KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ SPOŁECZNY

| Course title | ECTS code |
|---|---|
| Molecular methods of nucleic acid amplification | not defined |

**Name of unit administrating study**

null

**Studies**

| faculty | field of study | | |
|---|---|---|---|
| Faculty of Biology | Medical Biology | type | first tier studies (BA), second tier studies (MA) |
| | | form | full-time |
| | | specialty | all |
| | | specialization | all |
| Faculty of Biology | Biology | type | first tier studies (BA), second tier studies (MA) |
| | | form | full-time |
| | | specialty | all |
| | | specialization | all |
| Faculty of Biology | Genetics and Experimental Biology | type | first tier studies (BA) |
| | | form | full-time |
| | | specialty | all |
| | | specialization | all |
| Faculty of Biology | Natural Resources Conservation | type | first tier studies (BA) |
| | | form | full-time |
| | | specialty | all |
| | | specialization | all |

**Teaching staff**

dr inż. Karolina Stojowska-Swędrzyńska; dr hab. Wojciech Pokora, profesor uczelni

**Forms of classes, the realization and number of hours**

**Forms of classes**

Lecture

**The realization of activities**

classroom instruction

**Number of hours**

Lecture: 15 hours

**ECTS credits**

2

ESTIMATION OF WORKING TIME:

a) Classes requiring direct participation of the academic teacher and student:

- participation in lectures: 15 h
- participation in the exam: 1 h
- participation in consultations: 9 h

b) Student's own work:

- preparation for discussion and problem solving: 10 h
- preparation for exam, final assessment: 15 h.

TOTAL: 50 hours.

**The academic cycle**

2022/2023 summer semester

**Type of course**

an elective course

**Language of instruction**

english

**Teaching methods**

Conversational lecture with multimedia presentation, problem solving

**Form and method of assessment and basic criteria for eveluation or examination requirements**

**Final evaluation**

Graded credit

**Assessment methods**

written credit: test questions and open-ended tasks (problem solving)

**The basic criteria for evaluation**

| | |
|---|---|
| | credit comprises questions on lecture material and additional readings specified during the lecture series – minimum 51% of points from the final written test |

## Method of verifying required learning outcomes

| Learning outcome | Conversational lecture with multimedia presentation, problem solving |
|---|---|
| | **Knowledge** |
| 1 / 2 / 3 | Exam/discussion |
| | **Skills** |
| 4 / 5 / 6 | Exam/discussion |
| | **Social competence** |
| 7 / 8 | Discussion |

## Required courses and introductory requirements

**A. Formal requirements**

Courses containing the basics of molecular biology, biochemistry and microbiology

**B. Prerequisites**

Knowledge of the structure, properties and functions of basic biological macromolecules (including DNA, RNA, restriction enzymes, DNA polymerases)

## Aims of education

The aim of the lecture is to provide students with the various techniques of nucleic acid amplification in vitro, including target, probe and signal amplification systems and their application in molecular biology, biotechnology and medicine.

## Course contents

The basic principles of the Polymerase Chain Reaction (PCR), its modification and application:
Simplex and multiplex PCR
Nested PCR, Multiplex PCR, Reverse Transcription PCR, Long-range PCR, Random Amplified Polymorphic DNA, Quantitative and semi-quantitative)
Methods for detection of amplified fragments (hybridization and electrophoretic techniques, labeling, probes).
Methods for sequence analysis of the amplified fragment (SSCP, FIGE, PFGE, DGGE, melting point analysis, restriction analysis, sequencing).
Application of PCR for the analysis of unknown sequences (inverse PCR, Target Gene Walking, panhandle PCR, overlap extension).
review of other target amplification methods (eg. NASBA - Nucleic Acid Sequence-Based Amplification, TMA – Transcription Mediated Amplification, SDA - Strand Displacement Amplification)
review of probe amplification methods (e.g. LCR – Ligase Chain Reaction, Gap_LCR, Strand Displacement Amplification) and signal amplification methods (e.g. bDNA – Branched DNA probes, Hybrid Capture – Anti-DNA-RNA hybrid antibody).
Criteria for selecting an appropriate method of nucleic acid amplification
Design of the experiment: positive and negative controls
Interpretation of the results

## Bibliography of literature

A. Literature required to pass the course
Scientific articles (handed out during course)
Yi-Wei Tang, Charles W. Stratton, Advanced Techniques in Diagnostic Microbiology, Springer 2013 (selected chapters)
Chang-Hui Shen, Diagnostic Molecular Biology, Elsevier Academic Press, 2019 (selected chapters)
Rahman et al. Polymerase Chain Reaction (PCR): A Short Review, AKMMC J 2013: 4(1): 30-36
Carrino, Lee, Nucleic acid amplification methods, Journal of Microbiological Methods 23 (1995) 3-20, https://doi.org/10.1016/0167-7012(95)00024-F
Fakruddin et al, Nucleic acid amplification: Alternative methods of polymerase chain reaction . J Pharm Bioallied Sci. 2013 Oct-Dec; 5(4): 245–252. doi: 10.4103/0975-7406.120066

B. Extracurricular readings
Latest scientific articles (pointed during the course)
Mullis, Faloona, Specific synthesis of DNA in vitro via a polymerase-catalyzed chain reaction. Methods Enzymol. 1987;155:335-50. doi: 10.1016/0076-6879(87)55023-6.

| The learning outcomes (for the field of study and specialization) | Knowledge |
|---|---|
| | 1. The student is aware of the development and current state of knowledge as well as the latest research trends in the fields of: molecular biology, molecular diagnostics, genetic engineering or biotechnology with the use of nucleic acid amplification techniques, and demonstrates their relationship with other natural disciplines |

| | |
|---|---|
| | 2. The student explains the theoretical basis of experimental methods based on the analysis of nucleic acids and lists the most important methods and techniques used in molecular biology, genetic engineering, molecular diagnostics and biotechnology, with an emphasis on the methods discussed during the classes<br><br>3. The student explains the relationship between the achievements of molecular biology in relation to the methods of amplification and analysis of nucleic acids and the possibilities of their use in scientific work and in socio-economic life, taking into account the sustainable use of biological diversity |
| | **Skills** |
| | 4. The student reads with understanding simple scientific biological texts in the field of molecular biology, genetic engineering, molecular diagnostics, biotechnology and medical biology in English<br>5. The student independently searches for and uses available sources of biological information, including electronic sources<br>6. The student learns independently in a targeted manner, striving to expand knowledge in the field of molecular biology, genetic engineering, biotechnology and molecular diagnostics |
| | **Social competence** |
| | 7. The graduate knows the limitations of his own knowledge and understands the need for constant learning and development<br><br>8. performs a critical self-assessment of own competences and updates knowledge and improves skills |

**Contact**

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