STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Elements of Modern Physics		**1010401131010430578**
Field of study **EDUCATION IN TECHNOLOGY AND**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **2** Classes: **2** Laboratory: **-** Project/seminars: **-**		No. of credits **5**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **5 100%** **5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	basic knowledge of general physics as carried on the Education in Technology and Informatics specialization
2	**Skills**	ability to solve basic problems of general physics based on their knowledge
3	**Social competencies**	understanding of the need to expand their competences

Assumptions and objectives of the course:

-Acquainting students with selected areas of modern physics.

-Developing students' ability to analyze physical phenomena and solving by them technical problems on the basis of the achievements of modern physics.

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

Knowledge:

1. Define the physical concepts to the extent specified by the Elements of Modern Physics course program. - [K_W02]
2. Formulate and explain the laws of physics to the extent specified by the content of the course program and to determine the extent of their applicability. - [K_W02]
3. Describe the current state of research and the latest development trends in physics. - [K_W17]

Skills:

1. Apply the laws and formulas binding physical quantities to solve simple problems specified in the program content of the subject of the study. - [K_U01]
2. Draw conclusions on the basis of the results of calculations. - [K_U01]
3. Use with the understanding of the indicated sources of knowledge (basic bibliography) and to acquire knowledge from other sources. - [K_U01, K_U02]

Social competencies:

1. Actively engage in solving the questions posed. - [K_K01]

Assessment methods of study outcomes

Effect of education	Type of evaluation	Evaluation criteria	
W02	written/oral exam	3	50.1%-70.0%
		4	70.1%-90.0%
		5	above 90.1%
W017	written/oral exam	3	50.1%-70.0%
		4	70.1%-90.0%
		5	above 90.1%
U01	test	3	50.1%-70.0%
		4	70.1%-90.0%
		5	above 90.1%
U02	test	3	50.1%-70.0%
		4	70.1%-90.0%
		5	above 90.1%
K01	oral answers on the tutorials	(The student alone seeks a solution on the basis of acquired knowledge and show a strong commitment to solving problems - the student gets an extra score for the test result for any presentation of solution to the problem at the blackboard.)	

Course description

1. Elements of relativistic mechanics.
2. Photons and matter waves.
3. Elements of quantum mechanics.
4. The atomic structure of matter.
5. The basic physics of lasers.
6. Metals and semiconductors.
7. Applications of semiconductors.
8. Elements of nuclear physics.
9. Elementary particles and the quark model.

Basic bibliography:

1. D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, tom 4 i tom 5, Wydawnictwo Naukowe PWN, Warszawa, 2005.

Additional bibliography:

1. J. Orear, Fizyka, tom 2, Wydawnictwa Naukowo - Techniczne, Warszawa, 2004.
2. J. Massalski, Fizyka dla inżynierów. Część II. Fizyka współczesna, Wydawnictwa Naukowo - Techniczne, Warszawa, 2005.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Analysis of the lectures	6
3. Participation in tutorials	30
4. Preparing for tutorials	15
5. Preparing for colloquia	15
6. Consultation	2
7. Preparing for exams	20
8. Exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	120	5
Contact hours	64	3
Practical activities	30	1