



Faculty of Geoengineering

Course title: MOLECULAR BIOLOGY TECHNIQUES IN BIOTECHNOLOGY

ECTS credit allocation (and other scores): 2.0

Semester: spring

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

Branch of science: Natural sciences

Language: English

Number of hours per semester: 30

Course coordinator/ Department and e-mail: Slawomir Ciesielski/Department of Environmental Biotechnology;
slawomir.ciesielski(ate)uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES: DNA purification and quantification. Agarose gel electrophoresis. Polymerase chain reaction (PCR). Analysis of microsatellite DNA. Amplified DNA fragment analysis using automatic DNA sequencer. Genotyping and genetic variation assessment. DNA paternity testing. Genetic distance. Protein analysis using SDS-Page electrophoresis.

LECTURES: Organization of cells and cellular compartments. Structure of DNA and RNA. Molecular mechanisms of DNA replication, transcription and translation. Methods of RNA and DNA purification. Agarose and polyacrylamide electrophoresis. Basics of polymerase chain reaction PCR. Real-time PCR. Restriction enzymes. Fingerprinting techniques. DNA cloning. Vectors. Heterologous protein production. Basics of computer based DNA sequence analysis. Omics- and metaomics approaches: genomics, metagenomics, transcriptomics, metatranscriptomics, proteomics, metaproteomics. Application of molecular techniques in environmental protection, agriculture and aquaculture.

Learning purpose: The primary goal of this course is to presents the modern methods of molecular biology.

On completion of the study programme the graduate will gain:

Knowledge: Students will learn principles of molecular biology, the properties of nucleic acids and proteins. Students will acquire the theoretical background of molecular techniques and omics and meta-omics approaches.

Skills: Students will possess the skills of DNA purification, quantification and amplification. Will know how to use molecular biology techniques in genotyping.

Social Competencies: The student will gain competences how to work in team. Will understand the dangers of using GMOs.

Basic literature:

- Brown T.A., 2001, Gene Cloning and DNA Analysis: An Introduction. Blackwell Science, 363 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: 1.07

Student's independent work: 0.93