

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

SUPERVISOR DECLARING/CONDUCTING COURSE: Marta Kopaczyńska
DEPARTMENT: Faculty of Basic Technical Problems W11
SCIENTIFIC DISCIPLINE: Biomedical Engineering

COURSE CARD

Course name in Polish: **Badania mikroskopowe w inżynierii biomedycznej**

Course name in English: **Microscopic studies in biomedical engineering**

Course language Polish / English*

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: **IBQ100049W**

* delete as applicable

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of physics
2. Basic knowledge of medical imaging techniques

COURSE OBJECTIVES

C1 acquire knowledge of the techniques that are used in microscopic studies of biomaterials and tissues

C2 obtain basic knowledge of the structure and principles of the various microscopes used for imaging biomaterials and tissue

C3 Solving technical and design problems in the laboratory . Students obtain a knowledge about staining techniques used in nanoscopic measurement methods

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PROGRAM CONTENTS

Form of classes – lecture (Lec)		Number of hours
Lec1	An introduction to the newest examination methods of biological materials	2
Lec2	The application of measurement techniques in tissue engineering.	2
Lec3	The methods of stem cells characterization.	2
Lec4	The introduction to fluorescence microscopy - techniques of visualization.	2
Lec5	Preparation of the samples for microscopic examination. Methods of fixation and staining.	2
Lec6	Fluorescence microscopy: FRET, FLIC, TIRFM, FLIM.	2
Lec7	Fluorescence nanoscopy. Introduction.	2
Lec8	Fluorescence nanoscopy. STED.	2
Lec9	Fluorescence nanoscopy. PALM.	2
Lec10	Fluorescence nanoscopy. STORM.	2
Lec11	Hybrid techniques of micro- and nanoscopy part 1.	2
Lec12	Hybrid techniques of micro- and nanoscopy part 2.	2
Lec13	Techniques of nanomanipulation: optical tweezers.	2
Lec14	The application of nanomanipulation techniques for the characterization of biological materials part 1.	2
Lec15	The application of nanomanipulation techniques for the characterization of biological materials part 2.	2
Total hours:		30

Form of classes – foreign language course (Lng)		Number of hours
Lng1		
Lng2		
Lng3		
..		
Total hours:		

Form of classes – seminar (Sem)		Number of hours
Sem1		
Sem2		
Sem3		
...		
Total hours:		

Form of classes – mixed forms (mix)		Number of hours
Mix1		
Mix2		
Mix3		
...		
Total hours:		

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TEACHING TOOLS USED
N1. lecture with multimedia presentation N2. project with multimedia presentation and discussions

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8U_W	exam
Knowledge	P8S_WG	exam
Skills	P8U_U	project
Skills	P8S_UW	project
Social competence	P8S_KO	project

PRIMARY AND SECONDARY LITERATURE
<p><u>PRIMARY LITERATURE:</u></p> <p>[1] Mikroskopia sił atomowych (AFM) - biomedyczne zastosowanie pomiarów w nanoskali. Marta Kopaczyńska. Wrocław : Oficyna Wydawnicza Politechniki Wrocławskiej, 2010.</p> <p>[2] 3D images of materials structures :processing and analysis /Joachim Ohser and Katja Schladitz. Weinheim : Wiley-VCH Verlag GmbH & Co. KGaA, cop. 2009</p> <p>[3] Advanced biomaterials :fundamentals, processing, and applications /edited by Bikramjit Basu, Dharendra Katti, and Ashok Kumar. Hoboken. : John Wiley & Sons ; [Westerville, Ohio] : The American Ceramic Society, cop. 2009.</p> <p>[4] Optical imaging techniques in cell biology. Guy Cox. Boca Raton: CRC/Taylor & Francis, cop. 2007.</p> <p>[5] Tissue engineering :essentials for daily laboratory work /W. W. Minuth, R. Strehl, K. Schumacher. Weinheim : Wiley-VCH, cop. 2005</p> <p>[6] Obrazowanie biomedyczne. Red. tomu Leszek Chmielewski, Juliusz Lech Kulikowski, Antoni Nowakowski. Warszawa : Akademicka Oficyna Wydawnicza Exit, 2003.</p> <p>[7] Systemy mikroskopii bliskich oddziaływań w badaniach mikro- i nanostruktur. Teodor Paweł Gotszalk. Wrocław : Oficyna Wydawnicza Politechniki Wrocławskiej, 2004</p> <p><u>SECONDARY LITERATURE:</u></p> <p>[1] Articles from journals: Science, Biomaterials, Biomolecular Engineering, Biotechnology, Bioscience, Biomechanics and Modeling in Nanotechnology, Polymer Composites, Nanotechnology, Biophysics, Molecular Imaging, Tissue Engineering</p>
<p>SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)</p> <p>Dr hab. Marta Kopaczyńska, Prof. ucz. marta.kopaczynska@pwr.edu.pl</p>