Zał. nr 5 do ZW 78/2023

Attachment no. 4. to the Program of Studies

FACULTY of Chemistry

SUBJECT CARD

Name of subject in Polish Spektroskopia fluorescencyjna i bioobrazowanie
Name of subject in English Fluorescence spectroscopy and bioimaging
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-SM2001W, W03ANB-SM2001C
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15			
Number of hours of total student workload (CNPS)	75	25			
Form of crediting (Examination / crediting with grade)	Crediting with grade	Crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	3	1			
including number of ECTS points for practical classes (P)		1			
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,3	0,7			

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. General knowledge about biochemistry and chemistry
2. Skills in basic chemistry/biochemistry calculations

SUBJECT OBJECTIVES

C1 To provide an advanced understanding of the core principles and selected topics of biological chemistry and their experimental basis
C2 To enable students to acquire knowledge and understanding of selected aspects of fluorescence spectroscopy and bio-imaging in context of proteins visualization. This will be pursued by means of lecture series and wet laboratory classes.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 student knows the principles of chemical biology, cancer biology, and the role of proteolytic enzymes in health and disease

PEU_W02 student knows modern technologies for the proteins visualization in biological samples with emphasis on the detection of proteolytic enzymes using activity based probes

PEU_W03 student knows and understands the principles of the spectrofluorometric plate readers, confocal microscopy and mass cytometry

relating to skills:

PEU_U01 student can apply the principles of various biochemical techniques to visualize proteins in biological samples using spectrofluorimeter, LC-MS, fluorescence microscopy, infrared bio-imaging system and mass cytometry

PEU_U02 student is able to analyze and critically evaluate the results obtained by using aforementioned techniques and systems

PROGRAMME CONTENT

	Lecture	**Number of hours**
Lec 1	Basis of biological chemistry	2
Lec 2	Introduction to cell and molecular biology	2
Lec 3	Introduction to proteomics	2
Lec 4	Biochemical techniques in life sciences	2
Lec 5	Proteomic techniques in life sciences	2
Lec 6	Lifestyle diseases: the biology of cancer	2
Lec 7	Lifestyle diseases: the biology of diabetes	2
Lec 8	Proteomic techniques for the visualization of enzymes activtiy	2
Lec 9	Fluorescent techniques for the visualization of enzymes activtiy	2
Lec 10	Fluorescence microscopy as a tool for proteins visualization	2
Lec 11	Flow cytometry as a tool for diseases diagnosis	2
Lec 12	The principles of mass cytometry	2
Lec 13	The principles of imaging mass cytometry (IMC)	2
Lec 14	The application of mass cytometry and IMC for multiparametric bio-imaging	2
Lec 15	Final exam	2
	Total hours	30

	Classes	**Number of hours**
Cl 1	Introduction to enzyme kinetics (principles, methods, calculations)	2
Cl 2	Introduction to proteomics (principles, methods, calculations)	2
Cl 3	Detection of peptides hydrolysis by mass spectrometry techniques	2

Cl 4	Detection of enzymes activity with chemical probes and proteomics	2
C1 5	Detection of enzymes activity with fluorescent probes and antibodies	2
C1 6	Application of mass spectrometry in clinical proteomics	2
C1 7	Application of mass cytometry in clinical proteomics	2
C1 8	Final remarks	1
	Total hours	15

Laboratory		**Number of hours**
Lab 1		
Lab 2		
Lab 3		
Lab 4		
Lab 5		
…		
	Total hours	

Project		**Number of hours**
Proj 1		
Proj 2		
Proj 3		
Proj 4		
…		
	Total hours	

Seminar		**Number of hours**
Semin 1		
Semin 2		
Semin 3		
…		
	Total hours	

TEACHING TOOLS USED

N1. PowerPoint presentations (for lectures and classes)
N2. Scientific literature
N3. Data generated from experiments performed on spectrofluorimeters, fluorescence scanners, confocal microscopes, mass cytometers and imaging mass cytometers
N4. Other teaching tools will include: laboratory demonstrations, guest lecturers, online simulations, case studies and group projects.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
P (for lecure)	PEU_W01-W03	test
F1 (for classes)	PEU_U01-U02	Students' activtiy during classes
F2 (for classes)	PEU_U01-U02	The quality of group project and other tasks

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] **Principles and Techniques of Biochemistry and Molecular Biology**, by Keith Wilson and John Walker, *Cambridge University Press*

[2] **Principles of Fluorescence Spectroscopy,** by Joseph R. Lakowicz, *Springer*

[3] **Proteomics: Principles, Techniques, and Analysis** Syrawood Publishin House, Peter Wyatt

[4] High-Dimensional Single Cell Analysis: Mass Cytometry, Multi-parametric Flow Cytometry and Bioinformatic Techniques, by Harris G. Fienberg and Garry P. Nolan, *Springer*

SECONDARY LITERATURE:

[1] **Biochemistry: The Chemical Reactions of Living Cells**, by David Metzler, *Elsevier*

[2] **Introduction to Cancer Biology** by Robin Hesketh, *Cambridge University Press*

[3] **Handbook of Proteolytic Enzymes,** by Neil D. Rawlings and Guy S. Salvesen, *Elsevier*

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

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