FACULTY CHEMISTRY

SUBJECT CARD

Name of subject in English: Biophotonics
Main field of study (if applicable): Chemical and Process Engineering
Specialization (if applicable): Chemical Nanoegineering
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code: ICC025005
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				15
Number of hours of total student workload (CNPS)	30				30
Form of crediting	Exam				crediting with grade
For group of courses mark (X) final course	X				
Number of ECTS points	1				1
including number of ECTS points for practical (P) classes					1
including number of ECTS points for direct teacher-student contact (BK) classes	0,5				0,5

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of physics.
2. Fundamentals of chemistry
3. Fundamentals of biology on the high school level

SUBJECT OBJECTIVES

C1 To provide students with additional knowledge in the field of light-matter interactions

C2 Familiarize students with knowledge about modern use of light in biology and medicine
C3 To provide students with an additional knowledge about materials used in light-related therapies

C4 Familiarizing students with modern biophotonics

SUBJECT EDUCATIONAL EFFECTS

related to knowledge:

PEK_W01 student has a structured, theoretically founded general knowledge covering key issues in the field of light-matter interaction
PEK_W02 student knows new methods of bioimaging
PEK_W03 student knows modern methods of lasers applications in biology and medicine
PEK_W04 student knows the basic methods of application of biosensors
PEK_W06 student knows and understands selected applications of plasmonic nanoparticles
PEK_W07 student knows and understands the perspectives and risks associated with the use of light
PEK_W08 student knows the modern methods of photodynamic therapies
PEK_W09 student has knowledge about photonic biocrystals
PEK_W10 student knows new ways of photoproductions by 3-D technique

related to skills:

PEK_U01 – student can name and define biophotonics. He knows the latest literature on biophotonics. Searching for information on biophotonics from available sources.
PEK_U02 – student knows how to use lasers in biology and medicine
PEK_U03- student is able to name and define advanced equipment used in biophotonics
PEK_U04- student has language skills in the field of biophtonics
PEK_U05- student can name and define biosensors
PEK_U06- student has language skills in the field of biophotonics
PEK_U07- student is able to make a critical analysis of the prospects for the use of biomaterials
PEK_U08- student can name and define new biomaterials
PEK_U09- student knows the latest literature on biomaterials
PEK_U10 - student knows the various applications of DNA
PEK_U11 – student can give an example of biosensor
PEK_U12 - student knows bio-derivatives for photonics and material engineering
PEK_U13- student can define photonic biocrystals
PEK_U14 - student knows the 3-D printing technique with light

related to social competences:

PEK_K01student understands the need to inform the public about the need to achieve the goals of sustainable development in technologies for the production of new materials, energy and environmental protection.
PEK_K02 student is able to work in a group, performing various roles including group leader.
PEK_K03 student is aware of the social role of the engineer.
PEK_K04 student is ready to critically evaluate his/her knowledge and received content.

PROGRAMME CONTENT

Lectures		**Number of hours**
Lec 1	Fundamentals of light-matter interactions	4
Lec 2	Principles of lasers, current laser technology.	1
Lec 3	Bioimaging – principles, techniques and applications.	2
Lec 4	Principles of biosensors.	2
Lec 5	Plasmonic nanoparticles for cancer detection and treatment.	2
Lec 6	Light activated therapies, photodynamic therapy.	2
Lec 7	Photonic biocrystals.	1
Lec 8	Biocompatible materials for photonics - 3-D printing of new biomaterials.	1
Seminar		**Number of hours**
Sem 1	Plasmonic nanoparticles for cancer detection and treatment	2
Sem 2	Biomaterials for photonics	2
Sem 3	Nonlinear bioimaging	2
Sem4	Photonics crystals in nature	2
Sem5	Photodynamic therapy	2
Sem6	Biosensors in practice	2
Sem7	Advances in 3-D printing for medicine	2
Sem8	Bioimaging in therapies	1

TEACHING TOOLS USED

N1. Multimedia presentation
N2. Lectures
N3. Hands-on experiments discussed during lectures.

N4. Scientific reports.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1 seminars		
F2		
F3		
P		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Paras N. Prasad, Nanophotonics, Wiley-Interscience, 2004
[2]Challa Kumar, Nanomaterials for Medical Diagnosis and Therapy, Wiley, 2007
[3] Yoon Yeo, Nanoparticulate drug delivery systems : strategies, technologies, and applications, Wiley, 2013
[4] Paras N. Prasad, Introduction to biophotonics, Wiley-Interscience; 2003
[5] Ruikang K. Wang, Valery V Tuchin ,Advanced Biophotonics: Tissue Optical Sectioning, CRC Publishing, 2013

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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