

Course title: ADVANCED MOLECULAR DETECTION METHODS

ECTS credit allocation (and other scores): 4

Semester: spring

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

Branch of science: Natural sciences

Language: English

Number of hours per semester: 60 h.

Course coordinator/ Department and e-mail: Nina Smolińska; Department of Animal Anatomy and Physiology;
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Type of classes: classes and lectures

Substantive content

CLASSES: Laser microdissection system - isolation of biological material from microscopic preparations for molecular tests. DNA Sequencing Methods. DNA microarrays - various types, selection of analysis, hybridization, microarray scanning and analysis of the obtained results. Flow cytometric analysis (use of a flow cytometer to identify immunocompetent cells in the blood of domestic pig, computer analysis of the obtained results). Principles of occupational health and safety in the molecular biology laboratory. Seminar - "Advanced methods of molecular detection in practice".

LECTURES: Laser Microdissection - operation and application. DNA Sequencing Methods (Sanger method, Maxam and Gilbert method, pyrosequencing, next-generation sequencing). Microarray Technique (technologies, data analysis, application, advantages and disadvantages). Flow Cytometry (structure and principle of cytometer operation, standardization of results, application). Mass Spectrometry (construction and operation of a mass spectrometer, connection of mass spectrometry with chromatography, quadrupole spectrometers, MALDI-TOF, LC-MS). Genetically modified animals, transgenic animals – importance in scientific research, industry, and medical diagnostics.

LEARNING PURPOSE: Getting to know advanced research methods in the field of applied molecular biology in genetic and proteomic research. The ability to choose, plan experiments and apply the known methods of molecular biology as well as the ability to properly interpret the obtained results.

On completion of the study programme the graduate will gain:

KNOWLEDGE: the student knows and understands research methods and procedures allowing to learn about complex biological processes at various levels of their organization, methodology of research work in laboratory conditions, computer programs and biological databases, enabling the preparation and processing of data for publication, basic principles of ergonomics, hygiene and safety of work with biological material.

SKILLS: the student can use advanced techniques and research tools used in molecular biology, operate research equipment used in biological sciences (for research at the molecular, cellular level), use publicly available biological databases, and interpret empirical data that are the basis for formulating conclusions and theories.

SOCIAL COMPETENCIES: the student is ready to cooperate and work in a group, assuming different roles and properly prioritizing tasks and projects, following the principles of bioethics and professional ethics and preventing their violation, systematic reading of scientific journals, popular science and internet information resources related to biology, to expand and deepen knowledge and is ready to apply it in practice (responsibility for own development personal and professional), promotes the principles of strict, based on empirical data, interpretation of biological phenomena and processes.

Basic literature: 1. Simó C., Fundamentals of advanced omics technologies: from genes to metabolites, Oxford: Elsevier, 2014 2. Bjornson Z.B., Nolan G.P., Fantl W.J., Single-cell mass cytometry for analysis of immune system functional states, Current Opinion in Immunology, 2013 3. Any authors, Selected scientific publications on the subject 2014-2024

Supplementary literature: 1. Green M.R., Sambrook J., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, 2012

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 64 h.

Student's independent work: 36 h.