UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Faculty of Biology and Biotechnology

Course title: LABORATORY OF ADVANCED MOLECULAR BIOTECHNOLOGYMETHODS

ECTS credit allocation (and other scores): 2.5

Semester: spring

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

Branch of science: Natural sciences

Language: English

Number of hours per semester: 50 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

Substantive content

CLASSES: Laser microdissection system - isolation of biological material from microscopic slides for molecular studies. Methods for the preparation of genomic libraries. Familiarization with programs for the analysis of next-generation sequencing (NGS) results. De novo sequence assembly and assembly based on the reference genome. Search for microsatellite loci in the nuclear genome. Analysis of metagenomic data. Microarrays - different types, choice of analysis, hybridization, microarray scanning and analysis of the results obtained (bioinformatics techniques and platforms). Cytometric analysis - application of a flow cytometer to identify immunocompetent cells in the blood of domestic pigs, computer analysis of the results obtained. Databases. Mass spectrometry (design and operation of a mass spectrometer, combination of mass spectrometry with chromatography, quadrupole spectrometer, MALDI-TOF, LC-MS). Application of two-dimensional electrophoresis (2DPAGE) for the separation and comparative analysis of proteomes. Spectrometric analysis of proteins. Bioinformatic tools for protein identification. Health and safety principles in the molecular biology laboratory. Seminar "Advanced methods of molecular biotechnology in practice"

LEARNING PURPOSE: Knowledge of advanced research methods in the field of molecular biotechnology used in transcriptomic, genomic and proteomic studies. The ability to select, plan experiments and apply the known methods of molecular biotechnology and the ability to correctly analyze, interpret and present the results obtained.

On completion of the study programme the graduate will gain:

KNOWLEDGE: the student knows research methods and procedures that enable the understanding of complex biological processes at different levels of their organization, methodology of research work in laboratory conditions, computer programs and biological databases that enable the preparation and processing of data for publication, basic principles of ergonomics, hygiene and safety of work with biological material.

SKILLS: the student can apply advanced molecular biotechnology techniques and research tools, operate life science research equipment (for research at the molecular and cellular level), use publicly available biological databases, interpret empirical data that form the basis for formulating conclusions and theories.

SOCIAL COMPETENCIES: the student is prepared to cooperate and work in a group, take on different roles and prioritize the tasks and projects to be carried out appropriately, act in accordance with the principles of bioethics and professional ethics and prevent their violation, systematically familiarize themselves with scientific journals, familiarize themselves systematically with scientific journals, popular science and internet sources of information related to biology in order to broaden and deepen their knowledge and show a willingness to apply it in practice (responsibility for their own personal

and professional development), disseminate the principles of rigorous interpretation of biological phenomena and processes based on empirical data.

Basic literature: 1. Bjornson Z.B., Nolan G.P., Fantl W.J., Single-cell mass cytometry for analysis of immune system functional states, Tom 25, Current Opinion in Immunology, 2013, s. 484-494; 2. Sambrook J.F., Russell D.W., Molecular Cloning: A Laboratory Manual, 3rd ed., Tom 1-3, Wyd. Cold Spring Harbor Laboratory Press, R. 2001 4. Ausubel F., Short protocols in molecular biology, Wyd. ISBN, R. 2002 5. Simó C., Fundamentals of advanced omics technologies: from genes to metabolites, Oxford: Elsevier, 6. Any authors, Selected scientific publications on the subject 2014-2024

Supplementary literature: 1. Bodzon-Kulakowska A. et al.,, "Methods for sample preparation in proteomic research", Tom 848, Journal of Chromatography, 2007, s. 1-31

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 52 h.

Student's independent work: 10.5 h.