STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
physical methods in medicine		**1010401261010410819**

Field of study	Profile of study (general academic, practical)	Year /Semester
TECHNICAL PHYSICS	**general academic**	**3 / 6**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**elective**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **2**	Classes: **-**	Laboratory: **-**	Project/seminars: **-**	**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)

Responsible for subject / lecturer:

dr inż. Marek Nowicki
email: marek.nowicki@put.poznan.pl
tel. 61 665-32-33, 61 665-3236
Wydział Fizyki Technicznej
ul. Nieszawska 13A 60-965 Poznań

Responsible for subject / lecturer:

prof. dr hab. Alina Dudkowiak.
email: alina.dutkowia@put.poznan.pl
tel. 061 665 31 81
Wydział Fizyki Technicznej
Nieszawska 13 A, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of physics.
2	**Skills**	Ability to solve basic problems in physics and engineering on the basis of their knowledge, the ability to obtain information from the identified sources
3	**Social competencies**	Ability to work in a group, active in solving problems

Assumptions and objectives of the course:

The course is designed to acquaint students with physical methods used in modern medicine, and to provide knowledge about the structure of medical equipment used in the diagnosis and therapy.

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

Knowledge:

1. Explain the structure and functions of the basic elements of X-ray and CT scans. - [K_W01]
2. Present and explain the use of nuclear physics for imaging and therapy of malignancies. - [K_W04 K_W08]
3. Explain the concept of design and operation of nuclear magnetic resonance tomography. - [K_W04 K_W08]
4. Present optical law used in the construction of medical devices. - [K_W01 K_W08]

Skills:

1. Can discuss in detail the process of X-ray and CT scan. Know the features and technical specifications and design X-ray and CT devices used in medicine. - [K_U01 K_U14]
2. It can identify important for medical isotopes. Can discuss in detail the structure and function of: gamma camera, a particle accelerator, cobalt bomb and positron emission tomomografu computer. - [K_U01 K_U15]
3. He can explain the phenomenon of nuclear magnetic resonance and electron paramagnetic resonance. He knows the details of the design of apparatus MR. Able to identify the most important medical applications of magnetic resonance. - [KU_02 K_U17]
4. Can discuss in detail the construction of optical devices used in medicine: optical microscopes, lasers, spectrometers. He can discuss their medical use - [K)_U01]

Social competencies:

1. Actively engage in solving the questions posed. - [K_K01]
2. Is aware of the social role of technical college graduates, especially understands the need for formulating and providing the public with information and opinions on the achievements of physics used in medicine - [K_K09]

Assessment methods of study outcomes

Written test at the end of the lectures.

Course description

Fundamentals of optical and electron microscopy.
X-rays (generation, detection, interaction with matter).
Rentgenodiagnostics basic and contrast.
Computed tomography (CT principle, the reconstruction of images, examples of the use of X-ray tomography).
Natural and artificial radioactivity.
The use of radioisotopes for cancer therapy (brachytherapy, cobalt bomb).
Radionuclide diagnosis, characterization of radioisotopes.
Scintillation and semiconductor detectors.
Scyntygraf and gamma camera.
Examples scintigraphy selected organs (thyroid, circulatory system, digestive system).
Positron Annihilation.
Characteristics of positron sources used in medical diagnostics.
Fundamentals of positron emission tomography (PET).
Examples of the use of PET tomography.
Nuclear magnetic resonance (NMR) and electron paramagnetic resonance (EPR).
Nuclear magnetic resonance tomography.
Ultrasonography (U.S.) (mechanical wave propagation in the centers of continuous Doppler effect, piezoelectric effect).
Laser and its applications in medicine.
Infrared thermography (thermal radiation and its detection).
Optical spectroscopy in medical diagnostics.
Absorption laws and their use in biological systems.
Photodynamic therapy and diagnostics.
Blood tests and biochemical methods.

Basic bibliography:

1. Praca zbiorowa pod redakcją A.Z. Hrynkiewicza i E. Rokity. Fizyczne metody badań w biologii, medycynie i ochronie środowiska. PWN Warszawa 1999.
2. Praca zbiorowa pod redakcją A.Z. Hrynkiewicza i E. Rokity. Fizyczne metody diagnostyki medycznej i terapii. PWN Warszawa 2000.
3. Praca zbiorowa pod red. H. Podbielska, A.Sieroń, W.Stręk - Diagnostyka i terapia fotodynamiczna, Wydawnictwo Medyczne Urban &Partner, Wrocław, 2004.
4. Praca zbiorowa pod red. A. Hrynkiewicza - Człowiek i promieniowanie jonizujące, Wydawnictwo Naukowe PWN, Warszawa 2001.

Additional bibliography:

1. Current number of medical journals.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Indyvidual work, reading literature and scientific articles	20
3. Preparing to pass	15
4. Consultation	5

Student's workload

Source of workload	hours	ECTS
Total workload	70	3
Contact hours	35	2
Practical activities	20	1