

Nazwa zajęć/ <i>Course title:</i>	Mikroskopowe analizy wizualizacji procesów i związków chemicznych	ECTS	2
Nazwa zajęć w j. angielskim/ <i>Course title in English:</i>	Methods of microscopic visualization of processes and molecules		
Zajęcia dla kierunku studiów/ <i>Degree program name:</i>	Biotechnology		

Język kursu/ <i>Course language:</i>	English	Poziom studiów/ <i>Study level:</i>	1
Typ studiów/ <i>Form of studies:</i>	<input checked="" type="checkbox"/> intramural <input type="checkbox"/> extramural	Status zajęć/ <i>Course status</i>	<input checked="" type="checkbox"/> podstawowe/ <i>basic</i> <input type="checkbox"/> kierunkowe/ <i>major</i> <input type="checkbox"/> obowiązkowe/ <i>mandatory</i> <input checked="" type="checkbox"/> do wyboru/ <i>elective</i>
		Semestr/ <i>Semester:</i>	2 <input type="checkbox"/> semestr zimowy/ <i>winter semester</i> <input checked="" type="checkbox"/> semestr letni/ <i>summer semester</i>
Rok akademicki/ <i>Academic year:</i>		2022/2023	Numer katalogowy/ <i>Catalogue number:</i> BBT_BTa-1S-2L-19_4

Koordynator zajęć/ <i>Course coordinator:</i>	Dr. Mirosław Sobczak			
Prowadzący zajęcia/ <i>Teachers responsible for the course:</i>	Dr. hab. Wojciech Borucki (prof. SGGW), Dr. Edmund Kozieł, Dr. Mirosław Sobczak, Dr. Wojciech Kurek, Dr. Agnieszka Ostrowska			
Założenia, cele i opis zajęć/ <i>Aims, objectives and description of the course:</i>	<p>Aim and objective: to familiarize and train students with basic microscopic equipment and methods used in modern structural and analytical microscopy.</p> <p>Description: Principles of physical and chemical methods of sample processing microscopic preparation techniques. Preprocessing of samples for light and electron microscopy: fixation, embedding in resins, sectioning, cryo-sectioning, ultramicrotomy, staining and contrasting. Technical construction of light microscopes (classical and inverted), implementation of different illumination and observation techniques (bright field, dark field, phase contrast, differential-interference contrast (DIC, Nomarsky), polarization, fluorescence (trans- and epi-), „spin-disc”, confocal laser scanning microscopy (CLSM; direct observation of permanent and in vivo samples, localization and analyses of proteins, nucleic acids and other chemicals using different techniques, i.e. FRAP, FLIM, FRET, STED, co-localization, deconvolution). Observation and analyses of permanent slides in different types of microscopes and different illumination modes. Set up and applications of transmission (TEM) and scanning (SEM) electron microscopes. X-ray spectrometric analysis and localization of elements. Basis of scanning probe microscopy: atomic force microscope and tunnel microscope.</p>			
Formy dydaktyczne, liczba godzin/ <i>Teaching forms, number of hours:</i>	a) lecture; number of hours 15; b) laboratory classes; number of hours 15;			
Metody dydaktyczne/ <i>Teaching methods:</i>	Introductory lectures based on multimedia presentations, experimental classes in microscopic labs.			
Wymagania formalne i założenia wstępne/ <i>Formal requirements and prerequisites</i>	Basics of Physics (optics and electrics), Cell Biology, Biochemistry, Chemistry and Botany.			
Efekty uczenia się/ <i>Learning outcomes:</i>	treść efektu przypisanego do zajęć/ <i>the content of the effect assigned to the course:</i>	Odniesienie do efektu kierunkowego <i>/Relation to the course outcomes</i>	Siła dla ef. kier* <i>/Impact on the course outcomes*</i>	
Wiedza (absolwent zna i rozumie) <i>/Knowledge: (the graduate knows and understands)</i>	W1	basics of structural and functional organization, and functioning of plants on different levels of their organization	K_W05; K_W07;	3; 2;
	W2	basic techniques of light, electron and scanning probe microscopy and their implementations in biological research	K_W02; K_W07;	1; 1;
	W3	issues of scientific and technological progress in biological sciences	K_W02; K_W07;	2; 1;
Umiejętności (absolwent potrafi) <i>/Skills: (the graduate is able to)</i>	U1	use basic microscopic equipment and prepares probes for microscopic examinations	K_U03; K_U06; K_U11	1; 1; 1;
	U2	interpret results of microscopic observations on the basis of current knowledge concerning structural and functional organization of plants	K_U01; K_U11	2; 1
	U3	find in different sources (including Internet) and critically analyze recent information concerning implementation of microscopy in research and professional tasks	K_U19; K_U21; K_U22	1; 1; 2;

Kompetencje (absolwent jest gotów do) /Competences: (The graduate is ready to)	K1	implement rules of safety at work (HAS) when working alone or in a group	K_W11; K_U20; K_K02; K_K03	1; 1; 1; 2;
<i>Treści programowe zapewniające uzyskanie efektów uczenia się:</i> /Program contents ensuring the achievement of the learning outcomes:		Principles of technical construction of light microscopes, implementation of different illumination and observation techniques, „spin-disc”, confocal laser scanning microscope, transmission (TEM) and scanning (SEM) electron microscopes and scanning probe microscopes.		
Sposób weryfikacji efektów uczenia się/ Methods of the verification of the learning outcomes:		W1, W2, W3 - essay concerning selected technique of microscopy, W1, W2, W3, U1, U2, U3, K1 - evaluation of student's activity during case study analysis at laboratory exercises		
Szczegóły dotyczące sposobów weryfikacji i form dokumentacji osiągniętych efektów uczenia się /Details on the verification methods and of the ways of documenting the learning outcomes:		All student's reports will be stored in the Department of Botany according to regulations acting in the Warsaw University of Life Sciences-SGGW		
Elementy i wagi mające wpływ na ocenę końcową/Elements and weights influencing the final grade:		Evaluation of written essay - 100%. Final note is expressed according to evaluation scale acting in WULS-SGGW: 2.0 (below 50%; failed); 3.0 (passed; 50-60%); 3.5 (passed; 60-70%); 4.0 (passed; 70-80%); 4.5 (passed; 80-90%); 5.0 (passed; 90-100%).		
Miejsce realizacji zajęć/ Teaching place:		Seminar room and research microscopic laboratories of the Department of Botany, Building 37, rooms 2/99, 2/87C, 2/88B, 2/95, 2/97.		
Literatura/Literature:		1. Pawley J.B. (1995, or newer) „Handbook of biological confocal microscopy”, Plenum Press 2. Sanderson J.B. (1994, or newer) „Biological microtechnique”, BIOS Publ. 3. Beesley J.E. (1989) „Colloidal gold”, Oxford Univ. Press 4. Polak J.M., van Noorden S. (1997) „Introduction to immunocytochemistry”, BIOS Publ. 5. van Noorden C.J.F., Frederiks W.M. (1992) „Enzyme histochemistry”, Oxford Univ. Press 6. Clark G. (1981) „Staining procedures”, Williams and Wilkins 7. Chalfie M., Kain S. (1998) “GFP: properties, applications, and protocols”, Willey-Liss 8. Johnson I., Spence M.T.Z. (2011) „The molecular probes handbook”, Invitrogen 9. Bozzola J.J., Russell L.D. (1999) “Electron microscopy”, Jones and Bartlett 10. WWW pages and “open access” publications recommended by teachers.		
UWAGI/ANNOTATIONS: None				

*) 3 – zaawansowany i szczegółowy, 2 – znaczący, 1 – podstawowy/ 3 – significant and detailed, 2 – considerable, 1 – basic,

Wskaźniki ilościowe charakteryzujące moduł/przedmiot/Quantitative summary of the course:

Szacunkowa sumaryczna liczba godzin pracy studenta (kontaktowych i pracy własnej) niezbędna dla osiągnięcia zakładanych dla zajęć efektów uczenia się - na tej podstawie należy wypełnić pole ECTS /Estimated number of work hours per student (contact and self-study) essential to achieve the presumed learning outcomes - basis for the calculation of ECTS credits:	60h
Łączna liczba punktów ECTS, którą student uzyskuje na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich lub innych osób prowadzących zajęcia/ Total number of ECTS credits accumulated by the student during contact learning:	1.0 ECTS