Subject card

Subject name and code	History of Physics, PG_00179276		
Field of study	Physics		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	Bachelor’s studies	Subject group	Obligatory subject group in the field of study Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish no.
Semester of study	6	ECTS credits	3.0
Learning profile	academic	Assessment form	credit
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 Patryk Kamiński	
	Teachers	dr Patryk Kamiński	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30	0.0	0.0	30

Subject objectives	History of Physics as a Foundation of a Physicists Knowledge Understanding the historical background of major physical discoveries and the figures behind them provides deeper insight into the laws of nature. Each of these milestones arose in a specific era, shaped by the contemporary state of knowledge and available technology. The proposed format and content of the course are intended both to systematize the physics knowledge students have already acquired and to enrich it with an equally important historical context. Upon completion of the course, the student: understands the specific nature of scientific knowledge in relation to other forms of human knowledge, recognizes the development of scientific knowledge as part of broader civilizational change, can reconstruct the evolution of selected physical concepts, is able to analyze historical source texts in physics, knows the key stages and research methods in the development of physics, appreciates the role of the natural sciences in the advancement of civilization, can independently locate literature on the history of physics.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZL3_W02] understands the role of physical experiments, mathematical theoretical models approximating reality and computer simulations in the methodology of scientific research; is aware of technological, equipment and methodological limitations in scientific research	Explains how landmark experiments (from Galileo to Stern–Gerlach) shaped the development and testing of theoretical models. Discusses methodological and instrumental limitations of historical investigations and their impact on data interpretation. Analyses primary/secondary accounts of classic experiments, identifying model assumptions and major sources of uncertainty. Compares competing historical explanations and argues for the community’s criteria for theory acceptance.	[SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report [SW3] text preparation/written work
	[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	Organises the main stages in the development of physics from antiquity to the present, naming key concepts, laws and contributors. Characterises paradigm shifts (e.g., from ether to field, from classical to quantum) within their social and technological context. Summarises and interprets a short historical source or classic paper, using correct citations and bibliography. Communicates (via presentation or discussion) the significance of major advances in physics and their ethical/societal implications.	[SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report [SW3] text preparation/written work

Subject contents	Each session is planned for 2 academic hours. Instructors may adjust pacing or emphasize selected topics depending on class needs. Planned Course Content Schedule: **Week 1** **Introduction and Earliest Beginnings** • The role of the history of physics in understanding natural laws • Prehistoric origins of natural knowledge, astronomy, and mathematics • Ionian school of natural philosophy **Week 2** **Middle Ages and the Renaissance** • Medieval world systems • The Copernican revolution and the birth of modern science **Week 3** **The Birth of Modern Physics Newton and His Era** • Introduction of differential and integral calculus • Newton: optics, reflecting telescope, *Philosophiae Naturalis Principia Mathematica* • Newtons relations with Hooke **Week 4** **Experiments with Pressure and Temperature** • Torricelli, Pascal, von Guericke, Boyle atmospheric pressure and properties of air • First measurements of temperature **Week 5** **18th Century Light and Mechanics** • Theories of light: Huygens, Newton • Great mechanicians of the 18th century: Bernoulli family, Euler, dAlembert, Lagrange • Development of analytical mechanics, theory of vibrations **Week 6** **Heat and Gases** • Temperature scales, latent heat • Debate on the nature of heat: phlogiston and caloric theory

- Rumford and Davy experiments, gas laws

Week 7
Beginnings of Electromagnetism

- Electrostatics and electrochemistry
- Discoveries of Oersted and Ampère
- Electromagnetic induction

Week 8
19th-Century Optics and Thermodynamics

- Discovery of ultraviolet and infrared radiation
- Young and Fresnel, polarized light
- Doppler effect, measurement of the speed of light (MichelsonMorley)
- Laws of thermodynamics, kinetic theory of gases, statistical mechanics

Week 9
Turn of the 19th and 20th Centuries

- Discovery of electromagnetic waves Hertz
- Lorentzs electrodynamics
- Discovery of X-rays Röntgen

Week 10
Origins of Quantum and Relativistic Physics

- Black-body radiation and the quantum hypothesis
- Photoelectric effect
- Special theory of relativity
- Brownian motion

Week 11
Atomic Physics

- Bohr and BohrSommerfeld atomic models
- X-ray physics
- SternGerlach experiment
- Discovery of the photon and the wave nature of the electron

Week 12
Development of Nuclear Physics (I)

- Birth of quantum mechanics
- Discovery of the neutron and positron
- First nuclear reaction in an accelerator
- Gamows theory of alpha decay, cyclotron
- Beta-decay theory (Fermi), artificial radioactivity, uranium fission

Week 13
Development of Nuclear Physics (II)

- Production of transuranic elements
- Models of the atomic nucleus
- Yukawas nuclear-force theory
- Discovery of the muon and the pion

Week 14
20th-Century Particle and Solid-State Physics

- Quantum electrodynamics
- Hyperfine structure of hydrogen, Lamb shift
- Measurement of the electrons magnetic dipole moment
- Discovery of hypernuclei, strangeness, quark hypothesis (Gell-Mann), color charge, quantum chromodynamics
- Electroweak theory (Glashow, Weinberg, Salam) and the Standard Model
- Semiconductors, transistor invention, superconductivity, magnetism of solids
- Masers, lasers, holography

Week 15
Contemporary Physics and Outlook

- Physics at the dawn of the 21st century
- Large research collaborations
- Discovery of the Higgs boson at the LHC
- Prospects and directions of physics in the 21st century

Prerequisites and co-requisites	Basic knowledge of general physics and the ability to read scientific texts in Polish and English.		
Assessment methods and criteria	**Subject passing criteria**	**Passing threshold**	**Percentage of the final grade**
	Presence and active participation in classes. Assessment will include: regular attendance, preparation for discussion, active involvement in classes. Also, the ability to analyze source texts, logical formulation of arguments, and participation in debate.	51.0%	30.0%
	Preparation of an essay on a selected topic in the history of physics and submission in printed or electronic form, with approval by the instructor. The assessment will be based on: the quality of argumentation, historical accuracy, the ability to trace the evolution of the selected physical idea, and independence in using sources.	51.0%	70.0%
Recommended reading	Basic literature	1. Wróblewski, A. K., *History of Physics from Ancient Times to the Present*, PWN, Warsaw, 2007	
	Supplementary literature	1. G. Białkowski, *Old and New Paths of Physics*, Vols. IIII (any edition/ year) 2. A. Drzewiński, J. Wojtkiewicz, *Stories from the History of Physics* 3. Jerzy Przystawa, *Discover the Taste of Physics* 4. Andrzej Kajetan Wróblewski, *Truth and Myths in Physics* 5. Andrzej Kajetan Wróblewski, *Scientists in Anecdotes*, Vols. 1 and 2. 6. Isaac Asimov, History of Physics. 7. Florian Cajori, History of Physics in it elementary branches. In addition to each of the topics discussed in the lecture, an additional list of articles and books will be provided.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	See the course content.		
Work placement	Not applicable		

Document generated electronically. Does not require a seal or signature.