



**48SJO-  
BIOCHE12  
ECTS: 5.00  
CYCLE: 2023**

## Course syllabus - part A Biochemistry 1/2

### SUBJECT MATTER CONTENT

#### LECTURE

Amino acids, peptides and proteins structure, properties and functions. Enzymes – properties, kinetics of reaction and activity regulation. DNA structure, replication and repair. RNA structure, synthesis and processing. Protein synthesis. Regulation of gene expression.

#### SEMINAR

The major buffer systems in the body (metabolic acidosis and alkalosis). Oxygen toxicity and free-radical injury. Biochemistry of cell membranes. Blood plasma proteins. Hemostasis and thrombosis. Disorders of synthesis and/or structure of proteins. Processing of proteins in the cells.

#### CLASSES

Quantitative protein identification. Electrophoresis of serum proteins. Fibrinogen release and its quantitative identification. Isolation and identification of peroxidase activity. Determining the Michaelis constant and maximum velocity for peroxidase reaction. Identifying the activity of ALT, AST, and GGT in blood serum. Isolation of genomic DNA from blood cells and cheek epithelium cells. Quantitative and qualitative assessment of isolated DNA. Amplification of selected DNA fragment by PCR method.

#### TEACHING OBJECTIVE

During the course, the students are familiarised with molecular basics of the human body functioning in physiological and pathological conditions. They master the main metabolic pathways and are familiarized with genetic and environmental factors disturbing their course. The students also learn basic laboratory methods and techniques as well as the equipment applied in laboratory diagnostics. As a result, they obtain the expertise and skills necessary to understand the subjects taught in their further education (i.e.: physiology, immunology, pathology, clinical subjects) and indispensable in their future professional practice.

#### DESCRIPTION OF THE LEARNING OUTCOMES OF THE COURSE IN RELATION TO THE DESCRIPTION OF THE CHARACTERISTICS OF THE SECOND LEVEL LEARNING OUTCOMES FOR QUALIFICATIONS AT LEVELS 6-8 OF THE POLISH QUALIFICATION FRAMEWORK IN RELATION TO THE SCIENTIFIC DISCIPLINES AND THE EFFECTS FOR FIELDS OF STUDY:

**Symbols for outcomes  
related to the discipline:**

M/NMA\_P7S\_KR++, M/NMA\_P7S\_WG+++

**Symbols for outcomes  
related to the field of study:**

B.W10.+ , B.U13.+ , K.10.+ , K.6.++ , B.U12.+ ,  
C.W47.+ , K.7.+ , D.U12.++ , B.U10.++ , D.U16.+ ,  
B.W2.+ , B.U8.+ , B.U9.+ , K.5.+ , K.9.+ ,

**Legal acts specifying learning outcomes:**  
**3112022**  
**Disciplines:** medical sciences  
**Status of the course:** Obligatoryjny  
**Group of courses:** A - przedmioty podstawowe  
**Code:** ISCED 0912  
**Field of study:** Medicine  
**Scope of education:** Medicine  
**Profile of education:** General academic  
**Form of studies:** full-time  
**Level of studies:** uniform master's studies  
**Year/semester:** /1

**Types of classes:** Lecture, Seminar, Classes  
**Number of hours in semester:** Lecture: 10.00, Seminar: 15.00, Classes: 40.00  
**Language of instruction:** English  
**Introductory subject:** Biophysics, Chemistry, Molecular Biology and Genetics  
**Prerequisites:** Level 4 of The European Qualifications Framework (EQF) at least, and the satisfactory level of knowledge and skills covered by the introductory subjects.

**Name of the organisational unit conducting the course:** Katedra Biochemii  
**Person responsible for the realization of the course:** dr Edyta Sienkiewicz-Szłapka  
**e-mail:** edyta.sienkiewicz@uwm.edu.pl

**Additional remarks:**  
Protective clothing (lab coat) during the laboratory classes is required.

## **LEARNING OUTCOMES:**

### **Knowledge:**

W1 - the structure, properties, and functions of basic ingredients of a cell (proteins and nucleic acids)

W2 - the course and importance of the processes of synthesis, modification and degradation of proteins and nucleic acids, as well as the health implications of these processes perturbations

W3 - functions of the genome, transcriptome and proteome and methods used to study them or used in laboratory diagnostics

W4 - concepts of regulation of genetic information expression (from gene to protein)

W5 - cell catalytic strategies and mechanisms of action of individual enzymes and their cofactors, as well as their biomedical significance

W6 - biochemical aspects of the acid-base balance mechanisms in the body in physiological and pathological conditions

W7 - the major sources of reactive oxygen species, mechanisms of protection against free radicals, and the effects of their action in the cell and in the body

W8 - the structure and composition of the cell membrane, its transport functions and functions related to the transduction of the biological signals with examples of dysfunctions leading to the development of different diseases

W9 - principles of isolation methods and quantitative and qualitative determination of proteins, enzymes, and nucleic acids

### **Skills:**

U1 - perform isolation, identification and quantitative assessment of proteins and nucleic acids using basic laboratory and molecular techniques (e.g. spectrophotometry, electrophoresis, PCR)

U2 - operate measuring instruments and assess the accuracy of measurements

U3 - analyze the results obtained, perform calculations assessing the concentrations or activity of the determined compounds and draw conclusions based on them, prepare documentation of the performed experiments

U4 - predict the direction of biochemical processes based on knowledge of regulatory mechanisms

U5 - use medical databases and peer-reviewed information sources as well as critically analyze medical literature

U6 - prepare and present scientific information in a simple and understandable way (multimedia presentation)

U7 - cooperates and works in a group assuming various roles in it

### **Social competence:**

K1 - notice one's own limitations and make a self-assessing of educational deficits and needs

K2 - express one's opinion sensibly, candidly, and with respectability to the distinct opinion of the interlocutor

K3 - cooperate in a multicultural and multinational environment and show an understanding of ideological and cultural differences

K4 - present a favorable attitude toward the promotion of a pro-healthy lifestyle

K5 - comply with occupational health and safety rules in the laboratory

## **TEACHING FORMS AND METHODS:**

Lecture(W1;W2;W3;W4;W5;U4;K1;K3;K4;):Conversational lecture with the use of multimedia

Seminar(W1;W2;W3;W4;W5;W6;W7;W8;U4;U5;U6;U7;K1;K2;K3;K4;):Presenting a speech on an assigned subject, multimedia presentation, discussion, case study, debate,

Classes(W1;W2;W3;W5;W9;U1;U2;U3;U5;U7;K1;K2;K3;K4;K5;):laboratory experiments

## **FORM AND CONDITIONS OF VERIFYING LEARNING**

### **OUTCOMES:**

Lecture (Colloquium test) - Unit tests checking the knowledge of problems discussed on the lectures; each about 40 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, matching the right answer or open-question type with a short answer -

Seminar (Presentation) - an oral presentation of the selected problem (with multimedia support) -

Seminar (Written test) - written checking of knowledge in the field of problems assigned to the lab classes (short test with 6 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, matching the right answer or open-question type with a short answer -

Seminar (Part in the discussion) - being active in discussions -

Classes (Written test) - written checking of knowledge in the field of problems assigned to the lab classes (short test with 5 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, matching the right answer or open-question type with a short answer -

Classes (Report) - performing analyses and preparing laboratory report -

### **BASIC LITERATURE:**

1. Harvey Richard and Ferrier Denise, *Lippincott's Illustrated Reviews: Biochemistry*, Tom 1, Wyd. Wolters Kluwer | Lippincott Williams Wilkins, R. 2017, s. 551

2. Lieberman Michael, Marks Allan D., *Marks' Basic Medical Biochemistry: A Clinical Approach*, Tom 1, Wyd. Wolters Kluwer | Lippincott Williams Wilkins, R. 2018, s. 1000

### **SUPPLEMENTARY LITERATURE:**

1. Murray Robert K., Bender David A., Botham Kathleen M., Kennelly Peter J., Rodwell Victor W., Weil P., *Harper's Illustrated Biochemistry*, Tom 1, Wyd. The McGraw-Hill Companies, R. 2018, s. 800

2. Salway J.G., *Medical Biochemistry at a glance*, Tom 1, Wyd. Wiley-Blackwell, R. 2012, s. 169

# Detailed description of ECTS credits awarded - part B

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## Biochemistry 1/2

The number of ECTS credits awarded consists of:

1. Contact hours with the academic teacher:

- participation in: Lecture	10.0 h
- participation in: Seminar	15.0 h
- participation in: Classes	40.0 h
- consultation	2.0
	Total: 67.0 h.

2. Independent work of a student:

Preparation for colloquiums and written tests	35.00 h
preparation for practical classes (lab classes and seminars)	18.00 h
Preparation of reports	5.00 h

Total: 58.0 h

contact hours + independent work of a student Total: 125.0 h

1 ECTS credit = 25-30 h of an average student's work, number of ECTS credit = 125.0 h : 25.0 h/ECTS = 5.00 ECTS on average: 5.0 ECTS

- including the number of ECTS credits for contact hours with the direct participation of an academic teacher: 0,00 ECTS points,

- including the number of ECTS credits for hours of independent work of a student: