



## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                                                                              |                                     |                                                |            |     |
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| Subject name and code                       | PHYSICS, PG_00063512                                                                                                                                                                                                                                                                                                                                                  |                                                          |                                                                                              |                                     |                                                |            |     |
| Field of study                              | Chemistry                                                                                                                                                                                                                                                                                                                                                             |                                                          |                                                                                              |                                     |                                                |            |     |
| Date of commencement of studies             | October 2026                                                                                                                                                                                                                                                                                                                                                          |                                                          | Academic year of realisation of subject                                                      |                                     | 2026/2027                                      |            |     |
| Education level                             | first-cycle studies                                                                                                                                                                                                                                                                                                                                                   |                                                          | Subject group                                                                                |                                     | Obligatory subject group in the field of study |            |     |
| Mode of study                               | Full-time studies                                                                                                                                                                                                                                                                                                                                                     |                                                          | Mode of delivery                                                                             |                                     | at the university                              |            |     |
| Year of study                               | 1                                                                                                                                                                                                                                                                                                                                                                     |                                                          | Language of instruction                                                                      |                                     | Polish                                         |            |     |
| Semester of study                           | 1                                                                                                                                                                                                                                                                                                                                                                     |                                                          | ECTS credits                                                                                 |                                     | 4.0                                            |            |     |
| Learning profile                            | general academic profile                                                                                                                                                                                                                                                                                                                                              |                                                          | Assessment form                                                                              |                                     | exam                                           |            |     |
| Conducting unit                             | Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology                                                                                                                                                                                                                       |                                                          |                                                                                              |                                     |                                                |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                    |                                                          | dr hab. inż. Waldemar Stampor                                                                |                                     |                                                |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                              |                                                          | dr inż. Damian Głowienka<br>prof. dr hab. Józef Sienkiewicz<br>dr hab. inż. Waldemar Stampor |                                     |                                                |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                           | Lecture                                                  | Tutorial                                                                                     | Laboratory                          | Project                                        | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                 | 30.0                                                     | 15.0                                                                                         | 0.0                                 | 0.0                                            | 0.0        | 45  |
|                                             | E-learning hours included: 0.0                                                                                                                                                                                                                                                                                                                                        |                                                          |                                                                                              |                                     |                                                |            |     |
|                                             | eNauczanie source address: <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=47732">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=47732</a><br>Moodle ID: 47732 Fizyka dla chemików 2026/2027 sem 1<br><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=47732">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=47732</a> |                                                          |                                                                                              |                                     |                                                |            |     |
| Learning activity and number of study hours | Learning activity                                                                                                                                                                                                                                                                                                                                                     | Participation in didactic classes included in study plan |                                                                                              | Participation in consultation hours |                                                | Self-study | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                 | 45                                                       |                                                                                              | 5.0                                 |                                                | 50.0       | 100 |
| Subject objectives                          | The aim of the course is to acquire specific knowledge in the field of general physics and to acquire appropriate skills to predict the course of physical phenomena based on known laws of physics, necessary to solve future engineering problems                                                                                                                   |                                                          |                                                                                              |                                     |                                                |            |     |

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| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Subject outcome                                                                                                                                                                                                                                                                                                                                     | Method of verification                                                                    |
|                                 | [K6_W01] applies his/her knowledge of selected branches of mathematics and physics to analyse, interpret and solve problems and to describe physical, chemical phenomena and technological processes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | knows how to correctly write and interpret physical formulas, and distinguish between scalar and vector physical parameters; understands basic laws of physics; knows how to predict the course of physical phenomena based on the laws learned; knows how to formulate and solve physics problems in the fields of mechanics and electromagnetism. | [SW1] Assessment of factual knowledge                                                     |
|                                 | [K6_U02] determines the time required for the task, plans and organises the work of both the individual and the small team in such a way as to ensure that the task is completed within the set time limit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | is able to prepare in advance individually and in a team to solve problems given during classes.                                                                                                                                                                                                                                                    | [SU1] Assessment of task fulfilment<br>[SU2] Assessment of ability to analyse information |
|                                 | [K6_U04] creates detailed documentation of the results obtained from the experiments carried out individually or as part of a team, analysing and interpreting the results in the form of text documents, spreadsheets, graphs, technological diagrams, multimedia presentations using correct chemical nomenclature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | is able to use terminology from the fields of mechanics and electromagnetism to create charts showing the relationships between physical quantities in physical formulas                                                                                                                                                                            | [SU2] Assessment of ability to analyse information<br>[SU1] Assessment of task fulfilment |
| Subject contents                | <p>Course content – lecture</p> <p>ABOUT PHYSICS. Physical quantities and their units . Elements of vector algebra . MECHANICS . Kinematics of a particle : rectilinear motion , curvilinear motion, Newton's laws of motion. Dynamics of rigid body : the moment of inertia, principal axes , Steiner's law, torque and angular momentum , equation of rotational motion, gyroscopes and precession. Conservation laws in mechanics . Oscillations and mechanical waves . Free, damped and forced vibrations. Mechanical resonance . Beats . Distribution of periodic oscillations in the harmonic components . Types of waves. Equation of harmonic plane wave motion . Wave velocity . Examples of diffraction and interference of waves. Standing waves . Doppler effect. Sound intensity level . ELECTROMAGNETISM. Electric field . Coulomb's law . The intensity of the electric field . The electrical potential . The relationship between the intensity of the electric field and potential. An electric dipole and its behavior in an external electric field. Capacitance of the electric capacitor . Magnetic field. Magnetic induction vector . The Lorentz force . Biot- Savart law . Electrodynamical force . The interaction of two straight linear wires carrying an electric current. Magnetic dipole and its behavior in an external magnetic field.</p> |                                                                                                                                                                                                                                                                                                                                                     |                                                                                           |
|                                 | <p>Course content – exercises</p> <ol style="list-style-type: none"> <li>1. Multiples and submultiples of physical quantities.</li> <li>2. Vector algebra: scalar product and vector product.</li> <li>3. Kinematics: motion with constant acceleration (vertical, horizontal, oblique projection).</li> <li>4. Dynamics of translational motion: the block slides down an inclined plane.</li> <li>5. Moments of inertia of molecules.</li> <li>6. Dynamics of rotational motion: weights suspended on a rope thrown over a pulley.</li> <li>7. Principle of conservation of angular momentum: a person with dumbbells on a turntable.</li> <li>8. Rolling of a body without slippage: a solid cylinder rolls down an inclined plane.</li> <li>9. Oscillatory motion: mathematical and physical pendulum, weight attached to a spring.</li> <li>10. Doppler effect.</li> <li>11. Standing waves in pipes and strings.</li> <li>12. Coulomb's law. Electric field strength on dipole axes.</li> <li>13. Dipole moments of molecules.</li> <li>14. Lorentz force: the motion of a charged particle in a magnetic field.</li> </ol>                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                     |                                                                                           |
| Prerequisites and co-requisites | Knowledge of physics at the basic secondary school level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                     |                                                                                           |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Passing threshold                                                                                                                                                                                                                                                                                                                                   | Percentage of the final grade                                                             |
|                                 | Lecture: written exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 50.0%                                                                                                                                                                                                                                                                                                                                               | 30.0%                                                                                     |
|                                 | Lecture: oral exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 50.0%                                                                                                                                                                                                                                                                                                                                               | 30.0%                                                                                     |
|                                 | Exercises: midterm tests                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 50.0%                                                                                                                                                                                                                                                                                                                                               | 40.0%                                                                                     |
| Recommended reading             | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                     |                                                                                           |
|                                 | <ol style="list-style-type: none"> <li>1. D.Halliday, R.Resnick, J.Walker. Podstawy fizyki. T.1 - T.5; PWN, Warszawa 2003.</li> <li>2. Cz. Bobrowski. Fizyka. Krótki kurs. WNT, Warszawa (dowolne wydanie).</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                     |                                                                                           |

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|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1. J.Orear. Fizyka T1 i T2. WNT, Warszawa (dowolne wydanie).<br><br>2. J.Massalski. Fizyka dla inżynierów. T.1i T.2; WNT, Warszawa 2007. |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                          |
| Example issues/<br>example questions/<br>tasks being completed | 1 Moment of inertia . Determination of the moments of inertia of molecules<br>2 The principle of conservation of angular momentum. Man in a spinning chair .<br>3 Examples of harmonic oscillators : pendulum , the weight attached to a spring<br>4 Damped motion. Over time t1 amplitude of vibrations decreased n1 times. How many times will decrease the amplitude of vibrations in the time t2 ?<br>5 Doppler effect . Doppler ultrasound machine.<br>6 Comparison of the basic features of the gravity and electrostatic fields<br>7 Comparison of the basic features of the electrostatic and magnetostatic fields<br>8 Electric dipole . Electric dipole moment . The behavior of the dipole in an external electric field. Determination of the dipole moments of molecules<br>9 Magnetic Dipole . The magnetic dipole moment . The behavior of the dipole in an external magnetic field<br>10 The interaction between two straight parallel conductors carrying electric current . The definition of the ampere<br>11 Lorentz force . Definition of tesla . Motion of charge on a circular orbit in a uniform magnetic field. Mass spectrometer.<br>12 Motion of charge in electric field ( $mv^2 / 2 = eU$ ) . Definition of electronvolt<br>13 Capacitor and coil. Capacitance and inductance . Definition of farad and henry. |                                                                                                                                          |
| Practical activities within the subject                        | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                          |

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