<table>
<tr><td>Course code</td><td></td></tr>
<tr><td>Type and description</td><td>EC - elective course for Chemical engineering</td></tr>
<tr><td>ECTS credit</td><td>1</td></tr>
<tr><td>Course name</td><td>Application of - omics techniques for identification of microorganisms and chemical compounds in environmental systems</td></tr>
<tr><td>Course name in Polish</td><td>Zastosowanie technik - omicznych do identyfikacji mikroorganizmów I związków chemicznych w systemach środowiskowych</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. Beata Gutarowska</td></tr>
<tr><td>Course instructors</td><td>Prof. dr hab. Beata Gutarowska</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>0</td></tr>
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<tr><td>Course objective</td><td>The aim of the course is to learn about "omics" new generation techniques, mainly metagenomics and metabolomics, which are applicable to the systemic identification of microorganisms and chemical compounds in environmental samples.</td></tr>
<tr><td>Learning outcomes</td><td>1. The student is able to discuss the metabolomic and metagenomic methods and their importance
2. The student is able to describe bioinformatics tools, databases, statistical tools for analysing of the omics results
3. The student is able to interpret the results of omics analyzes
4. The student is able to present the problem using the literature databases and multimedia presentation tools.</td></tr>
<tr><td>Assessment methods</td><td>1. Discussion,
2. Discussion,
3. Case study presentation, discussion
4. Multimedia presentation</td></tr>
<tr><td>Prerequisites</td><td>not required</td></tr>
<tr><td>Course content with delivery methods</td><td>1. Introduction to the analysis of biology and system chemistry called omics. Definitions, types and importance of new generation methods compared to classical methods, environmental sampling - lecture 1 hour.
2. New generation metagenomic methods: DNA isolation, primers, commercial kits, PCR, qPCR, RTPCR, sequencing with proton detection in integrated circuit (Ion Torrent Sequencing), pyrosequencing 454, sequencing by synthesis (Illumina MiSeq), nanopore sequencing, comparison of methods, apparatus - presentation 1 hour
3. Targeted and untargeted metabolomic methods: high resolution mass spectrometry (HRMS) coupled with liquid (LC) or gas chromatography (GC), NMR (nuclear magnetic resonance), infrared IR spectroscopy, UV spectroscopy, fluorescence spectroscopy, metabolomic imaging MS mass spectrometry with laser desorption / ionization (SALDI) and assisted surface, for example plates with nanoparticles AgNPET or AuNPET - presentation 1 hour
4. Bioinformatics analysis, databases, statistical analysis, software, identification of microorganisms, chemical compounds and metabolic pathways in environmental samples (eg surfaces of historic objects), case study – Project Base Learning PBL 2 hours.</td></tr>
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Basic reference materials	5. Proteomika i metabolomika, Kraj Agnieszka, Drabik Anna, Silberring Jerzy, 2019, wyd Uniwersytetu Warszawskiego, Warszawa, ISBN: 9788323507659 6. Bioanalityka w nauce i życiu. Cz.1 i 2. Irena Staneczko-Baranowska, Bogusław Buszewski, 2020, wyd. PWN, Warszawa, ISBN:9788301212810
Other reference materials	Manuscripts in scientific journals on metabolomic and metagenomic tools – case studies
Average student workload outside classroom	15 hours
Comments	summer semester
Last update	18.11.2020