COURSE/MODULE DESCRIPTION (SYLLABUS)

1.	Course: **Systems Biology**
2.	Language of instruction: **English**
3.	Faculty **Faculty of Biotechnology**
4.	Course/module code: **29-BT-S2-E2-EngSBc**
5.	Course/module type (*mandatory* or *elective*): **mandatory**
6.	Programme: **Medical Biotechnology**
7.	Study cycle: **2nd cycle**
8.	Year: **1st year**
9.	Semester *(autumn* or *spring):* **spring**
10.	Form of tuition and number of hours: **Laboratory: 30 hours**
11.	Name, Surname, academic title **Małgorzata HEIDORN-CZARNA, PhD**
12.	Initial requirements (knowledge, skills, social competences) regarding the course/module and its completion: **The student should have basic knowledge about the structure and function of nucleic acids and proteins, their modifications as well as understand the concept of gene expression. The student should also be familiar with basic techniques of molecular biology and biochemistry and show the ability to perform basic biochemical calculations.**
13.	Objectives: **Understanding the concept of systems biology as scientific approach based on "omics" types of studies. Becoming familiar with different proteomic methods and databases used in plant systems biology and the problems of proteomics type of research. Acquiring the skills of specific isolation and quantitative analysis of plant proteins and their post-translational modifications. Acquiring the ability to use computer software for quantitative and differential analysis of the obtained data.**

14.	Content: **The use of proteomic studies and information available in online databases in order to perform the analysis of changes of the proteome of germinating *Arabidopsis thaliana* seeds lacking mitochondrial proteases compared to the wild type (WT). Isolation and purification of total plant proteins from germinating wild type and *A. thaliana* mutants. Understanding the different techniques for the separation of plant proteins (isoelectric focusing, 1D-SDS-PAGE, 2D-PAGE) and methods for staining gels. Application of two-dimensional gel electrophoresis 2D-PAGE for separation of Arabidopsis seed proteins and comparative quantitative analysis of proteins using Delta 2D software (Decodon) for analysis of two-dimensional gels. Detection of carbonylated proteins in total seed protein extracts. Analysis of changes in the protein oxidation level versus total protein amount in Arabidopsis seed protein extracts. The use of databases (TAIR, UniProt, Arabidopsis Seed Proteome) and available literature for the interpretation of results.**	
15.	Learning outcomes: Students: • provide qualitative and quantitative descriptions of complex biological phenomena and processes; • consistently apply and disseminate the principle of strict interpretation of biological phenomena and biochemical processes in research and practical activities which are based on empirical data; • possess advanced knowledge of biological sciences, namely biochemistry, bioinformatics and molecular biology; • possess in-depth knowledge of genetics and structural biology in understanding relationships and interrelations in biological systems; • apply advanced technology and research tools in biological sciences, namely biochemistry, bioinformatics and molecular biology; • efficiently make use of scientific literature in the field of biomedicine and biotechnology; read professional literature in English; • plan and perform research tasks and analysis under the supervision of a tutor; • use statistical methods, computer tools and technology to describe biological phenomena and perform analysis of specialist data; • collect and interpret experimental data, synthesise it and make appropriate conclusions; collaborate and work as part of a team in order to plan research and solve problems; • understand the need for a systematic review of professional literature in order to broaden and deepen his or her knowledge.	Outcome symbols: K_W01, K_W02, K_W03, K_W04 K_U01, K_U02, K_U04, K_U05, K_U06 K_K02, K_K05

<table>
<tr><td>16.</td><td colspan="2">Recommended literature:
• Systems Biology, Robert A. Meyers, John Wiley & Sons, 2012.
• Biochemistry: A Short Course, John L. Tymoczko, Jeremy M. Berg, Lubert Stryer, 2015, 3rd Edition.
• Mandatory: publications, laboratory manual and other materials provided by a tutor.</td></tr>
<tr><td>17.</td><td colspan="2">Methods of verification of the assumed learning outcomes:
Report on completed laboratory and computer tasks.</td></tr>
<tr><td>18.</td><td colspan="2">Conditions of earning credits:
• monitoring of student’s attendance and control of progress in knowledge of the subject of the course;
• report on completed laboratory and computer tasks.</td></tr>
<tr><td rowspan="6">19.</td><td colspan="2">Student’s workload:</td></tr>
<tr><td>Activity</td><td>Number of hours for the activity</td></tr>
<tr><td>Hours of instruction (as stipulated in study programme):
• laboratory: 25 hours
• classes in the computer lab: 5 hours</td><td>30 hours</td></tr>
<tr><td>Student’s own work:
• preparation for classes: 8 hours
• reading of literature: 5 hours;
• preparation for work report: 7 hours</td><td>20 hours</td></tr>
<tr><td>Total number of hours:</td><td>50 hours</td></tr>
<tr><td>Number of ECTS:</td><td>2 ECTS</td></tr>
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