COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optronics in medicine [S1IBio1>OwM_1]

Course

Field of study
Biomedical Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Information on the basics of biophysics and optics. Willingness to acquire new knowledge and skills. The ability to think logically and use information obtained from various sources.

Course objective

Getting to know the structure, principles of operation and operation of optoelectronic devices used in medicine and the directions of development of optronics.

Course-related learning outcomes

Knowledge:
1. The student should characterize the basics of the following techniques: interferometric, holographic and optical fibers used in medicine.
2. The student should characterize the basic features of the structure and principles of operation and operation of optoelectronic components used in medicine.
3. The student should define the basic directions of development in the construction of optoelectronic devices in medicine.

Skills:
1. The student should define the basic directions of development in the construction of optoelectronic devices in medicine
2. The student is able to formulate the basic principles of safe and proper operation of an optoelectonic device.
3. The student is able to propose optoelectronic techniques and elements useful in medicine and for its development.

Social competences:
1. The student can cooperate in a group.
2. The student is aware of the importance of understanding medical aspects in engineering activities.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written or oral test. In order to receive a pass mark, you must obtain at least 50% of the points possible in a subject area.
Laboratory: Assessment based on an oral or written answer on the content of each laboratory exercise and preparation of a report. In order to pass the classes, all exercises must be completed.

Programme content

Lecture:
1. Physical basics of optronics used in medicine
2. Sources of incoherent and coherent radiation used in medicine
3. Radiation detectors: optical and thermal, photodiodes, photomultipliers, CCD and ICCD cameras
4. Techniques and optical devices in medicine: arthroscopy, laparoscopy, fiberscope, endoscope
5. Interferometric and holographic techniques in medicine, ophthalmoscope, OCT
6. Diagnostic photometric and spectrometric measurements
7. Selected techniques of optical and laser spectroscopy
Laboratory:
1. Measurements of laser radiation power
2. Construction of simple set-ups using semiconductor lasers
3. Methods of forming and focusing a laser beam
4. Examination of the specificity of conducting radiation in optical fibers
5. Construction and testing of simple interferometric systems
6. Study of temperature changes in the refractive index of a fiber using fiber optic interferometers Michelson and Mach Zehnder
7. Measurements with the use of diffractive gratings: classic and holographic.

Course topics

none

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the blackboard and films.
Laboratory exercises: performing experiments, solving problems, discussion, team work.

Bibliography

Basic:
1. B. Ziętek, Lasery, Wydawnictwo Uniwersytetu Mikołaja Kopernika, Toruń 2009
2. K. Patorski, M.Kujawińska, L.Sałbut: „Interferometria laserowa z automatyczną analizą obrazu”, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005.
3. E. Hecht, "Optyka" Wydawnictwo Naukowe PWN, Warszawa 2012.

Additional:
1. K.Booth, S. Hill, Optoelektronika, Wydawnictwo Komunikacji i Łączności, Warszawa 2004.
2. P. Hariharan, Optical Holography; Principles, Techniques and Applications, Cambridge University Press, 2nd edition, Cambridge 2008

3. Inżynieria biomedyczna, kwartalnik Polskiego Towarzystwa Inżynierii Biomedycznej
4. Electrooptics, Europa Science Ltd, Cambridge

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00