

Course title: MOLECULAR BIOLOGY LABORATORY

ECTS credit allocation (and other scores): 3

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 45 h.

Course coordinator/ Department and e-mail: Prof. dr hab. Nina Smolińska; Department of Animal Anatomy and Physiology; nina.smolinska@uwm.edu.pl

Type of classes: classes and lectures

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#### Substantive content

**CLASSES:** Health and safety principles in the molecular biology laboratory. Analysis of the expression of the genes studied using real-time PCR. Preparation and morphological assessment of tissue/cell preparations for in situ hybridization (ISH) and immunohistochemistry (IHC) and immunocytochemistry (ICC). Staining of animal tissue sections. Determination of the cellular localization of the transcript using ISH. Determination of the localization of proteins using IHC and ICC. Western blot method. Isolation of proteins from animal tissues and their electrophoretic separation. Immunodetection of the analyzed proteins. Densitometric analysis of protein concentration using the computer program Image Studio lite (Li-cor).

**LECTURES:** Methods for collecting biological material. Methods for the isolation of ribonucleic acid (RNA). Methods of quantitative and qualitative analysis of RNA. Characteristics of real-time PCR reactions (composition, phases, optimization, principles, types, advantages and disadvantages, methods for analyzing results). Principles of correct design of primers and probes using IT tools for real-time PCR reactions. Methods of hybridization of nucleic acids. In situ hybridization (ISH). Types of hybridization probes and their labeling. Immunohistochemistry (IHC) and immunocytochemistry (ICC). Characteristics of antibodies used in immunodetection. Western blot method. Methods for labeling and detection of antibodies.

**LEARNING PURPOSE:** Knowledge of molecular biology research methods used in genomic and proteomic studies. Ability to select and apply the molecular biology methods learned and ability to correctly interpret the results obtained. Ability to use online databases and specialized literature to describe and report on molecular biology topics.

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On completion of the study programme the graduate will gain:

**KNOWLEDGE:** the student knows the ways of using biological material, modern techniques and research instruments used in biological laboratories, basic principles of ergonomics, hygiene and safety of working with biological material.

**SKILLS:** the student can apply molecular biology methods, carry out simple tasks with biological material, use available sources for scientific information, collect and process scientific information and communicate in writing and orally.

**SOCIAL COMPETENCIES:** the student is ready to work in a team, taking on different roles, constantly updating knowledge in the field of biology, assessing the risks arising from the use of biological tools and hazards in the workplace and complying with health and safety regulations, ethical behavior when working with biological material.

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Basic literature: 1. Burton E. Tropp, Molecular biology: Genes to proteins., Jones Bartlett Publishers, R. 2011 2. [http://www.protocol-online.org/prot/Molecular\\_Biology](http://www.protocol-online.org/prot/Molecular_Biology) 3. <https://molecular-biology.coe.hawaii.edu/protocols/> 4. Any authors, Selected scientific publications on the subject 2014-2024

Supplementary literature: 1. Nick A. Saunders and Martin A. Lee, "Real-Time PCR: Advanced Technologies and Applications", Horizon Scientific Press, R. 2013; 2. Sambrook J. Russel D., Molecular Cloning: A Laboratory Manual, 3rd ed., Tom 1-3, Wyd. Cold Spring Harbor Laboratory Press, R. 2001

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The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 47 h.

Student's independent work: 28 h.