

FACULTY of Chemistry

**SUBJECT CARD****Name of subject in Polish Biofotonika****Name of subject in English Biophotonics****Main field of study (if applicable): Advanced Nano and Biomaterials - MONABIPHOT****Specialization (if applicable):****Profile: academic****Level and form of studies: 2nd level, full-time****Kind of subject: obligatory****Subject code W03ANB-SM2003W, W03ANB-SM2003S****Group of courses NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15	20	30		30
Number of hours of total student workload (CNPS)	30				30
Form of crediting (Examination / crediting with grade)	C				C
For group of courses mark (X) final course					
Number of ECTS points	2				2
including number of ECTS points for practical classes (P)					2
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	0,65				1,4

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. General chemistry
2. Basics of physics
3. Basics of biology at high school level

**SUBJECT OBJECTIVES**

C1 Obtaining additional knowledge in the field of synthesis, characterization and application of materials for biophotonics

C2 Knowledge about modern biophotonics

C3 Obtaining additional knowledge about materials used in biophotonics

C4 To familiarize the student with modern biophotonics

C5 Knowledge about the development and limitations of biophotonics

**SUBJECT EDUCATIONAL EFFECTS**

In terms of knowledge:

Person who passed the subject:

PEU\_W01 – Has structured, theoretically based general knowledge covering key issues in the field of biophotonics

PEU\_W02 – Knows new methods of synthesizing materials for biophotonics

PEU\_W03- Knows modern methods of material characterization for biophotonics

PEU\_W04- Knows the basic methods of functionalization of materials for biophotonics

PEU\_W05 - Understands and is able to explain descriptions in biophotonics

PEU\_W06- Knows and understands selected applications of materials for biophotonics

PEU\_W07- Knows and understands the prospects and threats related to the synthesis and application of materials for biophotonics

PEU\_W08 – Knows modern methods of dynamic phototherapy

PEU\_W09 – Has knowledge of the toxicity of nanobiomaterials

PEU\_W10- Knows the applications of DNA in biophotonics

PEU\_W11 – Knows new methods of biosynthesis of nanomaterials

PEU\_W12 – Knows popular biopolymers and their applications

PEU\_W13 – Has knowledge about photonic biocrystals

In terms of skills:

Person who passed the subject:

PEU\_U01 – Is able to name and define biophotonics. Knows the latest literature on biophotonics. Searches for information in the field of biophotonics from available sources.

PEU\_U02 - Knows modern imaging methods

PEU\_U03- Is able to name and define advanced equipment used in biophotonics

PEU\_U04- Has language skills in the field of biophotonics.

PEU\_U05- Is able to name and define biophotonic materials.

PEU\_U06- Has language skills in the field of biophotonics.

PEU\_U07- is able to critically analyze the prospects for the use of biophotonics

PEU\_U08 - Is able to name and define new biomaterials

PEU\_U09- Knows the latest literature on biophotonics

PEU\_U10 – Knows various applications of photodynamic therapy

PEU\_U11 – Can give an example of a biosensor

PEU\_U12 – Knows biobased materials for photonics and materials engineering

PEU\_U13 - Is able to define photonic biocrystals

PEU\_U14 – Knows the 3-D printing technique for biomaterials

<b>PROGRAMME CONTENT</b>		
<b>Lecture</b>		<b>Number of hours</b>
Lec 1	<b>Fundamentals of light-matter interactions.</b>	2
Lec 2	<b>Principles of Lasers, Current Laser Technology and Nonlinear Optics</b>	2
Lec 3	<b>Bioimaging – principles, techniques and applications</b>	2
Lec 4	<b>Principles of biosensors</b>	2
Lec 5	<b>Plasmonic nanoparticles for cancer detection and treatment</b>	2
Lec 6	<b>Light activated therapy – photodynamic therapy</b>	2
Lec 7	<b>Photonics biocrystals</b>	2

Lec8	<b>Biocompatible materials for photonics – 3-D printing of new biomaterials.</b>	1
<b>Seminar</b>		<b>Number of hours</b>
Semin 1	<b>Bioimaging</b>	2
Semin 2	<b>Bioimaging in therapies</b>	2
Semin 3	<b>Biosensors</b>	2
Semin 4	<b>Biosensors in practice</b>	2
Semin 5	<b>Plasmonic nanoparticles for cancer detection and treatment</b>	4
Semin 6	<b>Photodynamic therapy</b>	2
Semin 7	<b>Antibacterial photodynamic therapy</b>	2
Semin 8	<b>Photonics crystals in nature</b>	4
Semin 9	<b>Advances in 3-D printing for medicine</b>	4
Semin 10	<b>Biomaterials for photonics</b>	4
Semin 11	<b>Nonlinear bioimaging</b>	2
	Total hours	30
<b>TEACHING TOOLS USED</b>		
N1. N1 Multimedia lectures N2 Workshop seminars N3 Own work – preparation of a presentation/paper N2. N3.		

#### **EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT**

<b>Evaluation</b> (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1 - lecture	PEU-W1 to W13	Presentation /lecture
F1 (wykład)		
F1 = P1 (seminarium)	PEU-W1 do W13, PEU-U1 do U14	Presentation

P
<b>PRIMARY AND SECONDARY LITERATURE</b>
<b><u>PRIMARY LITERATURE:</u></b> [1] [1] M. Jurgens, T. Mayerhöfer, and J Popp Handbook of biophotonics, Wiley 2013  <b><u>SECONDARY LITERATURE:</u></b> [1] Paras N. Prasad, Nanophotonics, Wiley-Interscience, 2004 [2] Paras N. Prasad, Introduction to Biophotonics, 2004 [3] Challa Kumar, Nanomaterials for Medical Diagnosis and Therapy, Wiley, 2007 [4] Yoon Yeo, Nanoparticulate drug delivery systems : strategies, technologies, and applications, Wiley, 2013
<b>SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)</b>
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