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| <b>Course title</b><br>Biochemia / Biochemistry   |                     | <b>ECTS code</b><br>13.3.0719   |  |
| <b>Name of unit administrating study</b><br>Faculty of Chemistry  |                     |   |  |
| <b>Studies</b>  |                     |   |  |
| <b>Field of study</b>   | <b>Type</b>         | <b>Form</b>   |  |
| Chemical Business   | Bachelor / Engineer | Full-time studies   |  |
| <b>Teaching staff</b><br>Prof. dr hab. Krzysztof Rolka  |                     |   |  |
| <b>Forms of classes, the realization and number of hours</b>  |                     | <b>ECTS credits</b> 4   |  |
| <b>A. Forms of classes, in accordance with the UG Rector's regulations</b><br>lecture, auditorium classes, laboratory classes |                     | classes - 60 h<br>tutorial classes – 10 h<br>student's own work – 30 h  |  |
| <b>B. The realization of activities</b><br>in-class learning  |                     | Total: 100 h - 4 ECTS   |  |
| <b>C. Number of hours</b><br>60 h (30 h lecture, 15 h auditorium classes, 15 h laboratory classes)                            |                     |   |  |
| <b>The academic cycle</b><br>2020/21 summer semester  |                     |   |  |
| <b>Type of course</b><br>obligatory   |                     | <b>Language of instruction</b><br>Polish  |  |
| <b>Teaching methods</b><br><br>Lecture with multimedia presentation<br>Problem-solving tutorials<br>Laboratory experiments    |                     | <b>Form and method of assessment and basic criteria for evaluation or examination requirements</b>  |  |
|   |                     | <b>A. Final evaluation, in accordance with the UG study regulations</b><br><br>lecture – exam<br>auditorium classes – course completion (with a grade)<br>laboratory classes – course completion (with a grade)   |  |
|   |                     | <b>B. Assessment methods</b><br>- <b>Written exam with open questions</b>   |  |
|   |                     | <b>C. The basic criteria for evaluation or exam requirements</b><br>• positive grade received in written exam composed of 5-10 open questions covering issues listed in the course contents; answers to these questions will require solving tasks specified in educational outcomes; the grading scale would be adjusted to the range of all rated exams<br>• to take the exam both the laboratory classes and <i>tutorials</i> must be passed;<br><i>Tutorials:</i><br>• passing two written colloquiums covering: (1) chemical structures and properties of amino acids, peptides and proteins (2) chemical structure and properties of monosaccharides, polysaccharides, lipids, cell membranes and nucleic acids;<br>• each negative grade should be improved at repeat colloquium.<br><i>Laboratory classes:</i><br>• positive grade received in 3 preliminary testes, that check knowledge required to perform experiments during the classes; accomplishment of all planned experimental work (quality of laboratory work, ability to team work and mode of work would be graded); analysis of obtained results performed as written report;<br>• to complete the laboratory course each negative grade must be improved. |  |
| <b>Required courses and introductory requirements</b><br>Organic chemistry (bachelor level)                                   |                     |   |  |

Fundamentals of organic chemistry, skills to work in a chemical laboratory, knowledge of basic laboratory glassware, learning the principles of work in a biochemical laboratory

#### **Aims of education**

- to acquaint students with all issues mentioned in the lecture contents;
- to introduce students to the basic endogenous organic compounds, their structure and functions;
- to acquaint students with basic metabolic pathways and relations between them;
- to teach students how to perform biochemical experiments using delivered instructions;
- to develop the ability to critically assess and interpret obtained experimental results and analysis of scientific sources;

A. Lecture: Energy-rich compounds, thermodynamics of biochemical reactions. Classification, structures and functions of enzymes. Mechanisms of enzyme catalysis. Carbohydrates, lipids and proteins – structures and functions. Biological membranes – structure and functions. Metabolic pathways: glycolysis, gluconeogenesis, pyruvate decarboxylation, Krebs cycle, oxidative phosphorylation, glycogen metabolism, fatty acids metabolism, amino acids metabolism, pentose phosphate pathway. Proteins and signal transduction. Photosynthesis. DNA and RNA: replication, transcription, translation, PCR. Basics of genetic engineering.

B. Tutorial: Chemical structure, physicochemical properties and biological functions of peptides, proteins, nucleic acids, phospholipids, mono- and polysaccharides.

C. The lab: completion of five experiments with the following topics: determination of activity of serine proteinases and their inhibitors using chromogenic substrates, determination of kinetic parameters of selected chromogenic substrate, separation of proteins by size-exclusion chromatography, phospholipid analysis by thin layer chromatography, determination of polysaccharides susceptibility to hydrolysis in low pH

#### **Bibliography of literature**

##### **A. Literature required to pass the course**

J. M. Berg, J. L. Tymoczko, L. Stryer, „Biochemia”, PWN, Warszawa 2009  
 Monographic works provided by assistants leading classes

##### **B. Extracurricular readings**

Various academic handbooks concerning biochemistry

#### **Knowledge**

1. Defines and demonstrates chemical structure of basic groups of bio- and macromolecules;
2. Describes and illustrates main metabolic pathways using chemical reactions, explains their importance for the body functioning;
3. Characterizes basic analytical methods of endogenous, organic compounds;
4. Characterizes methods of determination of enzymatic activity of selected proteases;
5. Recognizes basic laboratory equipment;
6. Understands influence of diet on physical condition of the body;

#### **Skills**

1. Uses chemical terminology necessary to present (both in oral and written form) the content presented in the course;
2. Has the ability to predict the course and products of metabolic pathways ;
3. Predicts physicochemical and biological properties of organic compounds based on their chemical formulas;
4. Uses the basic analytical techniques applied for the analysis of endogenous organic compounds;
5. Designs and performs simple biochemical experiments, using appropriate laboratory equipment;
6. Analyzes the results of performed experiments, draws conclusions about the correctness of their course;

#### **Social competence**

1. Understands the need of continuous education;
2. Takes care of laboratory equipment;
3. Carefully uses laboratory equipment and works cautiously with chemicals;
4. Appreciates the need of ability to team work according to assigned role (team leader/team member);
5. Is aware of the need of critical analysis of own work;
6. Shows cautious criticism when acquiring knowledge, especially these coming from mass media;
7. Is aware of the necessity of fair and reliable work;