<table>
<tr><td>Course code</td><td></td></tr>
<tr><td>Type and description</td><td>EC – elective subjects from the discipline of Chemical sciences</td></tr>
<tr><td>ECTS credit</td><td>1</td></tr>
<tr><td>Course name</td><td>Analytical techniques in omics science</td></tr>
<tr><td>Course name in Polish</td><td>Techniki analityczne w naukach omicznych</td></tr>
<tr><td>Language of instruction</td><td>English</td></tr>
<tr><td>Course level</td><td>8 PRK</td></tr>
<tr><td>Course coordinator</td><td>prof. dr hab. inż. Beata Kolesińska</td></tr>
<tr><td>Course instructors</td><td>prof. dr hab. inż. Beata Kolesińska, dr inż. Barbara Pacholczyk-Sienicka , dr hab. inż. Grażyna Leszczyńska</td></tr>
<tr><td>Delivery methods and course duration</td><td>
<table>
<tr><th></th><th>Lecture</th><th>Tutorials</th><th>Laboratory</th><th>Project</th><th>Seminar</th><th>Other</th><th>Total of teaching hours during semester</th></tr>
<tr><td>Contact hours</td><td>0</td><td>0</td><td>0</td><td>5</td><td>0</td><td>0</td><td>5</td></tr>
<tr><td>E-learning</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td></tr>
<tr><td>Assessment criteria (weightage)</td><td>0</td><td>0</td><td>0</td><td>100%</td><td>0</td><td>0</td><td>100%</td></tr>
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<tr><td>Course objective</td><td>The aim of the course is to acquaint PhD students with the main research methods used in omics science. In particular, problems of the separation of complex analytic matrices used in genomic, proteomic and metabolomics will be presented. Students get acquainted with advanced analytical methods used in proteomics (MS and blotting methods) and metabolomics (LC-MS, GC-MS and NMR).</td></tr>
<tr><td>Learning outcomes</td><td>A PhD student after completing the course can:

1. present the theoretical background of electrophoretic separation techniques and perform quantitative and qualitative analysis of macromolecules separated by this technique W1 P8S_EG, U1 P8S_UW

2. characterize particle / atom ionization techniques in mass spectrometry and discuss the use of ESI and MALDI techniques as well as tandem spectrometers in genomics and proteomics W1 P8S_EG, U1 P8S_UW

3. characterize the methods used in proteomics to determine the structure of a protein W1 P8S_EG, U1 P8S_UW

4. indicate possibilities and limitations of use NMR spectroscopy in metabolomic studies W1 P8S_EG, U1 P8S_UW

5. analyze and interpret results of experiments utilizing NMR techniques W1 P8S_EG, U1 P8S_UW</td></tr>
<tr><td>Assessment methods</td><td>Learning outcomes 1 - 5 – written colloquium

Learning outcomes 1-5- presentation

The final grade consists of:

Score from the written test - 70%

Presentation - 30%</td></tr>
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Prerequisites	Analytical chemistry, basics of biochemistry and chemistry of natural compounds
Course content with delivery methods	part I Electrophoresis as a separation technique in proteomic and genomic studies: theoretical basis for the separation of biomolecules, factors affecting the rate of migration of molecules in the electric field, types of electrophoretic carriers, types of electrophoresis, dyeing, quantitative and qualitative analysis. part II The use of mass spectrometry for precise determination of the composition of complex mixtures of compounds with large molar masses in proteomics and genomics. Techniques used in mass spectrometry to determine the weight and structure of proteins. Basics of enzymatic protein degradation, MS protein fragment analysis and protein structure reconstruction part III LC-MS and GC-MS in in metabolomic studies. Methods for isolating metabolites from matrices, methods for derivatization of metabolites. Nuclear Magnetic Resonance spectroscopy (NMR) in metabolomic studies. Preparation of samples, NMR spectra processing and metabolites quantification. Targeted and untargeted metabolomics by NMR spectroscopy. Examples of NMR application in metabolomics and pharmaco-metabolomics.
Basic reference materials	1. Lecturer material, 2. Difference Gel Electrophoresis, Methods and Protocols, Editors: Ohlendieck, Kay (Ed.), 2018 3. Protein electrophoresis, Methods and Protocols, Editors: Kurien, Biji T., Scofield, R. Hal (Eds.), 2012, 4. Nucleic Acid Electrophoresis (Springer Lab Manuals), Dietmar Tietz (Editor), 1998
Other reference materials	Current scientific articles, given by the lecturer
Average student workload outside classroom	15h
Comments	
Last update	July 2020