Appendix number 4 to the Senate Resolution No. 430/01/2015

SYLLABUS

concerning the cycle of education 2017-2023

1.1. BASIC INFORMATION CONCERNING THIS SUBJECT / MODULE

Subject / Module	**Lasers in Medicine**
Course code / module *	**LM/Fak**
Name of the leading direction	**Faculty of Medicine, University of Rzeszów**
Department Name	**Faculty of Medicine, University of Rzeszów**
Field of study	**Faculty of Medicine**
level of education	**Master Degree Studies**
Profile	**General academic**
Form of study	**Full Time and Part Time**
Year and semester	**3th year, 5th semester**
Type of course	**To choose**
Coordinator	**Dr. David Aebisher**
First and Last Name of the Teachers	**Dr. David Aebisher**

* - According to the resolutions of the Faculty of Medicine

1.2. Forms of classes, number of hours and ECTS

Lecture	Exercise	Conversation	Laboratory	Seminar	ZP	Practical	Other	**Number of points ECTS**
-	TBD*	-	-	30	-	-	-	1

TBD = Might be performed instead of seminars lessons

1.3. The form of class activities

☒classes are in the traditional form

☐classes are implemented using methods and techniques of distance learning

1.4. Examination Forms / module (exam, **credit with grade** or credit without grade)

2. REQUIREMENTS

KNOWLEDGE OF CHEMISTRY AND BIOLOGY FROM HIGH SCHOOL

3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

3.1. Objectives of this course/module

C1	An understanding of the basic physics of lasers and laser interaction with tissue
C2	An understanding of medical laser systems and laser safety
C3	An understanding of laser diagnostics and therapeutics
C4	Ability to use lasers and associated laboratory equipment, performance of laser-based experiments according to the procedures described in the instructions for laboratory exercises

3.2 OUTCOMES FOR THE COURSE / MODULE (TO BE COMPLETED BY THE COORDINATOR)

EK (the effect of education)	The content of learning outcomes defined for the class (module)	Reference to the directional effects (KEK)
EK_01	Knows the physical basis of selected therapeutic techniques, including ultrasound and irradiation;	B.W9
EK_02	Knows the rules of scientific research, observational and experimental and in vitro studies aimed at the development of medicine	B.W34
EK_03	Plans and performs a simple scientific study and interprets his findings and draws conclusions.	B.U14

3.3 CONTENT CURRICULUM (filled by the coordinator)

A. Seminars

1. Overview of lasers in medicine
2. Basic physics of lasers
3. Mechanisms of laser radiation in biological tissue
4. Basics of medical laser systems
5. Laser light delivery systems (fibers/waveguides)
6. Laser applications in medical diagnostics
7. Lasers in ophthalmolgy
8. Lasers in dermatology
9. Lasers for cardiovascular disease
10. Lasers in urology
11. Lasers in otorhinolaryngology
12. Lasers in neurology
13. Lasers in oncology
14. Theranostics
15. Lasers in dentistry

B. Practical laboratory classes (TBD)

1. Biomolecules and biocompatible compounds: spectroscopic characterization
2. Steady-state spectroscopy: Absorption, fluorescence, IR spectroscopy
3. Time-resolved spectroscopy: Transient absorption (fs up to ms), Single photon counting, Singlet oxygen phosphorescence
4. Data Analysis: Statistics and Data treatment
5. Imaging/Diagnostic: Optical coherence tomography, optical biopsy
6. Photodynamic therapy
7. Flow cytometry
8. Light scattering from disordered systems
9. Light scattering from ordered systems
10. Refraction

3.4 TEACHING METHODS

Lecture: Lecture with multimedia presentations
Laboratory: Gaining experience with lasers according to the procedures and design in laboratory

4 METHODS AND EVALUATION CRITERIA

4.1 Methods of verification of learning outcomes

Symbol of effect	Methods of assessment of learning outcomes (Eg.: tests, oral exams, written exams, project reports, observations during classes)	Form of classes
EK_ 01	Test and preparation of written Elaborate on one Subject	Seminars
EK_ 02 EK_03	Reports and observations during classes	Seminars/ laboratory exercises

4.2 Conditions for completing the course (evaluation criteria)

Lecture: Credit based on attendance, one test and written report .

Laboratory Exercise: In order to receive credit from the laboratory, students must perform all the experiments contained in the program description, document the results, write conclusions in the report, and the report must be positively evaluated. The final evaluation of the exercises is the average of the partial grades of: pre-tests, final, lab execution and reports.

Assessment of knowledge and skills:
5.0 - shows knowledge of the content of education at the level of 93% -100%
4.5 - shows knowledge of the content of education at the level of 85% -92%
4.0 - shows knowledge of the content of education at the level of 77% -84%
3.5 - shows knowledge of the content of education at the level of 69% -76%
3.0 - shows knowledge of the content of education at the level of 60% -68%
2.0 - demonstrates learning content below 60%

5. Total student workload required to achieve the desired result in hours and ECTS credits

Activity	Hours / student work

Hours of classes according to plan with the teacher	30
Preparation for classes	-
Participation in the consultations	-
The time to write a paper / essay	-
Preparation for tests	2
Participation in colloquia	-
Other (e-learning)	-
SUM OF HOURS	32
TOTAL NUMBER OF ECTS	**1**

6. TRAINING PRACTICES IN THE SUBJECT / MODUL

Number of hours	
Rules and forms of apprenticeship	

6. LITERATURE

READING:

1. H.-PETER BERLIEN , G. J. MÜLLER (EDITORs). APPLIED LASER IN MEDICINE. SPRINGER-VERLAG BERLIN HEIDELBERG 2003
2. H. JELÍNKOVÁ (EDITOR) LASERS FOR MEDICAL APPLICATIONS. DIAGNOSTICS, THERAPY AND SURGERY. WOODHEAD PUBLISHING LIMITED, 2013.

Additional literature:

1. K. NOURI (EDITOR). LASERS IN DERMATOLOGY AND MEDICINE. SPRINER, 2012.

2. D. R. VIJ AND K. MAHESH (EDITORS) MEDICAL APPLICATIONS OF LASERS, SPRINGER SCIENCE+BUSINESS MEDIA, LLC, 2002.

Acceptance Unit Manager or authorized person