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| **Course code** | CC6 |
| **Type and description** | CC6 - core curriculum for food technology and nutrition |
| **ECTS credit** | 1 |
| **Course name** | Biocatalysis |
| **Course name in Polish** | Biokataliza |
| **Language of instruction** | English |
| **Course level** | 8 PRK |
| **Course coordinator**  | Dr hab. inż. Aneta Białkowska |
| **Course instructors** |  |
| **Delivery methods and course duration** |

|  | **Lecture** | **Tutorials** | **Laboratory** | **Project** | **Seminar** | **Other** | **Total of teaching hours during semester** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Contact hours | 15 |  |  |  |  | 0 | 15 |
| E-learning | No | No | No | No | No | No |  |
| Assessment criteria (weightage) | 100,00 |  |  |  |  | 0,00 |  |

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| **Course objective** | The aim of the course is to familiarize students with the assumptions of applied biocatalysis, including: • modern methods of obtaining unique enzymes through highly efficient functional screening and sequential genomic and metagenomic libraries; • bioinformatic tools and molecular biology techniques used for the engineering of enzymatic proteins for selected features, especially useful for specific industrial applications • with the promiscuity of enzymes and engineering the environment of their reaction• the design of 'unnatural' enzymes and their use in the bio-processes• appropriate selection of enzymes, both native and improved for their use in specific biotechnologies |
| **Learning outcomes** | After completing the course, a PhD student is able to:1. describe the methods of functional and sequential screening of genomic and metagenomic libraries in the search for specific enzymatic activities2. describe bioinformatic tools and molecular biology techniques used for the engineering of enzymatic proteins for selected features, especially useful for specific industrial applications 3. define of enzyme promiscuity and give some examples4. describe of reaction engineering for high reaction rate5. describe of methods used for design unnatural proteins including non-proteinogenic amino acids and give some examples their application6. argue the role of molecular biotechnology in biocatalysis |
| **Assessment methods** | Learning outcomes 1-6. Credits in writing |
| **Prerequisites** | Knowledge of chemistry, biochemistry, enzymology and molecular biology |
| **Course content with delivery methods** | 1. Screening of unique enzymes. Functional and sequential screening of genomes and metagenoms from conventional and extreme environments.2. Protein engineering. Sequence-structure relationship and function of enzymatic proteins. Mutagenesis rational design and directed evolution of enzymes. High-performance screening techniques based on the physical binding of the genotype to the phenotype. 3. Synthetic biology. Design of de novo enzymes based on known scaffolds in order to obtain catalytic proteins with new functions unknown so far.4. Catalytic promiscuity of enzymes. Selection of enzymes with wide substrate specificity and their use in various reactions. Selection of reaction conditions, including reaction environment (water or unconventional environments: organic solvents, supercritical liquids, two-phase systems, gas environment, ionic liquids).5. Potential of native and recombinant enzymes in various industrial processes and services. |
| **Basic reference materials** | 1. Current developments in biotechnology and bioengineering (2017) Ed. Larroche Ch, Sanroman MA, Du G, Pandey A 2. Applied biocatalysis: from fundamental science to industrial application (2016). Ed. Hilterhaus L, Liese A, Kettling U, Antranikian G3. Biocatalysis – a practical approach (2016). Ed. de Gonzalo G, Lavandera I |
| **Other reference materials** |  |
| **Average student workload outside classroom** | 15 h |
| **Comments** |  |
| **Last update** |  |