# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Lasers in medicine [S2IBio1>LwM]

## Course

Field of study
Biomedical Engineering

Year/Semester
2/3

Area of study (specialization)
Bionics and Virtual Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

## Number of credit points

3,00

## Coordinators

prof. dr hab. Ewa Stachowska
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## Lecturers

## Prerequisites

Basic knowledge of physics, biophysics and electronics.

## Course objective

Getting to know the structure, principles of operation and operation of lasers used in medicine

## Course-related learning outcomes

Knowledge:
1. The student should characterize laser radiation and its influence on biological materials.
2. The student should characterize different laser devices used in therapy and diagnostics.
3. He knows the methods of correct and safe use of laser devices used in medicine.

Skills:
1. The student can assess the method and correct operation of a medical laser device.
2. The student can recognize the existing technical solutions used in a medical laser.
3. The student can design simple elements supporting the operation of a medical laser device.
4. The student can develop methods of correct and safe use of laser devices used in medicine.

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:

Learning outcomes presented above are verified as follows:
Lecture : 5-question test at the end of the semester.
Laboratory: crediting on the base of an oral or written answer concerning the content of each performed laboratory exercise and preparation of reports. In order to pass the classes, all exercises must be completed.

## Programme content

Non-coherent and coherent sorces of IR/VIS/UV radiation used in medicine,
The properties of laser radiation and its interaction with biological materials.
Indications and counter-indications for use of laser radiation.
Work safety with lasers.

## Course topics

Lecture:
1. Non-coherent and coherent sorces of IR/VIS/UV radiation used in medicine,
2. The properties of laser radiation and its interaction with biological materials.
3. Indications and counter-indications for use of laser radiation.
4. Work safety with lasers.
5. Construction and operation of different lasers used in therapy.
6. Optical and electronic laser control systems.
7. Laser for biostimulation, photodiagnostics and photodynamic therapy.
8. Lasers for photothermolysis, photoablation,and photocoagulation

Laboratory:
1. Investigation of selected properties of laser radiation.
2. Properties of a point and scanning applicator on the example of a biostimulation laser.
3. Semiconductor laser for carpal tunnel therapy.
4. Investigation of changes in thin layers of gels and liquids using a Mach-Zehnder laser interferometer.
5. Three-dimensional representation and measurement of erythrocyte geometric parameters using a laser holographic microscope.
6. Study of the dynamics of changes in the internal structure of substances used in selected laser therapies using a holographic microscope.

## Teaching methods

Multimedia presentations, laboratory classes.

## Bibliography

Basic
1. B. Ziętek, Lasery, Wydawnictwo Uniwersytetu Mikołaja Kopernika, Toruń 2009
2. P. Fiedor, T. Kęcik i wsp., Zarys klinicznych zastosowań laserów, Dom Wydawniczy Ankar, Warszawa 1995
3. D. J. Goldberg, Lasery i światło, Elsevier Urban & Partner, Wrocław 2009wy i zastosowania", Wydawnictwo PAK, Warszawa, 2011.
4. E. Hecht, "Optyka" Wydawnictwo Naukowe PWN, Warszawa 2012.

Additional
1. Medical Laser Application, International Journal for Laser Treatment and Research, wyd. Elsevier B.V.
2. Sean W. Lanigan, Lasery w dermatologii, Wydawnictwo Czelej, ISBN: 83-89309-51-3
3. P. Hariharan: "Optical Holography; Principles, Techniques and Applications", Cambridge University Press, 2nd edition, Cambridge 2008.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 75 | 3,00 |
| Classes requiring direct contact with the teacher | 45 | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 30 | 1,00 |