Załącznik nr 5 do zarządzenia nr 189/2025

COURSE SPECIFICATION

Course code: 0912.4.LEK.B.Bch

Course title in Polish: Biochemia
Course title in English: Biochemistry

1. Placement of the course within the study programme

1.1. Field of study	Medicine
1.2. Mode of study	Full-time
1.3. Level of study	Uniform Master's study
1.4. Profile of study	General academic
1.5. Course specification author	Prof. dr hab. inż. Przemysław Rybiński
1.6. Contact	przemyslaw.rybinski@ujk.edu.pl

2. Generał characteristics of the course

2.1. Language of instruction	English
2.2. Entry requirements	Basic knowledge of organic and inorganic chemistry

3. Detailed characteristics of the course

3.1. Type of classes	Lectures: 30 h, Laboratories: 20 h
3.2. Place of course delivery	Classes in the teaching rooms of UJK
3.3. Form of assessment	Credit with grade: Lecture: Four partial tests as well as exam. Laboratory: Final report and test
3.4. Teaching methods	Lectures: Verbal Laboratories: Verbal, perceptual, practical
3.5.a. Basic reading list	1. Dinesh P. Textbook of Medical Biochemistry. Third Edition. Elsevier 2. Vasudevan DM., Sreekumari S., Vaidyanathan K. Textbook of biochemistry for Medical Students. Sixth edition. Jaypee Brothers Medical Publisher LTD.
3.5.b. Supplementary reading list	1. Satyanarayana U., Chakrapani U. Biochemistry. Fourth Edition. Elsevier

4. Objectives, content and learning outcomes

4.1. Course objectives (taking into account the form of classes)

Lectures

- **CO1.** During the lecture, students should acquire theoretical knowledge related to the structure, properties, and applications of biologically active compounds.
- **CO2.** Additionally, students should acquire the skills to apply this knowledge in everyday life, as it relates to the functioning of the human body.

Laboratories

- **CO1.** Through laboratory exercises, students should acquire theoretical knowledge and practical skills related to the structure, properties, and applications of biologically active compounds.

- **CO2.** Additionally, students should acquire the ability to apply this knowledge in everyday life, as it relates to the functioning of the human body.

4.2. Course content (taking into count the form of classes)

Lectures

1. Enzymes and kinetics. Characteristic and features of enzymes. Classification of enzymes, function of enzymes. Model of action of enzymes. Enzyme kinetics. Enzyme inhibition.

2. Carbohydrates. Nomenclature, classification of carbohydrates, stereoisomers, mutarotation, diastereoisomers and epimers. Reactions of monosaccharides. Glycosides, amino sugars. Disaccharides and polysaccharides.

Metabolism. Catabolism and anabolism comparison. Glycolysis. Citric acid cycle. Energy balance of Krebs Cycle. Oxidative phosphorylation. Gluconeogenesis. Reaction of gluconeogenesis.

3. Lipids. Definition and function of lipids. Types of fats. Classification of fatty acids. Properties of fatty acids. Function of triacylglycerols. Compound lipids. Phosphoglycerates. Structure of sphingomyelin. Glycolipids, steroids. Metabolism of triacylglycerol. Absorption of lipids. Beta oxidation of fatty acids. Energetics of beta oxidation. Ketone bodies. Biosynthesis of simple lipids. Biosynthesis of cholesterol. Function of cholesterol in human body. Classification of lipoproteins. Biological membranes. Transport through membranes. Amino acids and proteins. Classification of amino acids based on their nutritional requirements. Properties of amino acids. Peptide chemical structure. Properties of chosen peptides. Structure of proteins. Metabolism of proteins. Nitrogen balance. Oxidative deamination of glutamate. Urea cycle.

4. Nucleotides. Structure of DNA, RNA. Transcription. Replication.

Laboratories

1. Properties of amino acids.
2. Properties of proteins.
3. Carbohydrates. Characteristically reactions and properties.
4. Soap and fats. Properties of fats.
5. Vitamins.

4.3. Course learning outcomes

Course learning outcomes (code)	Upon completion of the course, the student	Alignment with programme learning outcomes
	in the area of knowledge knows and understands:	
W01	The water and electrolyte balance in biological systems;	B.W1.
W02	Acid-base homeostasis and mechanisms of buffers and their significance in systemic homeostasis;	B.W2.
W03	The concepts of: solubility, osmotic pressure, isotonia, colloidal solutions and Gibbs-Donnan effect;	B.W3.
W04	The structure of lipids and polysaccharides and their functions in the cellular and extracellular structures;	B.W9.
W05	The protein primary, secondary, tertiary and quaternary structures as well as the post-translational and functional protein modifications and their significance;	B.W10.
W06	The functions of nucleotides in the cell, RNA and DNA primary and secondary structure as well as chromatin structure;	B.W11.
W07	Basic catabolic and anabolic pathways, methods of their regulation and the influence of genetic and environmental	B.W13.

	factors;	
W08	Basic methods used in laboratory diagnostics, including electrophoresis of proteins and nucleic acids;	B.W14.
W09	Metabolic changes taking place in organs as well as metabolic, biochemical and molecular basis of diseases and therapies;	B.W15.
W10	The principles of conducting scientific research aimed at the development of medicine;	B.W26.

in the area of skills knows how to:

U01	Determine molar and percentage concentration of compounds and the concentration of substances in isosmotic solutions, both mono- and multi-component;	B.U3.
U02	Determine the solubility of inorganic compounds, chemical substrate for the solubility of organic compounds, or lack thereof, and practical significance for nutrition and therapy;	B.U4.
U03	Determine the pH of the solution and the effect of changes in the pH on the inorganic and organic compounds;	B.U5.
U04	Envisage the development of biochemical processes depending on the state of the cells' energy;	B.U6.
U05	Use medical databases and properly interpret the information contained therein necessary to solve problems in the field of basic and clinical sciences;	B.U8.
U06	Classify the methodology of scientific research, including distinguishing between experimental and observational studies, along with their subtypes, rank them according to the reliability of the provided results and correctly assess the quality of scientific evidence;	B.U10.
U07	Plan and perform basic scientific research, interpret the results and draw conclusions;	B.U11.
U08	Use basic laboratory and molecular techniques;	B.U12.

in the area of social competences is able to:

K01	Recognize his/her own limitations and self-evaluate educational deficiencies and needs;	K.S5.
K02	Use reliable information sources;	K.S7.
K03	Conclude on the basis of own surveys and observations;	K.S8.
K04	Introduce rules of social conduct and teamwork to the group of specialists, including specialists form other medical professions also in the multicultural and multinational environment;	K.S9.
K05	Give opinions concerning various aspects of professional activity;	K.S10.
K06	Take responsibility for own decisions made during professional activities including own safety and safety of other people.	K.S11.

4.4. Assessment methods for learning outcomes

Assessment method (+/-)

Course learning outcomes (code)	Oral/written/ practical examinaion /other (specify)*	Test*	Project*	In-class activity*	Independent study*	Group work*	Other (specify)*

Type of classes

1: / 2:	L	Lab	...	L	Lab	...	L	Lab	...	L	Lab	...	L	Lab	...	L	Lab	...	L	Lab	...

W01	+			+	+								+				+				
W02	+			+	+								+				+				
W03	+			+	+								+				+				
W04	+			+	+								+				+				
W05	+			+	+								+				+				
W06	+			+	+								+				+				
W07	+			+	+								+				+				
W08	+			+	+								+				+				
W09	+			+	+								+				+				
W10	+			+	+								+				+				
U01	+			+	+								+				+				
U02	+			+	+								+				+				
U03	+			+	+								+				+				
U04	+			+	+								+				+				
U05	+			+	+								+				+				
U06	+			+	+								+				+				
U07	+			+	+								+				+				
U08	+			+	+								+				+				
K01-K06	+			+	+								+				+				

Annotation. 1: form of classes; 2: learning outcomes

4.5. Assessment criteria for learning outcomes

Type of classes:

LECTURE (L) (including classes conducted with the use of distance learning methods and techniques)

Grade	Assessment criteria
3,0	51 – 62% of the total number of points that can be obtained
3,5	63 – 72% of the total number of points that can be obtained
4,0	73 – 82% of the total number of points that can be obtained
4,5	83 – 92% of the total number of points that can be obtained
5,0	93 – 100% of the total number of points that can be obtained

Type of classes:

LABORATORIES (Lab) (including classes conducted with the use of distance learning methods and techniques)

Grade	Assessment criteria
3,0	51 – 62% of the total number of points that can be obtained
3,5	63 – 72% of the total number of points that can be obtained
4,0	73 – 82% of the total number of points that can be obtained
4,5	83 – 92% of the total number of points that can be obtained
5,0	93 – 100% of the total number of points that can be obtained

5. ECTS credit allocation – student workload

Category	Student workload (full-time mode)	Student workload (part-time mode)
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER (CONTACT HOURS)	**50**	
Participation in lectures*	30	

Participation in seminars/laboratories*	20	
Other (specify) e.g. classes conducted with the use of distance learning methods and techniques*		
INDEPENDENT STUDY (NON-CONTACT HOURS)	**50**	
Preparation for lectures*	30	
Preparation for seminars/laboratories*	20	
Preparation for examination/test*		
Gathering materials for project, online research*		
Preparation of a multimedia presentation*		
Other (specify)*		
TOTAL HOURS	**100**	
ECTS CREDITS for the course	**4**	

*** delete as appropriate**

Approved for implementation (date and legible signatures of course instructors in the given academic year):

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