

Course title: MOLECULAR METHODS IN BIOREMEDIATION

ECTS credit allocation (and other scores): 2.5

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 24/6

Course coordinator/ Department and e-mail: Slawomir Ciesielski/Department of Environmental Biotechnology;  
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Type of classes: classes and lectures

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#### Substantive content

**CLASSES:** Extraction of nucleic acids from soil, activated sludge, biofilm. Polymerase Chain Reaction (PCR). Agarose electrophoresis. Estimation of microbial diversity by Ribosomal Intergenic Spacer Analysis (RISA). Polyacrylamide gel electrophoresis. Bioremediation monitoring by Polymerase Chain Reaction (PCR). Detection of catabolic genes. Plasmid isolation from *E. coli*. Plasmid restriction analysis. Agarose gel electrophoresis of digested plasmids. Restriction analysis. In silico assembling of genetic constructs.

**LECTURES:** Organisms functioning on the molecular level. Properties of nucleic acids and proteins. Application of molecular techniques in environmental biotechnology for monitoring microbial systems. Molecular approaches to the assessment of microbial community biodiversity. Genomic library construction of environmentally useful catabolic genes. Analysis of microbial activity during biological processes of wastewater treatment using molecular methods (AFDRA, ARDRA, DGGE\TGGE, RISA). Metagenomics and metatranscriptomics. Genetic engineering techniques in bioreporter strains construction.

**Learning purpose:** The primary goal of this course is to introduce the concepts and practice of molecular methods application in bioremediation.

On completion of the study programme the graduate will gain:

**Knowledge:** The student will gain knowledge of the methods of DNA analysis and recombination. He will know the molecular methods application in bioremediation.

**Skills:** The student will have the ability to analyze DNA, including electrophoretic DNA testing methods, use PCR amplification methods.

**Social Competencies:** The student will understand the possibilities of using sophisticated methods in environment monitoring. Will be aware of the responsibility resulting from the use of GMOs in the natural environment.

**Basic literature:**

- Das P., das B. 2012, Bioremediation Techniques for Degradation of Aromatic Hydrocarbon LAP LAMBERT Academic Publishing, 64 pp.
- Nicholl D.S.T., 2002, An Introduction to Genetic Engineering. Cambridge University Press, 292 pp.

**Supplementary literature:**

- Glick B. R., Pasternak J. J., Patten C. L., 2010, Molecular Biotechnology. Principles and applications of recombinant DNA. ASM Press, 1000 pp.
- de Bruijn F. D., 2011, Handbook of molecular microbial ecology: Metagenomics in different habitats, Wiley Blackwell, 640 pp.



The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1.36

Student's independent work: 1.64