

关。GDAŃSK UNIVERSITY 创 OF TECHNOLOGY

Subject card

| Subject name and code | Waves and optics, PG_00020718 | | | | | | | |
|--|--|--|--|-------------------------------------|---------------------------------------|--|---------|-----|
| Field of study | Technical Physics | | | | | | | |
| Date of commencement of studies | October 2021 | | Academic year of realisation of subject | | | 2022/2023 | | |
| Education level | first-cycle studies | | Subject group | | | Obligatory subject group in the field of study Subject group related to scientific research in the field of study | | |
| Mode of study | Full-time studies | | Mode of delivery | | | at the university | | |
| Year of study | 2 | | Language of instruction | | | Polish | | |
| Semester of study | 3 | | ECTS credits | | | 5.0 | | |
| Learning profile | general academic profile | | Assessment form | | | exam | | |
| Conducting unit | Department of Physic | Phenomena -> | Faculty of Approximation | olied Ph | ysics and Mathematics | | | |
| Name and surname | Subject supervisor | | dr hab. inż. Jędrzej Szmytkowski | | | | | |
| of lecturer (lecturers) | Teachers | | dr hab. inż. Je | dr hab. inż. Jędrzej Szmytkowski | | | | |
| Lesson types and methods | Lesson type | Lecture | Tutorial | Laboratory | Projec | t | Seminar | SUM |
| of instruction | Number of study hours | 30.0 | 30.0 | 0.0 | 0.0 | | 0.0 | 60 |
| | E-learning hours inclu | ided: 0.0 | | | | - | | |
| Learning activity and number of study hours | Learning activity | Participation in classes includ plan | n didactic led in study | Participation in consultation hours | | Self-study | | SUM |
| | Number of study hours | 60 | | 5.0 | | 60.0 | | 125 |
| Subject objectives | Teach students and strengthen their knowledge about the nature of mechanical and electromagnetic waves, their generation, theoretical models and applications. Special attention is paid to optical waves and laws of optical geometry. | | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | | Method of verification | | |
| | K6_U01 | | Student knows how to use literature and databases id waves and optics | | | [SU2] Assessment of ability to analyse information | | |
| | K6_W01 | | Student knows hao to seperate wave phenomena in daily life | | [SW1] Assessment of factual knowledge | | | |
| | K6_W02 | | The knowledge allows to analyze problems concerning waves and optics in the real world | | | [SW1] Assessment of factual knowledge | | |
| Subject contents | Vibrations of simple physical systems: Basic concepts. Transversal and longitudinal vibrations of the weight- spring system. Harmonic oscillator. Mathematical and physical pendulum. Harmonic damped oscillator. Forced vibrations. Resonance. Vibrations in electrical systems on the example of RLC circuits. Com[plex vibrations. Beats. Vibrations with two degrees of freedom. Waves - basic concepts. Wave equation. The propagation of waves in various mechanical systems (rod, liquid, gas). A homogeneous string, the equation of the string. Reflection and transmission of the wave at the border of two materials. Wave impedance. Interference. Standing waves. Wave packets. Phase and group speed. Dispersions. Fourier analysis and its use in the theory of vibrations and waves. Elements of acoustics. Doppler effect. Electromagnetic waves, basic concepts. The spectrum of electromagnetic waves. Maxwell's equations. Wave equation for electromagnetic waves. The refractive index of the waves. Dependence of refractive index on frequency. Impedance of the electromagnetic wave. Poynting's vector. Polarization of waves - theoretical description and experimental methods of polarity study. Brewster angle. Fresnel equations. The phenomenon of interference of electromagnetic waves. Diffraction. The diffraction image of a single slit. Diffraction grating. Geometric optics: Fermat's principle. Snellius's law. Total internal reflection. Mirror. Prisms. Lens. Optical instruments. Photometric units. | | | | | | | |
| | EXERCISES: Examples illustrating the phenomena discussed in the lecture. | | | | | | | |

| Prerequisites and co-requisites | Course credit "Mechanics and heat"(07053) and "Mathematical analysis" (07053) | | | | | |
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| Assessment methods | Subject passing criteria | Passing threshold | Percentage of the final grade | | | |
| and criteria | Midterm colloguium | 50.0% | 40.0% | | | |
| | Written exam | 50.0% | 60.0% | | | |
| Recommended reading | Basic literature 1. F.C. Crawford, Fale, PWN 2. A. Januszaitis, Fizyka dla politechnik. Część 3 Fale, PWN 3. S. Szczeniowski, Fizyka doświadczalna, cz. I oraz IV, PWN | | | | | |
| | | 4. E. Hecht. Optyka, PWN | | | | |
| | Supplementary literature | J. Ginter, Fizyka fal, Fale w ośrodkach jednorodnych. Fale w ośrodkach niejednorodnych, PWN J. Ginter, Fizyka fal, Promieniowanie i dyfrakcja. Stany związane, PWN | | | | |
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| | | Adresy na platformie eNauczanie: | | | | |
| Example issues/ example questions/ tasks being completed | . Simple gravity pendulum | | | | | |
| | 2. Harmonic oscylator | | | | | |
| | 3. Fermats principle | | | | | |
| Work placement | Not applicable | | | | | |