

Nazwa zajęć/Course title:	Biochemistry	ECTS	4
Nazwa zajęć w j. angielskim/ Course title in English:	Biochemistry		
Zajęcia dla kierunku studiów/ Degree program name:	Biotechnology		

Język kursu/ Course language:	English	Poziom studiów/Study level: I	
Typ studiów/ Form of studies:	X intramural .. extramural	Status zajęć/ Course status	.. podstawowe/ Basic X obowiązkowe/ mandatory .. do wyboru/ elective X kierunkowe/ major
		Semestr/Semester: 3	X semestr zimowy/ winter semester .. semestr letni/ summer semester
Rok akademicki/Academic year:		2022/2023	Numer katalogowy/ Catalogue number: BBT_BTa-1S-3Z-24

Koordynator zajęć/Course coordinator:	Dr Małgorzata Gutkowska-Stronkowska		
Prowadzący zajęcia/ Teachers responsible for the course:	Employees of the Department of Biochemistry and Microbiology:		
Założenia, cele i opis zajęć/ Aims, objectives and description of the course:	<p>The aim of the course in Biochemistry is to introduce the principles of cell biochemistry and metabolism. The lectures are dedicated to structure and function of biologically important molecules as well as to regulation and integration of the metabolic pathways and the role of energy storage. The aim of the practical course is to learn the basic qualitative and quantitative methods of identification, concentration measurement and separation of biologically important compounds. The practical course aims to train a habit of compliance with procedures, keeping records and preparing reports of the conducted experiments.</p> <p>Lectures: Basic building blocks of organisms: amino acids, proteins, nucleic acids, carbohydrates, lipids. Nucleic acids, their composition, structure and function. Protein composition and structure. Methods of qualitative and quantitative protein biochemistry. Methods in studying protein and nucleic acids structure, methods in studying protein-protein and protein- nucleic acid interaction. Biological membranes, their composition, structure and function. Methods in studying membranes and lipids. Mechanisms of membrane transport and energy storage on membranes. Enzymes, basic concepts and kinetics. Factors influencing enzyme activity, kinetic constants, methods of kinetic analysis of the enzymes. Allosteric enzymes. Enzyme classification. Proteins, carbohydrates and lipids catabolism: glycolysis, Krebs cycle, fatty acids oxidation. Respiratory chain, photosynthesis, ATP synthesis. Energy transformations during photosynthesis. Calvin cycle. Nitrogen fixation and metabolism. Synthesis of amino acids, fatty acids and carbohydrates. Concepts in metabolism integration: positive and negative feedback, posttranslational regulation of the enzymes, product canalization, bootle-neck of the metabolic pathway.</p> <p>Practical exercises: Basics of qualitative analysis of bio-molecules (aminoacids, proteins, carbohydrates, nitrogen bases). Basics in quantitative methods in biochemistry: spectrophotometric analysis, standard curve preparation, titration. Introduction to chromatographic methods (size exclusion, absorption, partition chromatography) and techniques (columns, plates, paper chromatography). Determination of enzyme activity and factors influencing it (exemplified on enzymes from hydrolase family).</p>		
Formy dydaktyczne, liczba godzin/ Teaching forms, number of hours:	a)Lecture	hours	30
	b)Laboratory classes	hours	30
Metody dydaktyczne/Teaching methods:	Lecture, practical exercises in the laboratory, preparing reports from conducted experiments, individual consultations, eventually distant learning		
Wymagania formalne i założenia wstępne/ Formal requirements and prerequisites	Basics in physics, biophysics and organic chemistry. Applying student knows basic concepts in thermodynamics, biophysics and organic chemistry on the level that enables understanding the processes taking place in a living organism (basic academic courses).		
Efekty uczenia się/Learning outcomes:	treść efektu przypisanego do zajęć/the content of the effect assigned to the course:		Odniesienie do efektu kierunkowego /Relation to the course outcomes
Wiedza (absolwent zna i rozumie) /Knowledge: (the graduate knows and understands)	W1	Student knows the structure of basic biochemical building blocks of the living organisms and understands how the structure may influence the function of the bio-molecules;	
	W2	Student knows and understands the principles of main analytical methods in biochemistry.	KW05 3 KW06 3
	W3	Student understands the basic concepts in metabolism integration and regulation and knows how it may be studied experimentally;	KW07 2 KW08 2
	W4	Student knows the safety rules in laboratory work.	KW11 2
Umiejętności (absolwent potrafi)	U1	Student can explain the chemical reactions hidden behind the biochemical processes and apply the correct techniques to study them.	KU05 1 KU06 1 KU07 1

<i>/Skills: (the graduate is able to)</i>	U2	Student can safely and precisely operate simple instruments in the laboratory (automatic pipette, analytical weights, spectrophotometer, burette, chromatographic column, etc..)	KU16 KU20 KU21	2 2 2
	U3	Student obeys the safety rules.		
	U4	Student can apply correctly the chemical and physical symbols, graphs and calculations to explain the experimental results,		
	U5	Student can plan, analyze, interpret and report the data obtained in the experiments conducted individually or in groups		
Kompetencje (absolwent jest gotów do)	K1	Student is well prepared to safe laboratory work including handling, storage and disposal of laboratory equipment, chemical and biological material.	KK03	2
<i>/Competences: (The graduate is ready to)</i>	K2	Student is trained in preparing the experiment documentation and written reports		
<i>Treści programowe zapewniające uzyskanie efektów uczenia się: (Program contents ensuring the achievement of the learning outcomes:</i>		Molecular structure of main groups of bio-active molecules and bio-polymers, correlation between their structure and function. Main concepts of metabolism and cross-talk of metabolism pathways. Importance of enzymatic catalysis. Basic methods of biochemical studies- spectral methods, chromatography, mass spectrometry. Basic concepts in experiment design. Biochemical calculations.		
Sposób weryfikacji efektów uczenia się/ <i>Methods of the verification of the learning outcomes:</i>		Effects W1-W3 final written examination. Effects W2, W3, W4, U1– short written examinations performed weekly. Effects W4, U1-4, K1, K2– written reports prepared individually, rates for performance of the experiment eventual possibility of distant examinations		
Szczegóły dotyczące sposobów weryfikacji i form dokumentacji osiągniętych efektów uczenia się <i>/Details on the verification methods and of the ways of documenting the learning outcomes:</i>		Individual student rating cards , questions from short written examinations, final written examination sheet with rate, eventual possibility of distant examination		
Elementy i wagi mające wpływ na ocenę końcową/ <i>Elements and weights influencing the final grade:</i>		Final note consists of: 1) rate of performance of the experiment conducted during the practical course (P) and the written report from the experiment prepared at home (S) – 25% of final note, 2) sum of the rates of short written examinations (15min) written weekly before the practical part of the exercises (K) – 25% final note, (sum of the previous add to 50% final note) 3) final written examination of the material from lectures – 50%, Students that gained less than 51% from the practical course (rate of performance + written reports + short examinations) must write the examination covering the material from practical course. Only students that reach minimum of 51% points from this examination are allowed to write the final examination covering the material from lectures. Student must gain minimum 51% points to pass the final examination on Biochemistry.		
Miejsce realizacji zajęć/ <i>Teaching place:</i>		Laboratory of Department of Biochemistry and Microbiology, building 37, ground floor		
Literatura/Literature: (1) J.M. Berg, J. L. Tymoczko, L. Stryer: Biochemia. PWN 2009; (2) D.B. Hames, N.M. Hooper: Krótkie wykłady. Biochemia PWN 2004; (3) P. Karlson: Zarys biochemii. PWN, (4) Biochemia Harpera R. Murray, D. Granner, V. Rodwell. 2014 PZWL; (5) Przewodnik do ćwiczeń z biochemii. W. Bielawski, B. Zagdańska (red) Wydawnictwo SGGW Warszawa 2014				
UWAGI/ANNOTATIONS				

*) 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 / <i>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:</i>	98 h
Łączna liczba punktów ECTS, którą student uzyskuje na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich lub innych osób prowadzących zajęcia/ <i>Total number of ECTS credits accumulated by the student during contact learning:</i>	2.5 ECTS