STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Selected problems of modern physics**		Code **1010342631010417257**
Field of study **Mathematics**	Profile of study (general academic, practical) **general academic**	Year /Semester **2 / 3**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **30** Classes: **15** Laboratory: **-** Project/seminars: **-**		No. of credits **4**
Status of the course in the study program (Basic, major, other) **other**	(university-wide, from another field) **university-wide**	
Education areas and fields of science and art		ECTS distribution (number and %)

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of general physics at the high school level.
2	**Skills**	Ability to think logically, ability to translate verbal description of the model on mathematical equations, ability to independently obtain information on a given subject.
3	**Social competencies**	Understanding the role of technical university graduate in society, particularly in the discussions on issues related to science and technology.

Assumptions and objectives of the course:

1. Creation of a consistent image of the most important theories of physics.
2. Develop the ability to interpret the observed phenomena of nature and analyze technical problems based on acquired knowledge of modern physics.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Knowledge of the role of physics in science and technology and its relation to mathematics. - [-]
2. Knowledge of the principles and hierarchical structure of the most important modern physics theories. - [-]

Skills:

1. The ability to use knowledge in the field of physics to the analysis of issues in which the laws of physics play a decisive role. - [-]
2. The ability to use indicated sources of knowledge (e.g. literature list, lecture materials) with understanding and gain knowledge from other sources. - [-]

Social competencies:

1. Ability to critically evaluate new ideas emerging in society. - [-]
2. Ability to independently develop and expand their own competencies. - [-]

Assessment methods of study outcomes

W01-W02	written/oral exam
dst (3)	50.1%-70.0%
db (4)	70.1%-90.0%
bdb (5)	od 90.1%
U01-U02	test
dst (3)	50.1%-70.0%
db (4)	70.1%-90.0%
bdb (5)	od 90.1%

Course description

1. Scientific method physics, fundamental interactions in physics, the relationship between basic units.
2. Mechanics: Newton's principles, the equations of motion, oscillatory motion and waves, laws of conservation of physical quantities.
3. Thermodynamics: principles of thermodynamics, phenomenological and statistical thermodynamics, processes of transportation.
4. Electrodynamics: Maxwell's equations, electromagnetic waves.
5. Introduction to quantum physics: the ideas of quantization, Schrödinger?s equation, quantum and classical oscillator.
6. Fundamentals of atomic and molecular physics: models of atom, atomic and molecular orbital functions.
7. Fundamentals of nuclear physics: models of atomic nucleus, basic nuclear reactions, idea of a nuclear power plant.
8. Fundamentals of elementary particle physics: what the Standard Model is.
9. The special theory of relativity: Einstein?s postulates, Lorentz?s transformation formulae and their consequences.
10. Basics of astrophysics and cosmology: structure and evolution of the Universe, the Big Bang model.

Basic bibliography:

1. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, toms 1-5, Wiley.

Additional bibliography:

1. P. A. Tipler, R. A. Llewellyn: Modern Physics, Freeman.

Result of average student's workload

Activity	Time (working hours)
1. A critical analysis of the issues discussed during the lectures; preparation for exams.	65
2. Solving mathematical problems; preparation for tests.	35

Student’s workload

Source of workload	hours	ECTS
Total workload	100	4
Contact hours	47	2
Practical activities	0	0