STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Physics		**1010341731010440037**
Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics in Technology	**general academic**	**2 / 3**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **-**		**2**
Status of the course in the study program (Basic, major, other)	(university-wide, from another field)	
basic	**university-wide**	
Education areas and fields of science and art		ECTS distribution (number and %)
technical sciences		**2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	knowledge of physics course issues from II semester, I year of study
2	**Skills**	skill of basic problem solving of physics on the basis of possessed knowledge, skill in acquiring information from indicated sources
3	**Social competencies**	understanding the need for education in order to obtain the relevant qualifications to perform in the future of the profession and social roles

Assumptions and objectives of the course:

1. Providing to students knowledge of physics in the field specified by the content of the curriculum relevant to the field of study: Mathematics in technology.
2. Developing of skills of mathematical description and interpretation of the observed phenomena in the surrounding world based on the known laws of physics.
3. Developing of the ability to perform simple and more complex experiments in the field of physics on the basis of the obtained knowledge.

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

Knowledge:

1. She/he as knowledge in the field of selected issues including quantum mechanics (experimental and theoretical fundamentals), elements of solid state physics, experimental methods of solid state structure investigation and investigation of surface of solid state - [K_W10]
2. She/he knows applications of laws of physics in the field of selected issues including quantum mechanics, elements of solid state physics, experimental methods of solid state structure investigation and investigation of surface of solid state to description of phenomena in the surrounding world - [K_W10]

Skills:

1. She/he is able to apply basic laws of physics and mathematical models to solving problems in the field including quantum mechanics, elements of solid state physics, experimental methods of solid state structure investigation and investigation of surface of solid state - [K_U06, K_U07, K_U08]
2. She/he is able to plan and carry out standard measurements related to selected issues relevant to course description and perform analysis of measurement results taking into account their statistical description - [K_U17, K_U22]
3. She/he is able to use with understanding from specified sources of knowledge (e.g. references, databases) and is active in extraction of knowledge from other sources - [K_U18]

Social competencies:

1. She/he knows limits their knowledge, understands the need of opportunities for continuous self-improvement and actively involves in solving of posed problems raising his or her competences - [K_K01]
2. She/he follows the rules of professional ethics, is responsible for the reliability of results obtained in his or her work and their interpretation - [K_K04]

Assessment methods of study outcomes

W01-W02	written test/oral (during exam session)	
	3	50.1%-70.0%
	4	70.1%-90.0%
	5	od 90.1%
U01-U03	oral answer/written; realization of laboratory exercises; reports of laboratory exercises	
	3	50.1%-70.0%
	4	70.1%-90.0%
	5	od 90.1%
K01-K02	evaluation of activity on laboratory exercises	
	3	50.1%-70.0%
	4	70.1%-90.0%
	5	od 90.1%

Course description

1. The fundamentals of quantum mechanics:
 - thermal radiation (laws of thermal radiation, Rayleigh-Jeans theory, Planck's theory),
 - the photoelectric and Compton efects,
 - X-ray radiation,
 - wave-particle duality of radiation,
2. Experimental background of quantum mechanics ? models of atom:
 - discovery of the electron,
 - Thomson model of atom,
 - discovery of atom nucleus ? Rutheford model,
 - Bohr?s model of hydrogen atom,
 - the quantum model of hydrogen atom,
3. Elements of quantum mechanics:
 - the wave properties of particles,
 - quantum particles ? probabilistic interpretation,
 - Heisenberg?s uncertainty principle,
 - Schrödinger equation,
 - Schrödinger equation solution for selected potentials,
 - Physical interpretation of quantum numbers for atom,
 - postulates of quantum mechanics,
 - quantum statistics.
4. Elements of solid state physics:
 - structure and properties of solid state matter,
 - bonding types in solids,
 - free-electron theory of metals,
 - lattice dynamics of crystals, acoustic and optic phonons, dispersion relationships,
 - specific heat of crystalline solids (classical, Einstein and Debye model)
 - band theory of solids,
 - semiconductors (intrinsic and doped).
5. Crtystal structure ? method ofinvestigation (neutron, electron and X-ray diffraction).
6. Investigation of surface of solids (SEM, AFM, STM).

Basic bibliography:

1. R.A. Serwey, J.H. Jewett, Physics for Scientists and Engineers with Modern Physics, eight edition, Belmont USA 2010.
2. D. Halliday, R.Resnick, J.Walker, Podstawy fizyki, t. 1-5, PWN, Warszawa 2003.
3. W. Bogusz, J. Garbarczyk, F. Krok, Podstawy fizyki, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1999.
4. K. Jezierski, B.Kołodka, K.Sierański, Fizyka. Zadania z rozwiązaniami, t. 1-2, Oficyna Wydawnicza Scripta, Wrocław 2009.
5. A. N. Kucenki, J. W. Rublewa, Zbiór zadań z fizyki dla wyższych uczelni technicznych, PWN, Warszawa 1997.

Additional bibliography:

1. Masalski, Fizyka dla inżynierow, t.1-2, WNT, Warszawa 1980.

Result of average student's workload

Activity	Time (working hours)
1. participation in lectures	15
2. participation in laboratory excercise	15
3. preparation for laboratory excercises	5
4. preparation of raports for laboratory excercises	8
5. take a part in consultation related with realization of educational process	2
6. preparation to exam	15
7. participation in exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	62	2
Contact hours	34	0
Practical activities	28	0