Fundamentals of physics IV - Optics, modern physics - course description

General information

Course name	Fundamentals of physics IV - Optics, modern physics
Course ID	13.2-WF-FizP-FP-IV-OMP-S17
Faculty	Faculty of Physics and Astronomy
Field of study	Physics
Education profile	academic
Level of studies	First-cycle studies leading to Bachelor's degree
Beginning semester	winter term 2022/2023

Course information

Semester	4
ECTS credits to win	6
Course type	obligatory
Teaching language	english
Author of syllabus	• prof. dr hab. Wiesław Leoński

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Class	45	3	-	-	Credit with grade

Aim of the course

The aim of the course is acquainting students with basic laws of optics and elements of quantum physics necessary to understand and predict wave phenomena in optics and micro-world.

Prerequisites

Mathematical methods in physics, Elements of physics I, II i III

Scope

LECTURE:

- Electromagnetic waves in vacuum and material media.

- Geometrical optics: reflection and refraction of light (Fermat's principle), mirrors, lenses, prisms; dispersion, aberrations and optical tools.

- Wave optics: periodic wave motion, interference, diffraction and diffraction gratings, dispersion, absorption and dispersion of light, polarization of light.

- Quantum nature of light: photoelectric and Compton effects, wave-particle duality.

- Quantum nature of matter: atomic emission spectra, de Broglie's waves, diffraction of electrons, electron microscope. Quantum properties of matter: atom's models, energy quantization and Schrodinger equation, spin of electron and Pauli exclusion principle, multi-electron atoms, periodic table of elements, atom nuclei and elementary particles.

CLASS:

Solving chosen physical problems related to the lecture.

Teaching methods

Conventional lecture and demonstrations. Solving computational problems and discussing results.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Student can analyse theoretical problems from optics and draw reasonable conclusions	• K1A_U02	• a quiz • an exam - oral, descriptive, test and other	• Lecture • Class
Student knows basic principles of construction and principles of operation of optical tools	• K1A_W05	• a quiz • an exam - oral, descriptive, test and other	• Lecture • Class
Student understands the necessity of inducing quantum notions to description of micro-world	• K1A_K06	• an exam - oral, descriptive, test and other	• Lecture

Outcome description	Outcome symbols	Methods of verification	The class form
Student has knowledge of classical optics and contemporary physics	• K1A_W01	• an exam - oral, descriptive, test and other	• Lecture
Student can acquire on their own knowledge from optics and elements of contemporary physics	• K1A_U07	• a quiz • an exam - oral, descriptive, test and other	• Lecture • Class
Student understands and can explain physical phenomena from optics and atom physics	• K1A_W03	• a discussion • an exam - oral, descriptive, test and other	• Lecture • Class

Assignment conditions

LECTURE: Exam. The course credit is obtained by passing a final written exam composed of tasks of varying degrees of difficulty.

CLASS: A student is required to obtain at least the lowest passing grade from the written tests organized during class.

To be admitted to the exam a student must receive a credit for the class.

Final grade: weighted average of grades from exam (60%) and class (40%).

Recommended reading

[1] B. Jaworski, A. Dietlaf, Kurs fizyki, t. 3, Procesy falowe. Optyka. Fizyka atomowa i jądrowa, PWN, Warszawa 1984.
[2] I. W. Sawieliew, Wykłady z fizyki, t. 2, PWN, Warszawa 2002, (wyd. 3).
[3] J. R. Meyer-Arendt, Wstęp do optyki, PWN, Warszawa 1979.
[4] V. Acosta, C.L. Cowan, B.J. Graham, Podstawy fizyki współczesnej, PWN, Warszawa 1981.
[5] D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, t. 4, t. 5, PWN, Warszawa 2003.
[6] J. Walker, Podstawy fizyki. Zbiór zadań, PWN, Warszawa 2005.
[7] David J. Griffiths, Podstawy elektrodynamiki, PWN, Warszawa 2005.

Further reading

Notes

Modified by dr Marcin Kośmider (last modification: 04-04-2022 20:49)