

**Subject card**

|  |  |   |                           |  |  |                   |            |
|--|--|---|---------------------------|--|--|-------------------|------------|
| <b>Subject name and code</b>                       | Research Project, PG_00182279  |   |                           |  |  |                   |            |
| <b>Field of study</b>                              | Physics  |   |                           |  |  |                   |            |
| <b>Date of commencement of studies</b>             | October 2026   | <b>Academic year of realisation of subject</b>                  |                           |  | 2028/2029  |                   |            |
| <b>Education level</b>                             | Bachelor's studies   | <b>Subject group</b>  |                           |  | Obligatory subject group in the field of study<br>Subject group related to scientific research in the field of study |                   |            |
| <b>Mode of study</b>                               | full-time studies  | <b>Mode of delivery</b>   |                           |  | at the university  |                   |            |
| <b>Year of study</b>                               | 3  | <b>Language of instruction</b>                                  |                           |  | Polish   |                   |            |
| <b>Semester of study</b>                           | 5  | <b>ECTS credits</b>   |                           |  | 2.0  |                   |            |
| <b>Learning profile</b>                            | academic   | <b>Assessment form</b>  |                           |  | credit   |                   |            |
| <b>Conducting unit</b>                             |  |   |                           |  |  |                   |            |
| <b>Name and surname of lecturer (lecturers)</b>    | <b>Subject supervisor</b>  |   | dr hab. Michał Studziński |  |  |                   |            |
|  | <b>Teachers</b>  |   |                           |  |  |                   |            |
| <b>Lesson types</b>                                | <b>Lesson type</b>   | Lecture   | Tutorial                  | Laboratory                                 | Project  | Seminar           | SUM        |
|  | <b>Number of study hours</b>   | 0.0   | 0.0                       | 30.0                                       | 0.0  | 0.0               | 30         |
|  | E-learning hours included: 0.0   |   |                           |  |  |                   |            |
| <b>Learning activity and number of study hours</b> | <b>Learning activity</b>   | <b>Participation in didactic classes included in study plan</b> |                           | <b>Participation in consultation hours</b> |  | <b>Self-study</b> | <b>SUM</b> |
|  | <b>Number of study hours</b>   | 30  |                           | 0.0  |  | 30.0              | 60         |
| <b>Subject objectives</b>                          | <p>The aim of the course is to familiarize the student with elements of independent scientific and project-based work through active participation in ongoing research conducted at the Faculty. The student becomes acquainted with advanced measurement equipment, experimental and numerical methods, as well as theoretical research methodology, including model formulation, mathematical analysis, and computer simulations. During the internship, the student takes part in the work of one of the research groups either theoretical or experimental according to individual preferences. Assignment to a given research group follows a prior meeting with the group leaders and depends on their decision. The internship provides an opportunity to learn about diverse research approaches and tools, and helps develop teamwork skills, effective communication of results, and adherence to principles of scientific ethics.</p> |   |                           |  |  |                   |            |

| Learning outcomes | Course outcome   | Subject outcome   | Method of verification   |
|-------------------|--|---|--|
|                   | [FIZL3_U17] can competently express opinions and actively participate in discussions and debates on the problems of physics and its applications                   | The student is able to present and justify the results of their own project (theoretical or experimental) in oral or written form, using appropriate physics terminology; the student is able to take an active part in scientific discussion by asking questions, responding to comments, and defending their position in relation to problems in physics and its applications.                      | [SU1] oral statement/conversation/discussion<br>[SU2] presentation/project/paper/report<br>[SU3] text preparation/written work   |
|                   | [FIZL3_U16] can independently plan and implement his/her own learning  | The student is able to independently plan the stages of a project (theoretical or experimental), defining objectives and a schedule of activities; the student is able to select and expand the necessary knowledge and skills, using scientific literature and available tools, in order to carry out research tasks effectively.  | [SU2] presentation/project/paper/report<br>[SU3] text preparation/written work<br>[SU8] observation of student's independent or team work  |
|                   | [FIZL3_U15] can work in a team, plan and organize his/her own work and in a team   | The student is able to work effectively in a research team, taking on different roles and responsibilities; the student is able to plan and organize both their own work and the group's activities, establishing tasks, a schedule, and methods of communication.  | [SU1] oral statement/conversation/discussion<br>[SU3] text preparation/written work<br>[SU8] observation of student's independent or team work   |
|                   | [FIZL3_U10] is able to independently search for information in Polish and English-language professional and popular science literature, as well as on the Internet | The student is able to independently search for and select information necessary for the implementation of a project in Polish- and English-language scientific and popular-science literature, as well as in reliable online sources; the student is able to critically evaluate the quality and reliability of the collected data and use it to develop their own research and present the results. | [SU1] oral statement/conversation/discussion<br>[SU2] presentation/project/paper/report<br>[SU5] implementation of a problem task<br>[SU8] observation of student's independent or team work |

| Subject contents   | <p>The course content is flexible, and its detailed scope depends on the choice of research group (including the specific project) as well as the students individual interests and skills. Below are examples of activities that may be undertaken during the research project:</p> <p><b>Introduction to research work:</b></p> <ul style="list-style-type: none"> <li>-Familiarization with the topics and current projects of the selected research group.</li> <li>-Preparation of a comprehensive literature review with discussion</li> <li>-Overview of safety regulations, research ethics, and laboratory procedures.</li> </ul> <p><b>Project in a theoretical group (scope depending on specialization):</b></p> <ul style="list-style-type: none"> <li>-Learning selected analytical and numerical methods.</li> <li>-Formulating and analyzing theoretical models, including carrying out ones own calculations or computer simulations.</li> </ul> <p><b>Project in an experimental group (scope depending on available equipment):</b></p> <ul style="list-style-type: none"> <li>-Preparation, calibration, and operation of research apparatus.</li> <li>-Participation in planning and conducting measurements, data collection, and preliminary analysis.</li> </ul> <p><b>Integration and presentation of results:</b></p> <ul style="list-style-type: none"> <li>-Preparation of a report in the form of a scientific article based on the completed research project.</li> </ul> <p>Specific tasks, methods, and the schedule are determined individually in consultation with the head of the selected research group and the students supervisor after preliminary discussions with the student. The program may include both experimental and theoretical activities in proportions that match the students aptitudes and interests.</p> |  |  |                          |                   |                               |  |       |        |
|--|--|--|--|--------------------------|-------------------|-------------------------------|--|-------|--------|
| Prerequisites and co-requisites                              | <p><b>A. Formal requirements:</b> completion of courses thematically related to the internship topic at the bachelors level (years 1 and 2).</p> <p><b>B. Prerequisites:</b> knowledge of selected areas of physics at the level of the 1st and 2nd year of bachelors studies.</p>   |  |  |                          |                   |                               |  |       |        |
| Assessment methods and criteria                              | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Report from the project in the form of a scientific article.</td> <td>51.0%</td> <td>100.0%</td> </tr> </tbody> </table>   |  |  | Subject passing criteria | Passing threshold | Percentage of the final grade | Report from the project in the form of a scientific article. | 51.0% | 100.0% |
| Subject passing criteria                                     | Passing threshold  | Percentage of the final grade  |  |                          |                   |                               |  |       |        |
| Report from the project in the form of a scientific article. | 51.0%  | 100.0%   |  |                          |                   |                               |  |       |        |
| Recommended reading  | Basic literature   | <p>Appropriate to the subject matter of the research conducted in the given research group and to the students interests. The reading list should be proposed by the students research supervisor in consultation with the head of the research group.</p> |  |                          |                   |                               |  |       |        |

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|--|--|---|
|  | Supplementary literature   | Relevant to the subject matter of the research carried out in the given research group and to the students interests.<br>A supplementary reading list should be proposed by the students research supervisor in consultation with the head of the research group. |
|  | eResources addresses   |   |
| Example issues/<br>example questions/<br>tasks being completed | 1. Research Group Theoretical<br>Example topic: Simulations of the quantum dynamics of a chosen many-body system.<br>2. Research Group Experimental<br>Example topic: Optical characterization of semiconductor materials. |   |
| Work placement   | Not applicable   |   |

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