GDAŃSK UNIVERSITY 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 Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jędrzej Szmytkowski	
	Teachers	dr hab. inż. Jędrzej Szmytkowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

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
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.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Course credit "Mechanics and heat"(07053) and "Mathematical analysis" (07053)</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Midterm colloguium</td><td>50.0%</td><td>40.0%</td></tr><tr><td>Written exam</td><td>50.0%</td><td>60.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">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</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. J. Ginter, Fizyka fal, Fale w ośrodkach jednorodnych. Fale w ośrodkach niejednorodnych, PWN

2. J. Ginter, Fizyka fal, Promieniowanie i dyfrakcja. Stany związane, PWN</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Uzupełniające
Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Simple gravity pendulum

2. Harmonic oscylator

3. Fermats principle</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
</table>