<br>U06<br>U07 | 1<br>1<br>1<br>1 |
| E3 | The student is prepared for further studies in atomic, molecular and condensed matter physics. | K01<br>K03 | 1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion |

| | | |
|---|---|---|
| | | *transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 45 | exam | E1, E2 | a01 |
| FZ2 | discussion classes | 30 | course work | E3 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Introduction to Experiment** |
| Module code | W4-FZ-S1-1-23-06 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the laboratory is to familiarize students with the specificity of work in a physics laboratory. As part of the course, students learn to use basic measuring instruments and analyze and interpret the results of experiments. Students also acquire the skills necessary to prepare a report on the concluded work. |
| 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) |
|---|---|---|---|
| E1 | The student knows the basic concepts of metrology, including systems of units, measuring tools, measurement methods, calculation of measurement uncertainties., and understands their correlations. | W08 | 1 |
| E2 | The student is skilled in planning and implementing an experiment, analyzing the data obtained and preparing a report on the completed experiments. | U03 | 1 |
| E3 | The student knows and understands the principles of laboratory work; takes care of health and safety and acts ethically. | W09 | 1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | K03<br>U05 | 1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| c07 | Demonstration methods | Screen presentation<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |
| f01 | Methods of self-learning | Self-education<br>*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<br>*searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue* |

**10. Forms of teaching**

| Code | Name | Number of hours | Assessment of the learning outcomes of the module | Learning outcomes of the module | Methods of conducting classes |
|---|---|---|---|---|---|
| FZ1 | laboratory classes | 30 | course work | E1, E2, E3, E4 | a05, c07, e01, 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? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Introduction to Subatomic Physics** |
| Module code | W4-FZ-S1-5-23-22 |
| Number of the ECTS credits | 5 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to the basic concepts of particle physics and nuclear physics, as well as to present the current state of knowledge in these areas. During classes, the student solves selected problems related to particle physics and nuclear physics, thus deepening their understanding of the lecture material. |
| 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) |
|---|---|---|---|
| E1 | The student knows the basics of elementary particle physics and nuclear physics. | W01<br>W02 | 1<br>1 |
| E2 | The student is familiar with current research problems in elementary particle physics and nuclear physics. | K01<br>U05<br>U06<br>U07 | 1<br>1<br>1<br>1 |
| E3 | The student is prepared for further studies in particle physics and nuclear physics. | K01<br>K03 | 1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion |

| | | |
|---|---|---|
| | | *transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 45 | exam | E1, E2 | a01 |
| FZ2 | discussion classes | 30 | course work | E3 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Linear Algebra** |
| Module code | W4-FZ-S1-1-23-02 |
| Number of the ECTS credits | 6 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to the basic concepts of linear algebra such as complex numbers, polynomials, groups, vector spaces and linear transformations, matrices and determinants, and eigenvalue problems. The aim of the tutorial is to acquire skills in applying the content covered in the lecture to solve basic problems of linear algebra. |
| 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) |
|---|---|---|---|
| E1 | The student knows the basic concepts of linear algebra. | W05 | 1 |
| E2 | The student is able to solve basic problems of linear algebra. | U01 | 1 |
| E3 | The student is prepared to study further fields of mathematics. | K04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

| 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** |
| FZ1 | lecture | 30 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 30 | course work | E2 | b02, b07 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Mathematical Analysis I** |
| Module code | W4-FZ-S1-1-23-01 |
| Number of the ECTS credits | 8 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The goal of the lecture is to introduce students to the basics of logic and set theory, as well as to real analysis of functions of one variable, including differential and integral calculus. The goal of the tutorial is to acquire skills in analyzing real functions of a single variable based on the content presented in the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows the elements of logic and set theory as well as differential and integral calculus of single variable functions. | W05 | 1 |
| E2 | The student is able to analyze real-valued functions of one variable. | U01 | 1 |
| E3 | The student is prepared to study further fields of mathematics. | K04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative* |

| | | |
|---|---|---|
| | | *analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 60 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 60 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Mathematical Analysis II** |
| Module code | W4-FZ-S1-2-23-07 |
| Number of the ECTS credits | 8 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to real analysis of functions of multiple variables as well as the theory of ordinary and partial differential equations. The goal of the tutorial is to acquire the ability to analyze real functions of multiple variables and differential equations based on the content presented in the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows differential and integral calculus of many variable functions as well as theory of ordinary and partial differential equations. | W05 | 1 |
| E2 | The student is able to analyze real-valued functions of many variables and differential equations. | U01 | 1 |
| E3 | The student is prepared to study further fields of mathematics. | K04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative* |

| | | |
|---|---|---|
| | | *analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 60 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 60 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Mathematical Analysis III** |
| Module code | W4-FZ-S1-3-23-11A |
| Number of the ECTS credits | 8 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to the elements of measure theory, complex and functional analysis, as well as the elements of distribution theory. The aim of the seminar is to acquire the ability to analyze complex functions and to use distribution theory and functional analysis to solve differential equations. |
| 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) |
|---|---|---|---|
| E1 | The student knows complex function analysis, functional analysis and distribution theory. | W05 | 1 |
| E2 | The student is able to analyze complex functions and solve differential equations using distribution theory and functional analysis methods. | U01 | 1 |
| E3 | The student is prepared to study further fields of mathematics. | K04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative* |

| | | |
|---|---|---|
| | | *analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 60 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 60 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Mathematical Methods in Physics** |
| Module code | W4-FZ-S1-3-23-11B |
| Number of the ECTS credits | 8 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to the basic mathematical methods used in physics, including elements of differential geometry, theory of distributions, methods of complex and functional analysis, and group theory. The aim of the seminar is to acquire skills in analyzing basic mathematical problems that arise in physics. |
| 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) |
|---|---|---|---|
| E1 | The ability to apply mathematical methods of physics to solve physical problems. | W05 | 1 |
| E2 | Understanding the role of mathematics in the process of creating physical theories. | U01 | 1 |
| E3 | The student is prepared to study further fields of mathematics. | K04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

| 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** |
| FZ1 | lecture | 60 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 60 | course work | E2 | b02, b07 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Mathematics Repetitory** |
| Module code | W4-FZ-S1-1-23-03 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the seminar is to systematize and supplement students' knowledge and to acquire the ability to solve problems in the field of mathematical analysis regarding the real function of one variable at the level of the extended matriculation exam in mathematics. |
| 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) |
|---|---|---|---|
| E1 | The student understands the civilizational importance of mathematics. | W05 | 1 |
| E2 | The student is able to independently solve simple problems concerning the real function of one variable. | U04 | 1 |
| E3 | The student is able to present, in an understandable way, in speech and in writing, the definition of the function, the limit of the function, the derivative, and its application. | U06 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| c07 | Demonstration methods | Screen presentation<br>*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* |

| 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** |
| FZ1 | discussion classes | 30 | course work | E1, E2, E3 | b02, c07 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Modern IT Tools** |
| Module code | W4-FZ-S1-2-23-28B |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The course "Modern IT Tools" aims to familiarize students with a diverse range of modern tools and technologies used in the field of computer science. Through interactive classes and practical exercises, students acquire practical skills in utilizing these tools to solve physical problems. Throughout the course, students will explore various IT tools and technologies, such as programming languages, development environments, and database 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 competenc (scale 1-5) |
|---|---|---|---|
| E1 | The student possesses knowledge about various IT tools and technologies used in the field of computer science, such as programming languages, development environments, and database management systems. | W06 | 1 |
| E2 | The student is capable of effectively utilizing modern IT tools to solve physics-related problems. They can identify appropriate tools and technologies and apply them in practice. | U04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 30 | course work | E1, E2 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Module in the "Civil Society and Entrepreneurship" area** |
| Module code | MO-2023-SS-SOP |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | “Civil society and entrepreneurship” is the area which like no other contributed to opening university education "to the world", the area which directly connects science and knowledge acquisition to social use (the system of institutions, laws, customs, social norms). Underlying the area are the conviction that education within each academic discipline should be correlated with the awareness of the changing relation between a person and a citizen, between private and collective life, between a political and a non-political subject, etc. The area of “Civil Society and Entrepreneurship” can be pursued by a student within modules dominated by an academic teacher as well as those where the responsibility for achieving the learning outcomes lies mainly with the student, e.g. civil society in action (projects combining social and natural sciences, combining social sciences and humanities, or combining social sciences, mathematics, physics and chemistry) or social participation in practice. The choice from the range of the above-mentioned modules allows for a high individualization of the education process. |
| 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) |
|---|---|---|---|
| KS_01 | Is ready to meet social obligations, co-organize activities for the benefit of the community and is open to scientific solutions to cognitive and practical problems. | MOB.2023_K01 | 3 |
| U_01 | Asks questions, analyzes research problems, and finds solutions to them, making use of knowledge, skills and experience pertaining to civil society and entrepreneurship, in conjunction with the leading discipline of the degree programme. | MOB.2023_U01 | 3 |
| U_02 | Communicates the results of his/her work on civil society and entrepreneurship in a way which is clear and understandable not only to specialists. | MOB.2023_U01 | 3 |
| W_01 | Has advanced knowledge of selected scientific theories and methods, and is familiar with issues connected with civil society and entrepreneurship. | MOB.2023_W01 | 3 |
| W_02 | Understands the connection between the issues pertaining to civil society and entrepreneurship, and the leading discipline of the degree programme. | MOB.2023_W01 | 3 |

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

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| 01 | depending on the choice | 30 | course work | KS_01, U_01, U_02, W_01, W_02 | a03, a05, b04, c07, d03, f01, f02 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a01 | Preparation for classes | Search for materials and review activities necessary for class participation<br>*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<br>*reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class* | No |
| a04 | Preparation for classes | Consulting materials complementary to those indicated in the syllabus<br>*agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation* | Yes |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| e01 | Activities complementary to the classes | Undertaking, on one’s own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University<br>*a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education* | Yes |

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

| **7.** | **General information about the module** |
|---|---|
| **Module name** | **Module in the "Creative Expression and Critical Thinking" area** |
| Module code | MO-2023-SS-ETKM |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | Underlying the area of “Critical Thinking and Creative Expression” is the conviction that it is necessary to interest students in various intellectual traditions and forms of creative practice making it possible to approach a given problem from many perspectives. It is crucial to develop critical thinking skills, in particular with regard to information present in various forms of communication (popular, popular science, specialist publications, traditional and so-called new media, or artistic activities based on scientific research). Equally important is work in the area of cultural awareness and expression aimed at creative expression of ideas, experiences and emotions through various means of expression: music, theater, literature and visual arts. Driving the process of self-creation is the need to be creative and the need for creative expression, stemming from a deeply rooted human tendency to be inventive while drawing from the values found in art, literature, music, fine arts, values defining the culture of the nation, existing in national traditions, in historical memory and in folk culture. |
| 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) |
|---|---|---|---|
| KS_01 | Is ready to meet social obligations, co-organize activities for the benefit of the community and is open to scientific solutions to cognitive and practical problems. | MOB.2023_K01 | 3 |
| U_01 | Asks questions, analyzes research problems, and finds solutions to them, making use of knowledge, skills and experience pertaining to critical thinking and creative expression in connection with the leading discipline of the degree programme. | MOB.2023_U01 | 3 |
| U_02 | Communicates the results of his/her work in the field of critical thinking and creative expression in a way which is clear and understandable not only to specialists. | MOB.2023_U01 | 3 |
| W_01 | Has advanced knowledge of selected scientific theories and methods, and is familiar with issues pertaining to critical thinking and creative expression. | MOB.2023_W01 | 3 |
| W_02 | Understands the connection between issues related to critical thinking and creative expression and the leading discipline of the degree programme. | MOB.2023_W01 | 3 |

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

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| 01 | depending on the choice | 30 | course work | KS_01, U_01, U_02, W_01, W_02 | a03, a05, b04, c07, d03, f01, f02 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a01 | Preparation for classes | Search for materials and review activities necessary for class participation<br>*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<br>*reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class* | No |
| a04 | Preparation for classes | Consulting materials complementary to those indicated in the syllabus<br>*agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation* | Yes |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| e01 | Activities complementary to the classes | Undertaking, on one’s own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University<br>*a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Module in the "Digital World" area** |
| Module code | MO-2023-SS-CS |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | Apart from the real world, the digital world is of course another area constantly present in modern people’s lives. The two human environments – the natural and the cultural one – have been joined by a third one, i.e. the digital environment. Modern digital technologies create new opportunities, but their constant development may, in addition to new opportunities, also create new threats. The modules proposed within the “Digital World” area provide an opportunity to learn about the crucial, current technological and social aspects of the digital world and to build competences for conscious, creative and safe functioning in this/her world.<br>The modules of the Digital World area are divided into two sub-areas. Crucial for the first one, dubbed “Digital technologies”, are the issues pertaining to technologies; this/her sub-area will allow students to expand their digital competences in the field of programming as well as data processing and analysis. Essential for the second sub-area, dubbed “Digital society”, is a reflection on the impact of the development of digital technologies, including artificial intelligence, on the way we function as individuals and as entire societies. The purpose of the module content in this/her sub-area is to develop students' skills of navigating the digital world in creatively and safely, while maintaining personal autonomy and self-awareness. |
| 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) |
|---|---|---|---|
| KS_01 | Shows openness to science-based solutions to cognitive and practical problems and is ready to fulfill social obligations. | MOB.2023_K01 | 3 |
| U_01 | Asks questions, analyzes research problems, and finds solutions to them, making use of knowledge, skills and experience gained in the field of digital technologies and issues pertaining to the digital society in conjunction with the leading discipline of the degree programme. | MOB.2023_U01 | 3 |
| U_02 | Communicates the results of his/her work pertaining to the key technological and social aspects of the digital world in a way which is clear and understandable not only to specialists. | MOB.2023_U01 | 3 |
| W_01 | Has advanced knowledge of selected scientific theories and methods and is familiar with issues pertaining to key technological and social aspects of the digital world. | MOB.2023_W01 | 3 |
| W_02 | Understands the connection between key technological and social aspects of the digital world and the leading discipline | MOB.2023_W01 | 3 |

| | | | |
|---|---|---|---|
| | of the degree programme. | | |

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

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| 01 | depending on the choice | 30 | course work | KS_01, U_01, U_02, W_01, W_02 | a03, a05, b04, c07, d03, f01, f02 |

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

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

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Module in the "Health and Personal Development" area** |
| Module code | MO-2023-SS-ZRO |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The area of “Health and Personal Development” opens university education to the perspective of the well-being of an individual (i.e., a student, who is a person entering adulthood). The area focuses on such categories as maintaining physical, mental and social health, the level of satisfaction with various spheres of one’s life and the development of "soft" skills (dealing with stress, communicating with others or the conscious shaping and managing one’s life). The modules offered within the “Health” sub-area are meant to equip students with the ability to recognize and assess their own health (including their mental health) and to find appropriate means of promoting it. The point of departure of the module is the presentation of modern knowledge that distinguishes evidence-based medicine from common beliefs. The modules in the “Personal Development” sub-area direct students towards methods of the practical maintenance of one’s well-being (including mental well-being). They supply competences for building one’s personal potential in the modern world in a way which is active and effective as well as conscious and prudent. The main concern is realizing and recognizing one's own preferences, possibilities and limits, as well as the awareness of agency and responsibility for the balance between health, happiness and development. Having attended the module, the individual will be in a position to combine his/her own development with taking care of his/her mental and physical condition and general well-being in a balanced way. |
| 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) |
|---|---|---|---|
| KS_01 | Is ready to meet social obligations, co-organize activities for the benefit of the community and is open to scientific solutions to cognitive and practical problems. | MOB.2023_K01 | 3 |
| U_01 | Asks questions, analyzes research problems, and finds solutions to them, making use of knowledge, skills and experience pertaining to the concept of an individual’s well-being, including their health and personal development, in conjunction with the leading discipline of the degree programme. | MOB.2023_U01 | 3 |
| U_02 | Communicates the results of his/her work regarding the concept of an individual’s well-being, including their health and personal development, in a way which is clear and understandable not only to specialists. | MOB.2023_U01 | 3 |
| W_01 | Has advanced knowledge of selected scientific theories and methods, and is familiar with issues connected with the concept of an individual’s well-being, including their health and personal development. | MOB.2023_W01 | 3 |

| | | | |
|---|---|---|---|
| W_02 | Understands the connection between the issues pertaining to the concept of an individual’s well-being, including their health and personal development, and the leading discipline of the degree programme. | MOB.2023_W01 | 3 |

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

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| 01 | depending on the choice | 30 | course work | KS_01, U_01, U_02, W_01, W_02 | a03, a05, b04, c07, d03, f01, f02 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a01 | Preparation for classes | Search for materials and review activities necessary for class participation<br>*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<br>*reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class* | No |
| a04 | Preparation for classes | Consulting materials complementary to those indicated in the syllabus<br>*agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation* | Yes |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| e01 | Activities complementary to the classes | Undertaking, on one’s own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University<br>*a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Module in the "Natural Environment and Technologies" area** |
| Module code | MO-2023-SS-SNT |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The “Natural Environment and Technologies” area pertains to human interaction with the material environment, both the natural one and the one heavily modified by technology. This is the environment where people live, which they are subject to, and which they change in many ways. Understanding the Anthropocene requires an understanding of how biological systems function (from cells to ecosystems, to modern environmental threats, climate issues, natural resources, and many other natural issues) as well as an understanding of the rudiments of technical and technological knowledge. It is crucial to know and understand how technological development, especially in the areas of energy, green technologies, modern materials or everyday life (e.g. food production) can change the nature of human impact and support the way we care for the environment. The ways in which the human impact on the environment is regulated include using legal tools, such as nature protection law or energy law, as well as EU regulations, Sustainable Development Goals or the European Green Deal. |
| 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) |
|---|---|---|---|
| KS_01 | Shows openness to science-based solutions to cognitive and practical problems and is ready to meet social obligations. | MOB.2023_K01 | 3 |
| U_01 | Asks questions, analyzes research problems, and finds solutions to them, making use of knowledge, skills and experience pertaining to the human interaction with the material environment – both natural and technologically modified, in conjunction with the leading discipline of the degree programme. | MOB.2023_U01 | 3 |
| U_02 | Communicates the results of his/her work pertaining to the human interaction with the material environment – both natural and technologically modified, in a way which is clear and understandable not only to specialists. | MOB.2023_U01 | 3 |
| W_01 | Has advanced knowledge of selected scientific theories and methods, and is familiar with issues connected with human interaction with the material environment – both natural and technologically modified. | MOB.2023_W01 | 3 |
| W_02 | Understands the connection between issues pertaining to human interaction with the material environment – both natural and technologically modified, and the leading discipline of the degree programme. | MOB.2023_W01 | 3 |

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

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| 01 | depending on the choice | 30 | course work | KS_01, U_01, U_02, W_01, W_02 | a03, a05, b04, c07, d03, f01, f02 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a01 | Preparation for classes | Search for materials and review activities necessary for class participation<br>*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<br>*reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class* | No |
| a04 | Preparation for classes | Consulting materials complementary to those indicated in the syllabus<br>*agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation* | Yes |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| e01 | Activities complementary to the classes | Undertaking, on one’s own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University<br>*a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Module in the "The Limits of Science" area** |
| Module code | MO-2023-SS-GN |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | Scientific pursuits and the ways people function in the world are geared towards getting to know the reality and acquiring knowledge. All of this/her is within the purview of the “Limits of Science” area. It endeavours to indicate the difference between science and pseudoscience, the pitfalls and benefits of popularizing knowledge, to address the issue of how knowledge is obtained in various research communities. What is the difference between the natural sciences and humanities? What happens on the way from a hypothesis to testing a theory? What methods do the different sciences have at their disposal? Can humanities be scientific and how much literature is there in physics?<br>The “Limits of Science” area strives to indicate practical ways of navigating the world of science. It strives to describe how to distinguish valuable knowledge from information noise, to introduce students to the arcana of recognizing and applying research methods and to develop the panorama of concepts related to the classification of knowledge and cognition, to present the history and the directions of human inquiry. An important role of the area is to indicate the methods of interpreting scientific texts and the research results contained within them, and to develop the ability to present scientific content in an effective and accessible way. |
| 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) |
|---|---|---|---|
| KS_01 | Is ready to meet social obligations, co-organize activities for the benefit of the community and is open to scientific solutions to cognitive and practical problems. | MOB.2023_K01 | 3 |
| U_01 | Asks questions, analyzes research problems, and finds solutions to them, making use of knowledge, skills and experience pertaining to the issues falling under the scope of limits of science , in conjunction with the leading discipline of the degree programme. | MOB.2023_U01 | 3 |
| U_02 | Communicates the results of his/her work on the issues falling under the scope of limits of science in a way which is clear and understandable not only to specialists. | MOB.2023_U01 | 3 |
| W_01 | Has advanced knowledge of selected scientific theories and methods, and is familiar with issues typical to scientific enquiry and practicing science. | MOB.2023_W01 | 3 |
| W_02 | Understands the connection between the issues falling under the scope of limits of science and the leading discipline of | MOB.2023_W01 | 3 |

| | | | |
|---|---|---|---|
| | the degree programme. | | |

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

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| 01 | depending on the choice | 30 | course work | KS_01, U_01, U_02, W_01, W_02 | a03, a05, b04, c07, d03, f01, f02 |

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

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

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Open University Module** |
| Module code | OMU-2023-SS-01-OG |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The aim of the module is to extend the students' knowledge to include specialist content that goes beyond their degree programme and to inspire them to search for information on their own. The issues addressed are on the one hand meant to arouse curiosity, and, on the other hand, to indicate the usefulness of interdisciplinary knowledge in professional life as well as in social relations and interactions. They will be connected with current research results or with specialist professional experience. The module offers diverse forms of classes, involving in both innovative and professional ways of conveying knowledge, as well as interactive methods, inspiring students to actively participate in classes. The interdisciplinary assumptions of the module allow for the classes being taught by teachers representing various scientific disciplines, resulting in a multi-faceted presentation of the issues. In addition, the module can be taught in foreign languages. The student selects the subject matter of the classes from the submitted proposals. |
| 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) |
|---|---|---|---|
| 01 | The student understands the relationship between humanities, social sciences, natural sciences, exact mathematical sciences, technical sciences and performing, visual and other arts. | OMU.2023_U01<br>OMU.2023_W01 | 3<br>3 |
| 02 | The student is able to combine information from various fields of knowledge, creating a coherent vision of an interdisciplinary issue. | OMU.2023_U01<br>OMU.2023_W01 | 3<br>3 |
| 03 | The student is able to search for necessary information in various types of sources and is able to critically select them. | OMU.2023_U01<br>OMU.2023_W01 | 3<br>3 |
| 04 | The student is able to move freely in the area of concepts pertaining to the issues discussed within the module, presented in detail in the relevant syllabuses. | OMU.2023_U01<br>OMU.2023_W01 | 3<br>3 |
| 05 | The student develops the need and the habit of accessing source information which goes beyond the content typical to the studied degree programme. | OMU.2023_K01<br>OMU.2023_U01 | 2<br>2 |

| | | | |
|---|---|---|---|
| | | OMU.2023_W01 | 2 |

**9. Methods of conducting classes**

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

**10. Forms of teaching**

| Code | Name | Number of hours | Assessment of the learning outcomes of the module | Learning outcomes of the module | Methods of conducting classes |
|---|---|---|---|---|---|
| 01 | depending on the choice | 30 | course work | 01, 02, 03, 04, 05 | a03, a05, b04, c07, d03, f01, f02 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a01 | Preparation for classes | Search for materials and review activities necessary for class participation<br>*reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the* | No |

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

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

| **7.** | **General information about the module** |
|---|---|
| **Module name** | **Physical education** |
| Module code | WF-2023 |
| Number of the ECTS credits | 0 |
| Language of instruction | |
| Purpose and description of the content of education | Academic physical culture should be an integral and complementary part of the general educational program of the university. Physical culture consists of physical education, recreation, sport and tourism. The physical education module is the only area that creates the opportunity for implementing the body- and health-related values and provides a counterbalance to the mental workload of university students. It responds to the changing reality and to a large extent participates in the process of preparing the student for professional adult life as well as the life in the family and in the society. The aim of the classes in this/her module is to become familiar with and to learn the technical elements of the selected sports discipline. Also, to possibly consolidate the skills acquired at a previous stage of education. Thus, the student becomes equipped with the necessary knowledge about physical culture, its history and specific regulations. He/she becomes familiar with the organization of competitions and the recreational and tourist events. Through group cooperation and discipline, the classes develop self-esteem and instill life-long health-promoting attitudes. |
| 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) |
|---|---|---|---|
| K01 | The student observes the rules of "fair play" on the sports field and in everyday life. He/she promotes the social and cultural importance of sport and exercise and cultivates his/her own preferences related to physical culture. | | |
| U01 | The student uses sports facilities and equipment in a safe way, practices the correct warm-up and, if necessary, implements appropriate safety measures when exercising. | | |
| U02 | The student is able to properly analyze the level of their own physical fitness and motor skills. | | |
| U03 | The student is able to cooperate in a group and assume various roles: creating and supporting the attitudes of others, following the instructions of the coach or the teacher, as well as competition, rivalry and responsibility. | | |
| W01 | The student has knowledge pertaining to the impact of physical exercise on human health. He/she knows the body needs and the forms of physical activity needed to maintain health, as well as the consequences and risks associated with the lack of exercise. | | |
| W02 | The student knows the rules and regulation, rules of the games and the history of the chosen form of exercise. | | |

| 9. | Methods of conducting classes | |
|---|---|---|
| **Code** | **Category** | **Name (description)** |
| b03 | Problem-solving methods | Activating method – educational games<br>*learning content in the guise of a rule- and/or principle-based game; conducted in a deliberately arranged situation based on the description of relevant facts and processes; learners compete with one another within the framework of rules laid down by the academic teacher; varieties include simulation games – involving a simulation of real situations; decision games – based on the decision-making process and the recognition of the consequences of the decisions made (e.g., a decision tree); psychological games – increasing the emotional-volitional component of the participants' attitudes* |
| c06 | Demonstration methods | Demonstration-imitation<br>*a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours* |
| e05 | Practical methods | Internship<br>*including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions* |
| e06 | Practical methods | Observation<br>*also conducted as fieldwork; a method of watching phenomena, objects or people in a systematic/planned way in order to gain knowledge about them; perceptual separation of elements of a model action as an element of learning through imitation; a complex system of cognition based on sensory experiences* |

| 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** |
| 01 | practical classes | 30 | course work | K01, U01, U02, U03, W01, W02 | b03, c06, e05, e06 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Physics Laboratory I: Electricity and Magnetism** |
| Module code | W4-FZ-S1-3-23-13 |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The laboratory aim is to complement the content of the Fundamentals of physics: electricity and magnetism by developing students' skills in planning and solving physical problems using simple experiments in electricity and magnetism. During the laboratory, students will perform experiments and collect data necessary to prepare reports. They analyze and discuss the obtained results with the calculation of measurement uncertainties. |
| 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) |
|---|---|---|---|
| E1 | The student knows the fundamentals of physics laws in the field of electricity and magnetism, has the ability to use measuring apparatus. | W01<br>W03 | 1<br>1 |
| E2 | The student is skilled in planning and implementing an experiment, analyzing the data obtained and preparing a report on the completed experiments. | U02<br>U03<br>W07<br>W08 | 1<br>1<br>1<br>1 |
| E3 | The student has the ability to work in a team, estimate the time and resources needed to complete the assigned task, understand the division of tasks and the need to fulfill the assigned task. | K03<br>U07 | 1<br>1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | K01<br>U05 | 1<br>1 |
| E5 | The student knows and understands the principles of laboratory work; takes care of health and safety and acts ethically. | W08<br>W10 | 1<br>1 |

| 9. | Methods of conducting classes | |
|---|---|---|
| **Code** | **Category** | **Name (description)** |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 25 | course work | E1, E2, E3, E4, E5 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |
| d01 | Consulting the results of the verification of learning outcomes | Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes<br>*reading through the academic teacher’s comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Physics Laboratory I: Mechanics** |
| Module code | W4-FZ-S1-2-23-09 |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The laboratory aim is to complement the content of the Fundamentals of physics: mechanics by developing students' skills in planning and solving physical problems using simple experiments in Mechanics. During the laboratory, students will perform experiments and collect data necessary to prepare reports. They analyze and discuss the obtained results with the calculation of measurement uncertainties. |
| 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) |
|---|---|---|---|
| E1 | The student knows the fundamentals of physics laws in the field of mechanics and has the ability to use measuring apparatus. | W01<br>W03 | 1<br>1 |
| E2 | The student is skilled in planning and implementing an experiment, analyzing the data obtained and preparing a report on the completed experiments. | U02<br>U03<br>W07<br>W08 | 1<br>1<br>1<br>1 |
| E3 | The student has the ability to work in a team, estimate the time and resources needed to complete the assigned task, understand the division of tasks and the need to fulfill the assigned task. | K03<br>U07 | 1<br>1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | K01<br>U05 | 1<br>1 |
| E5 | The student knows and understands the principles of laboratory work; takes care of health and safety and acts ethically. | W08<br>W10 | 1<br>1 |

| 9. | Methods of conducting classes | |
|---|---|---|
| **Code** | **Category** | **Name (description)** |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 20 | course work | E1, E2, E3, E4, E5 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |
| d01 | Consulting the results of the verification of learning outcomes | Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes<br>*reading through the academic teacher’s comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Physics Laboratory I: Optics and Structure of Matter** |
| Module code | W4-FZ-S1-4-23-16 |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The laboratory aim is to complement the content of the Fundamentals of physics: optics and structure of matter by developing students' skills in planning and solving physical problems using simple experiments in optics and structure of matter. During the laboratory, students will perform experiments and collect data necessary to prepare reports. They analyze and discuss the obtained results with the calculation of measurement uncertainties. |
| 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) |
|---|---|---|---|
| E1 | The student knows the fundamentals of physics laws in the field of optics and structure of matter, has the ability to use measuring apparatus. | W01<br>W03 | 1<br>1 |
| E2 | The student is skilled in planning and implementing an experiment, analyzing the data obtained and preparing a report on the completed experiments. | U02<br>U03<br>W07<br>W08 | 1<br>1<br>1<br>1 |
| E3 | The student has the ability to work in a team, estimate the time and resources needed to complete the assigned task, understand the division of tasks and the need to fulfill the assigned task. | K03<br>U07 | 1<br>1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | K01<br>U05 | 1<br>1 |
| E5 | The student knows and understands the principles of laboratory work; takes care of health and safety and acts ethically. | W08<br>W10 | 1<br>1 |

| 9. | Methods of conducting classes | |
|---|---|---|
| **Code** | **Category** | **Name (description)** |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 25 | course work | E1, E2, E3, E4, E5 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |
| d01 | Consulting the results of the verification of learning outcomes | Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes<br>*reading through the academic teacher’s comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Physics Laboratory I: Thermodynamics** |
| Module code | W4-FZ-S1-5-23-20 |
| Number of the ECTS credits | 2 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The laboratory aim is to complement the content of the Fundamentals of physics: thermodynamics by developing students' skills in planning and solving physical problems using simple experiments in Thermodynamics. During the laboratory, students will perform experiments and collect data necessary to prepare reports. They analyze and discuss the obtained results with the calculation of measurement uncertainties. |
| 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) |
|---|---|---|---|
| E1 | The student knows the fundamentals of physics laws in the field of thermodynamics and has the ability to use measuring apparatus. | W01<br>W03 | 1<br>1 |
| E2 | The student is skilled in planning and implementing an experiment, analyzing the data obtained and preparing a report on the completed experiments. | U02<br>U03<br>W07<br>W08 | 1<br>1<br>1<br>1 |
| E3 | The student has the ability to work in a team, estimate the time and resources needed to complete the assigned task, understand the division of tasks and the need to fulfill the assigned task. | K03<br>U07 | 1<br>1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | K01<br>U05 | 1<br>1 |
| E5 | The student knows and understands the principles of laboratory work; takes care of health and safety and acts ethically. | W08<br>W10 | 1<br>1 |

| 9. | Methods of conducting classes | |
|---|---|---|
| **Code** | **Category** | **Name (description)** |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 20 | course work | E1, E2, E3, E4, E5 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |
| d01 | Consulting the results of the verification of learning outcomes | Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes<br>*reading through the academic teacher’s comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Physics Laboratory II** |
| Module code | W4-FZ-S1-6-23-27A |
| Number of the ECTS credits | 9 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the laboratory is to complement the content of specialist modules on subatomic physics, atomic and molecular physics and condensed matter physics. During the course, students will perform experiments in specialized laboratories using advanced measurement systems and collect data necessary to prepare scientific reports. They analyze and discuss the obtained results with the calculation of measurement uncertainties. |
| 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) |
|---|---|---|---|
| E1 | The student knows the fundamentals of physics laws and has the ability to use measuring apparatus. | W01<br>W02<br>W03 | 1<br>1<br>1 |
| E2 | The student is skilled in planning and implementing an experiment, analyzing the data obtained and preparing a report on the completed experiments. | U02<br>U03<br>U04<br>W07<br>W08 | 1<br>1<br>1<br>1<br>1 |
| E3 | The student has the ability to work in a team, estimate the time and resources needed to complete the assigned task, understand the division of tasks and the need to fulfill the assigned task. | K03<br>U07 | 1<br>1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | K01<br>U05 | 1<br>1 |
| E5 | The student knows and understands the principles of laboratory work; takes care of health and safety and acts ethically. | W08 | 1 |

| | | | |
|---|---|---|---|
| | | W10 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

**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 |
|---|---|---|---|---|---|
| FZ1 | laboratory classes | 90 | course work | E1, E2, E3, E4, E5 | a05, e01 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |
| d01 | Consulting the results of the verification of learning outcomes | Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes<br>*reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Physics Repetitory** |
| Module code | W4-FZ-S1-1-23-05 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the seminar is to systematize and supplement students' knowledge of the basics of mechanics at the level of the extended matriculation exam in physics. The student acquires the ability to solve problems in the field of kinematics and dynamics of a material point and a rigid body. |
| 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) |
|---|---|---|---|
| E1 | The student understands the civilizational importance of physics. | W01<br>W03 | 1<br>1 |
| E2 | The student knows the units and laws of mechanics, knows how to solve simple physical problems. | W01<br>W03 | 1<br>1 |
| E3 | The student has the ability to present the basic laws of mechanics in an understandable manner, both orally and in writing. | U02 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| c07 | Demonstration methods | Screen presentation<br>*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* |

| 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** |
| FZ1 | discussion classes | 30 | course work | E1, E2, E3 | b02, c07 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| **7.** | **General information about the module** |
|---|---|
| **Module name** | **Programming I** |
| Module code | W4-FZ-S1-2-23-28A |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The subject "Programming I" serves as an introduction to the basics of programming for students. The objective of this course is to familiarize students with fundamental programming concepts and enable them to effectively create simple computer programs. During the classes, students will learn about basic programming structures, such as variables, conditional statements, loops, and functions. They will also acquire problem-solving skills through programming by analyzing, designing, and implementing simple programs. |
| 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) |
|---|---|---|---|
| E1 | The student is familiar with programming concepts such as variables, data types, control structures, and functions. | W06 | 1 |
| E2 | The student is capable of writing code in a selected programming language, including syntax, logic, and good programming practices. | U04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 30 | course work | E1, E2 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Programming II** |
| Module code | W4-FZ-S1-3-23-29A |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The course "Programming II" is a continuation of the introduction to programming for students. The aim of this course is to further develop programming skills by delving into more advanced concepts and programming techniques. During the classes, students expand their knowledge of data structures, algorithms, and advanced programming techniques. They learn to design and implement more complex programs that encompass various programming paradigms, such as object-oriented programming and functional programming. |
| 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) |
|---|---|---|---|
| E1 | The student possesses advanced programming concepts knowledge, such as object-oriented programming, functional programming, and others. They gain a deeper understanding of various programming paradigms. | W06 | 1 |
| E2 | The student is able to design and develop more advanced programs that encompass multiple modules, interaction between them, and complex data structures. They can apply various programming techniques to solve advanced problems. | U04 | 1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 30 | course work | E1, E2 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Quantum Mechanics I** |
| Module code | W4-FZ-S1-5-23-21 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to present the basic physical problems that cannot be explained using classical mechanics and to introduce students to the description of non-relativistic dynamics of simple quantum systems in the Schrödinger, Heisenberg, and interaction pictures. The aim of the seminar is to acquire the skills of analyzing the dynamics of simple quantum systems based on the content presented in the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows the description of the dynamics of simple quantum systems in the Schrödinger, Heisenberg, and interaction pictures. | W04<br>W05 | 1<br>1 |
| E2 | The student is able to solve the Schrödinger equation for a simple quantum system. | U02 | 1 |
| E3 | The student is prepared to study further fields of physics, such as quantum field theory, and statistical physics. | K01<br>K04<br>W04<br>W05 | 1<br>1<br>1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |

| | | |
|---|---|---|
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 30 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 30 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Quantum Mechanics II** |
| Module code | W4-FZ-S1-6-23-24 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to consolidate knowledge of quantum mechanics through its application to describe problems relevant to particle physics, nuclear, atomic and molecular physics, and condensed matter physics, such as elements of relativistic quantum mechanics, quantum scattering theory, motion in central and periodic fields, and elements of quantum many-body theory. The aim of the classes is to acquire skills in analyzing quantum systems based on the content presented in the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows the most important applications of quantum mechanics and the quantum effects that arise from them. | W04<br>W05 | 1<br>1 |
| E2 | The student is able to apply quantum mechanics to analyze typical microscopic systems. | U02 | 1 |
| E3 | The student is prepared to study further areas of physics, such as quantum field theory, statistical physics, relativistic quantum mechanics, and quantum many-body theory. | K01<br>K04<br>W04<br>W05 | 1<br>1<br>1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion |

| | | |
|---|---|---|
| | | *transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study<br>*a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 30 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 30 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Specialized Laboratory** |
| Module code | W4-FZ-S1-6-23-27B |
| Number of the ECTS credits | 9 |
| Language of instruction | Polish |
| Purpose and description of the content of education | In the laboratory, students participate in specialized experiments in the field of subatomic physics, atomic and molecular physics, or condensed matter physics. Compared to the Physics Laboratory II module, the Specialized Laboratory allows for a deeper exploration of a selected branch of experimental physics at the expense of a wider range of learned methods. During the course, students will perform experiments in specialized laboratories using advanced measurement systems and collect data necessary to prepare scientific reports. They analyze and discuss the obtained results with the calculation of measurement uncertainties. |
| 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) |
|---|---|---|---|
| E1 | The student has an advanced knowledge of subatomic physics or atomic and molecular physics or condensed matter physics. | W01<br>W02<br>W03 | 1<br>1<br>1 |
| E2 | The student is skilled in planning and implementing an experiment, analyzing the data obtained and preparing a report on the completed experiments. | U02<br>U03<br>U04<br>W07<br>W08 | 1<br>1<br>1<br>1<br>1 |
| E3 | The student has the ability to work in a team, estimate the time and resources needed to complete the assigned task, understand the division of tasks and the need to fulfill the assigned task. | K03<br>U07 | 1<br>1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | K01<br>U05 | 1<br>1 |

| | | | |
|---|---|---|---|
| E5 | The student knows and understands the principles of laboratory work; takes care of health and safety and acts ethically. | W08<br>W10 | 1<br>1 |

| 9. | Methods of conducting classes | |
|---|---|---|
| **Code** | **Category** | **Name (description)** |
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| e01 | Practical methods | Laboratory exercise / experiment<br>*[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

| 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** |
| FZ1 | laboratory classes | 90 | course work | E1, E2, E3, E4, E5 | a05, e01 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |
| d01 | Consulting the results of the verification of learning outcomes | Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes<br>*reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **Statistical Methods for Research Measurement Processing** |
| Module code | W4-FZ-S1-2-23-10 |
| Number of the ECTS credits | 3 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the seminar is to familiarize students with the basics of statistical analysis of measurement uncertainties and presentation of results in the form of a report. The student acquires the skills of planning an experiment and describing the results based on computer methods. |
| 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) |
|---|---|---|---|
| E1 | The student is skilled in planning and implementing an experiment, analysing obtained data with the calculation of measurement uncertainties and preparing a report on the completed experiments. | U03<br>U04 | 1<br>1 |
| E2 | The student uses computer methods to present the obtained measurement results. | U04 | 1 |
| E3 | The student has the ability to work in a team, estimate the time and resources needed to complete the assigned task, understand the division of tasks and the need to fulfil the assigned task. | K03 | 1 |
| E4 | Students can obtain information from literature, databases and other sources; they can integrate the acquired information and interpret it, draw conclusions and formulate opinions. | U04<br>U05 | 1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a05 | Lecture methods / expository methods | Explanation/clarification<br>*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* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| e01 | Practical methods | Laboratory exercise / experiment |

| | | |
|---|---|---|
| | | *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment* |

**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 |
|---|---|---|---|---|---|
| FZ1 | laboratory classes | 20 | course work | E1, E2, E3, E4 | a05, b02, e01 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| c03 | Preparation for verification of learning outcomes | Implementation of an individual or group assignment necessary for course/phase/ examination completion<br>*a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course* | Yes |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Statistical Physics** |
| Module code | W4-FZ-S1-6-23-23 |
| Number of the ECTS credits | 6 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The goal of the lecture is to introduce students to the description of the dynamics of complex systems consisting of a macroscopic number of degrees of freedom using theory of probability and statistics, as well as a microscopic derivation of the phenomenological laws of thermodynamics. The aim of the classes is to acquire skills in the analysis of complex systems based on the content presented in the lecture. |
| 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) |
|---|---|---|---|
| E1 | The student knows the statistical description of the dynamics of complex systems and the microscopic derivation of phenomenological thermodynamics. | W03 | 1 |
| E2 | The student is able to apply statistical physics to analyze typical complex systems. | U01<br>U02 | 1<br>1 |
| E3 | The student is prepared to study further topics in physics such as quantum field theory, relativistic quantum mechanics, and quantum many-body theory. | K03<br>U05 | 1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study |

| | | |
|---|---|---|
| | | *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 30 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 30 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | General information about the module |
|---|---|
| **Module name** | **Statistics** |
| Module code | W4-FZ-S1-4-23-18 |
| Number of the ECTS credits | 4 |
| Language of instruction | Polish |
| Purpose and description of the content of education | The aim of the lecture is to introduce students to probability theory, descriptive statistics, estimation theory and statistical inference, as well as statistical data analysis. The aim of the tutorial is to acquire skills in applying probability theory and statistical methods for data analysis. |
| 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) |
|---|---|---|---|
| E1 | The student knows the methods of probability theory and statistics, including the theory of estimation and hypothesis testing. | W01 | 1 |
| E2 | The student is able to perform statistical analysis of data. | U01<br>U03<br>U04 | 1<br>1<br>1 |
| E3 | The student is prepared to apply statistical methods to problems beyond the scope of exact sciences and understands the conditions under which they can be applied. | K02<br>K04 | 1<br>1 |

**9. Methods of conducting classes**

| Code | Category | Name (description) |
|---|---|---|
| a01 | Lecture methods / expository methods | Formal lecture/ course-related lecture<br>*a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided* |
| b02 | Problem-solving methods | Lecture-discussion<br>*transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up* |
| b07 | Problem-solving methods | Activating methods: a case study |

| | | |
|---|---|---|
| | | *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon* |

**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 |
|---|---|---|---|---|---|
| FZ1 | lecture | 30 | exam | E1, E3 | a01 |
| FZ2 | discussion classes | 30 | course work | E2 | b02, b07 |

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

| Code | Category | Name (description) | Is it part of the BUNA? |
|---|---|---|---|
| a02 | Preparation for classes | Literature reading / analysis of source materials<br>*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<br>*activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)* | Yes |
| a05 | Preparation for classes | Production/preparation of tools, materials or documentation necessary for class participation<br>*developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes* | No |

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

| 7. | **General information about the module** |
|---|---|
| **Module name** | **The area of “Civil Society and Entrepreneurship: Entrepreneurship”** |
| Module code | MO-2023-SS-SOP-P |
| Number of the ECTS credits | 3 |
| Language of instruction | |
| Purpose and description of the content of education | The aim of the module is to develop in students a creative attitude towards reality and to familiarize them with the organizational and legal conditions of operating in those sectors of social life in which they can function independently after they graduate. The module prepares students to take up business activity, start a company or an organization whether in the sphere of business, in the third sector (foundations, associations, etc.), or in the broadly understood sector of education, culture and art. Studying the module, students become familiar with the principles of starting, running and financing a business venture, as well as other forms of enterprise or organization, e.g. limited liability companies, joint-stock companies, foundations, associations, etc., they identify basic market mechanisms determining the nature of the conducted activity, in particular the legal, social and ethical framework for conducting it, and gain the ability to independently identify opportunities and threats (risks). |
| 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) |
|---|---|---|---|
| KS_01 | Is ready to meet social obligations, co-organize activities for the benefit of the community and is open to scientific solutions to cognitive and practical problems. | MOB.2023_K01<br>MOB.2023_W02_P | 3<br>3 |
| KS_02 | Is prepared and motivated to act in an entrepreneurial and creative way and with respect for the norms and rules of coexistence applicable in diverse cultural environments. | MOB.2023_K01<br>MOB.2023_W02_P | 3<br>3 |
| U_01 | Asks questions, analyzes research problems, and finds solutions to them, making use of knowledge, skills and experience pertaining to entrepreneurship, in conjunction with the leading discipline of the degree programme. | MOB.2023_U01 | 3 |
| U_02 | Communicates the results of his/her work connected with entrepreneurship in a way which is clear and understandable not only to specialists. | MOB.2023_U01 | 3 |
| U_03 | Can use knowledge in the field of entrepreneurship to design, implement and evaluate their own business or other activities undertaken in cooperation with other entities. | MOB.2023_U01 | 3 |
| W_01 | Has advanced knowledge of selected scientific theories and methods regarding entrepreneurship, including legal and organizational aspects of conducting one's own business or some other activity. | MOB.2023_W01 | 3 |

| | | | |
|---|---|---|---|
| | | MOB.2023_W02_P | 3 |
| W_02 | Knows and understands the characteristic features which define thinking and acting in an entrepreneurial way in the context of the leading discipline of the degree programme. | MOB.2023_W01<br>MOB.2023_W02_P | 3<br>3 |

**9. Methods of conducting classes**

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

| 10. | Forms of teaching | | | | |
|---|---|---|---|---|---|
| **Code** | **Name** | **Number of hours** | **Assessment of the learning outcomes of the module** | **Learning outcomes of the module** | **Methods of conducting classes** |
| 01 | depending on the choice | 30 | course work | KS_01, KS_02, U_01, U_02, U_03, W_01, W_02 | a03, a05, b04, c07, d03, f01, f02 |

| 11. | The student's work, apart from participation in classes, includes in particular: | | |
|---|---|---|---|
| **Code** | **Category** | **Name (description)** | **Is it part of the BUNA?** |
| a01 | Preparation for classes | Search for materials and review activities necessary for class participation<br>*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<br>*reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class* | No |
| a04 | Preparation for classes | Consulting materials complementary to those indicated in the syllabus<br>*agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation* | Yes |
| b01 | Consulting the curriculum and the organization of classes | Getting acquainted with the syllabus content<br>*reading through the syllabus and getting acquainted with its content* | Yes |
| c01 | Preparation for verification of learning outcomes | Determining the stages of task implementation contributing to the verification of learning outcomes<br>*devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.* | Yes |
| c02 | Preparation for verification of learning outcomes | Studying the literature used in and the materials produced in class<br>*exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class* | No |
| e01 | Activities complementary to the classes | Undertaking, on one’s own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University<br>*a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education* | Yes |

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.