University of Gdańsk

Subject card

Subject name and code	Atomic Physics, PG_00182577						
Field of study	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 Optional subject group 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	4		ECTS credits		4.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Ryszard Drozdowski, prof. UG				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	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
	Number of study hours	45		0.0		55.0	100
Subject objectives	Learning the characteristic properties of spectral lines, learning the operating principles of spectroscopic equipment, and learning selected issues of emission and absorption spectroscopy.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZL3_U09] can extrapolate the results obtained in the terrestrial laboratory to describe phenomena in the Universe	The student is able to use laboratory knowledge of atomic physics, including the description based on the Landé factor, to interpret atomic processes occurring in stars and to extrapolate the results of laboratory studies to describe the mechanisms of transport and exposure of lanthanides on the surfaces of stars.	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
[FIZL3_W10] has advanced knowledge of the elementary components of matter and the types of fundamental interactions between them, of the manifestations of these interactions in phenomena occurring on various scales from subatomic to astronomical, knows the time and energy scales associated with these phenomena	The student knows: - quantum processes leading to the emission of spectral lines with characteristic properties (line half-width, transition probability) - principles of operation of spectroscopic equipment (dispersive elements, electromagnetic radiation detectors)	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[FIZL3_W01] has advanced knowledge of physical concepts, principles and theories, understands their historical development and significance not only for physics, but also for other exact and natural sciences and cognition of the world; knows and understands fundamental dilemmas of the civilization	The student knows: - selected methods of atomic spectroscopy used to study various physical phenomena - how atomic spectroscopy is used in biology, medicine, and various other fields of human activity	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion

Subject contents

Quantum description of spectral line formation, taking into account their shape (profiles: Lorentzian, Gaussian, Voigt) and intensity (transition probabilities, Einstein coefficients);

Spectroscopic apparatus spectrographs (prismatic, grating), interferometers (Michelson, Mach-Zehnder, Fabry-Pérot).
Light detectors (photoresistors, photodiodes, photocells, and photomultipliers);
Spectral lamps, and lasers as tunable coherent light sources;
Selected absorption and emission spectroscopy methods (photoacoustic, optogalvanic, ionization, Starkov spectroscopy).

Prerequisites and co-requisites

- Basic knowledge of quantum mechanics

- Basic knowledge of modern physics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
student's attitude during classes/ activity	0.0%	25.0%
written study of a given problem	51.0%	75.0%

Recommended reading

Basic literature	H. Haken, H.C. Wolf, "Atomy i kwanty, wprowadzenie do spektroskopii atomowej", PWN Warszawa 1997 W. Demtröder, Spektroskopia laserowa, Wydawnictwo Naukowe PWN Warszawa 1993 R. Eisberg, R. Resnick, "Fizyka kwantowa atomów, cząsteczek, ciał stałych, jąder i cząstek elementarnych", PWN Warszawa 1983

	Supplementary literature	Z. Leś, "Podstawy fizyki atomu", Wydawnictwo Naukowe PWN SA, Warszawa 2015 W. S. Letochow, W.P. Czebotajew, Nieliniowa spektroskopia laserowa, Wydawnictwo Naukowe PWN Warszawa 1982 F. Kaczmarek, "Wstęp do fizyki laserów", Wydawnictwo Naukowe PWN 1979
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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