University of Gdańsk

Subject card

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|---|---|---|---|
| Subject name and code | Optics and Waves, PG_00182149 | | |
| Field of study | Medical Physics | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2027/2028 |
| Education level | Bachelor's studies | Subject group | Obligatory subject group in the field of study<br>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 | 4.0 |
| Learning profile | academic | Assessment form | exam |
| Conducting unit | Division of Atomic and Molecular Physics -> Institute of Experimental Physics -> Faculty of Mathematics, Physics and Informatics -> Rector | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Dzmitryi Ushakou | |
| | Teachers | | |

**Lesson types**

| 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 | 0.0 | 60.0 | 120 |

**Subject objectives**

To familiarise students with the basic concepts of mechanical waves and geometric optics. As part of geometric optics, to learn about its laws and the basics of how optical instruments work.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [FIZMEDL3_W01] Knows and understands at an advanced level the phenomena, principles, laws and theories specific to physics and biophysics. | The student is able to: describe mechanical waves quantitatively; formulate the basic laws of geometric optics; describe optical phenomena; indicate the limitations of geometric optics in the analysis of optical phenomena. | [SW4] test/exam - oral or written<br>[SW1] oral statement/ conversation/discussion<br>[SW3] text preparation/written work<br>[SW5] implementation of a problem task |
| [FIZMEDL3_U01] He can formulate, analyse, and solve complex problems in physics and medicine, using mathematical formalism, based on the physical phenomena, principles, and theories he has learned. | The student knows: basic physical quantities describing wave motion and mathematical formalism used in the description of mechanical waves; basic concepts of optics; basic optical phenomena; principles of optical instrument construction; basic prinbciples of geometric optics. | [SU1] oral statement/conversation/ discussion<br>[SU3] text preparation/written work<br>[SU4] test/exam - oral or written<br>[SU5] implementation of a problem task |

<table>
<tr><td>Subject contents</td><td>Mechanical waves<br>1. Wave equation<br>2. Wave interference.<br>3. Wave diffraction.<br>4. Wave polarisation.<br>Optics<br>1. Basic laws of geometric optics. Basic elements of optical systems: lenses, spherical and flat mirrors, prisms and wedges.<br>2. Fundamentals of visual photometry. Luminous flux, luminous intensity, illuminance, emittance and luminance.<br>3. Monochromaticity of radiation. Coherence of electromagnetic waves. The phenomenon of light interference. Basic types of interferometers.<br>4. Interference in thin layers. Anti-reflective coatings based on the phenomenon of interference.<br>5. Light diffraction. Huygens-Fresnel principle. Diffraction gratings.<br>6. Light polarisation. The phenomenon of birefringence. Polarising elements.<br>7. The photoelectric effect. Photomultipliers: structure and application.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of mathematical analysis and the principles of physics.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>not applicable</td><td>51.0%</td><td>30.0%</td></tr><tr><td>not applicable</td><td>51.0%</td><td>40.0%</td></tr><tr><td>not applicable</td><td>51.0%</td><td>30.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>not applicable</td></tr><tr><td>Supplementary literature</td><td>not applicable</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>not applicable</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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