DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: Piotr Dobryszycki
DEPARTMENT: Chemical Department
SCIENTIFIC DISCIPLINE: Chemical Sciences

COURSE CARD

Course name in Polish: Metody Badań Biochemicznych
Course name in English: **Methods in Biochemistry**
Course language: Polish
University-wide general course type*:
The course is intended for all PhD students: YES / NO
1) BASIC COURSE
~~**2) SPECIALIST COURSE**~~
~~**3) SEMINAR**~~
~~**4) HUMANISTIC COURSE**~~
~~**5) LANGUAGE**~~

Subject code: NCQ100108W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam			
Number of ECTS points	0			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Fundamental knowledge in biochemistry and biophysics

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COURSE OBJECTIVES

C1 Methods in biochemistry; biospectroscopy methods in the structure-function relationships of proteins and nucleic acids
C2 Theoretical bases of modern biochemical methods. Each lecture describes different method.
C3 Chosen examples of the technique application for the resolving of biological problems
C4 Reading of Methods section of the papers which applies biophysical methods for the analysis protein structure-function.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours
Lec 1	Introduction. Spectroscopy – definitions – absorption, emission, fluorescence, phosphorescence phenomena. UV-VIS spectroscopy of proteins and nucleic acids.	2
Lec 2	Spectrofluorometry – polarization, steady-state methods; dynamic	2

	measurements – excited state lifetime. Fluorescence probes. Fluorescence quantum yield determination.	
Lec 3	Fluorescence spectroscopy – energy transfer (FRET); Foerster theory.	2
Lec 4	Theoretical aspects of the optical activity. Circular dichroism spectroscopy (ORD, CD, MCD). Determination of protein's secondary structure.	2
Lec 5	Fluorescence microscopy; nanoscopes – STORM, STED, PALM	2
Lec 6	Intrinsically Disordered Proteins (IDP) – methods of structure analysis	2
Lec 7	Ultracentrifugation for the structural studies of biomolecules	2
Lec 8	Protein knots – methods of structure analysis	2
Lec 9	Protein folding – methods of analysis	2
Lec 10	Surface plasmon resonance (SPR) – for the biomolecules interactions studies	2
Lec 11	Light-scattering methods (dynamic light-scattering, SAXS, SANS)	2
Lec 12	Single molecule spectroscopy – confocal microscopy. smFRET (single molecule FRET), fluorescence correlation spestroscopy (FCS)	2
Lec13	Atomic force microscopy (AFM), molecular tweezers in the protein folding studies	2
Lec 14	Biosensors, quantum dots, molecular beacons.	2
Lec 15	Examination	2
	Total hours	30

	ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Student knows and understands:	Method of evaluation:
Knowledge	**P8U_W**	- the world's scientific and creative heritage and its implications for practice	- student competently quotes other authors in articles published and prepared for publication in peer-reviewed scientific journals, peer-reviewed materials from international scientific conferences, and in book editions preceding the preparation of a doctoral dissertation
Knowledge	**P8S_WG**	- to such an extent that it is possible to revise existing paradigms – world heritage, including theoretical foundations, general issues and selected specific issues – specific to a scientific or artistic discipline - the main trends in the development of the scientific or artistic disciplines covered in the curricula - research methodology	- student has a sound knowledge of basic subjects such as chemistry and biology chemistry - has an advanced knowledge fundamental to a field relevant to his/her research, including the most advanced methods of research and verification of results achieved in biochemistry and biophysics - has advanced knowledge of directional subjects in biotechnology - has knowledge at an advanced level of chemistry and subject matter relevant to the field of biotechnology, including the most recent research findings and scientific achievements

		- the rules for the dissemination of scientific results, including in open access mode	
	Code of the descriptive component	Student is able to:	The method of evaluation:
SKILLS	**P8U_U**	- analyse and creatively synthesise scientific and creative achievements in order to identify and solve research, innovation and creative problems; create new elements of this achievements	- is able to classify scientific publishers, including scientific journals, and scientific achievements according to accepted rules for: - journals included in international databases Scopus and Web of Science - impact factor (if), - quoting, - Hirsch index, - have knowledge of current specification of active scientific journals in Scopus and Web of Science databases and their associated disciplines, as defined in the new classification of fields and disciplines

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

1. Spectroscopy for the Biological Sciences – Gordon G. Hammes; Wiley – Interscience, 2005.
2. Methods in Biochemistry (continous edition)

SECONDARY LITERATURE:

1. Chosen papers from scientific journals with the application examples of biochemical methods
2. Principles of Fluorescence Spectroscopy – Joseph Lakowicz, 3rd ed., Springer

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

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