

Course title Selected topics on applications of modern physics in medicine		ECTS code 13.2.0429	
Name of unit administrating study Institute of Experimental Physics			
Studies			
Field of study	Type	Form	Specialization
Medical Physics	Second cycle	Full-time	all
Teaching staff Aleksander Kubicki, Ph. D., Associate Professor			
Forms of classes, the realization and number of hours		ECTS credits	
A. Forms of classes Lectures		2	
B. The realization of activities Regular classes			
C. Number of hours Lecture: 30 hours			
The academic cycle 2021/2022, summer semester			
Type of course obligatory		Language of instruction English	
Teaching methods Student's own work (i.e. Exam preparation)		Form and method of assessment and basic criteria for evaluation or examination requirements	
		A. Final evaluation Examination	
		B. Assessment methods – Written examination: 5 questions/problems to be solved from the list of 40 problems discussed/explained during the lecture. The list is published in advance to exam	
		C. The basic criteria for evaluation Correct solution of at least 3 of 5 questions/problems giving by the examiner. Student should show demonstrate understanding of the processes taking place in tissue and cells (at the molecular level) illuminated by the laser light depending on kind and parameters of the laser.	
Required courses and introductory requirements			
A. Formal requirements			
B. Prerequisites Knowledge in the field of "Fundamentals of physics"			
Aims of education Student has to gain broad knowledge of the possibilities applications of lasers and spectroscopic methods in medicine. He/she has to understand the processes taking place in tissue and cells illuminated by the laser light depending on kind and parameters of the applied laser. Particularly, he/she has to understand processes taking place at the cellular level upon illumination by the laser beam.			

Course contents

- Review of basics for atomic, diatomic and molecular spectroscopy
- Fluorescence technics applied in physical and nonphysical applications
- Physical basics of lasers
- Review of lasers used in medicine
- Mechanisms of interaction of the laser light to the tissue
- Review of the use of lasers in: general surgery, ophthalmology, neurosurgery, dermatology, pip blood and crushing deposits, laser biostimulation
- Laser biostimulation of plant cells
- Optical methods of the early detection and localization of tumors
- Photodynamic diagnosis and therapy of tumors
- Review of Photosensitizers used in the PDT; their role and action
- Application of photodynamic therapy in microbiology
- Lasers in Doppler blood flowmeters
- Lasers in cytometry

Bibliography of literature

1. J. Lakowicz, Principles of fluorescence, 3rd ed.,, corr. 4th pr., Springer 2010.
2. Z. Gryczynski, I. Gryczynski, Practical fluorescence spectroscopy, CRC Press 2020.
3. Zarys klinicznych zastosowań laserów. Praca zbiorowa. Warszawa 1995.
4. Fotodynamiczna metoda rozpoznawania i leczenia nowotworów. Pod redakcją A. Graczykowej. Warszawa 1999.
5. Diagnostyka i terapia fotodynamiczna. Pod redakcją: H. Podbielska, A. Sieroń i W. Stręć. Wrocław 2004.
6. Laser non-surgical medicine. L. Goldman. Lancaster, Pennsylvania. USA 1991.
7. Materials available by lecturer.

the fields of The learning outcomes

Knowledge

Skills

Social competence

Contact

aleksander.kubicki@ug.edu.pl