## Subject card

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| Subject name and code | Physics, PG_00060837 |
| Field of study | Chemical Technology |

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| Date of commencement of studies | October 2023 | Academic year of realisation of subject | 2023/2024 |
| 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 | assessment |

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| Conducting unit | Department of Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics |

| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Waldemar Stampor |
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| | Teachers | dr inż. Daniel Pelczarski<br><br>dr hab. inż. Waldemar Stampor |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
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| | Number of study hours | 30.0 | 15.0 | 0.0 | 0.0 | 0.0 | 45 |
| | E-learning hours included: 0.0 | | | | | | |

| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
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| | Number of study hours | 45 | 10.0 | 65.0 | 120 |

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| 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 |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
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| | [K6_U01] is able to acquire information from literature, databases and other appropriately selected sources, also in English; is able to integrate information obtained, interpret it and make conclusions, formulate and justify opinions | A student -correctly writes and reads physical formulae, - distinguishes scalar and vector quantities, -understands fundamental physical laws, - predicts the following course of actions according to the physical laws, -sets up and solves physics problems in mechanics and electromagnetism. Can critically analyze information obtained on the basis of textbooks, the Internet and other sources. | [SU2] Assessment of ability to analyse information |
| | [K6_W01] has knowledge in mathematics, including the solution of equations and inequalities involving elementary functions, differential and integral calculus, elements of vector analysis, statistics, optimisation and numerical methods, has basic knowledge in selected branches of physics, useful for the description and analysis of technological processes | A student gains the basic knowledge in the field of mechanics and electromagnetism defines basic concepts, gives definitions of physical quantities and explains physical laws. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |

| Subject contents | 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. Consevation laws in mechanics . Oscillations and mechanical waves . Free, damped and forced vibrations. Mechanical resonance . Beats . Decomposition of periodic oscillations into 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 . Electrodynamic force . The interaction of two straight linear wires carrying an electric current. Magnetic dipole and its behavior in an external magnetic field. |
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| Prerequisites and co-requisites | |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
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| | midterm tests | 50.0% | 100.0% |

| Recommended reading | Basic literature | 1. D.Halliday, R.Resnick, J.Walker. Podstawy fizyki. T.1 - T.5; PWN, Warszawa 2003.<br><br>2. Cz. Bobrowski. Fizyka. Krótki kurs. WNT, Warszawa 2004. |
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| | Supplementary literature | 1. J.Orear. Fizyka T1 i T2. WNT, Warszawa 2008.<br><br>2. J.Massalski. Fizyka dla inżynierów. T.1i T.2; WNT, Warszawa 2007. |
| | eResources addresses | Adresy na platformie eNauczanie:<br>Fizyka dla chemików 2023/2024 sem 1 - Moodle ID: 29523<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29523 |

| Example issues/ example questions/ tasks being completed | 1 Moment of inertia . Determination of the moments of inertia of molecules<br><br>2 The principle of conservation of angular momentum. Man in a spinning chair .<br><br>3 Examples of harmonic oscillators : pendulum , the weight attached to a spring<br><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><br>5 Doppler effect . Doppler ultrasound machine<br><br>6 Comparison of the basic features of the gravity and electrostatic fields<br><br>7 Comparison of the basic features of the electrostatic and magnetostatic fields<br><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><br>9 Magnetic dipole . The magnetic dipole moment . The behavior of the dipole in an external magnetic field<br><br>10 The interaction between two straight parallel conductors carrying electric current . The definition of the ampere<br><br>11 Lorentz force . Definition of tesla . Motion of charge on a circular orbit in a uniform magnetic field. Mass spectrometer.<br><br>12 Motion of charge in electric field ( $mv2 / 2 = eU$ ) . Definition of electronvolt<br><br>13 Capacitor and coil. Capacitance and inductance . Definition of farad and henry. |
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| Work placement | Not applicable |