Course Syllabus

I. General Information

Course name in English	Molecular diagnostics
Course name in Polish	Diagnostyka molekularna
Programme	Bioanalytical technologies
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	MSc
Form of studies (full-time, part-time)	Full-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	Dr Daria Ler/ dr hab. Maciej Masłyk

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	30	II	6
tutorial			
classes	30	II	

Course pre-requisites	Principles of molecular biology, biochemistry, genetics, molecular biology techniques

II. Course Objectives

C1- Identify the fundamentals and important parameters in the design of laboratory biomedicine and genetics to conduct the most commonly used molecular diagnostic procedures and tests
C2- Identify the important parameters in the design of a quality system for molecular analyses
C3- Become proficient with the techniques required to perform the most commonly used molecular diagnostic protocols in biomedical practice
C4- Identify the components of well-controlled diagnostic test
C5- Use critical thinking skills to troubleshoot problems as they occur and determine possible causes

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	Explore the fundamental principles of molecular methods and their implications in biomedical diagnostics, as well as disease treatment	K_W05
W_02	Knows the fundamental principles of testing methodology, quality assurance and the application of molecular methods to the clinical and research laboratory	K_W08
W_03	The students are exposed to aspects of statistics, quality control, regulatory issues and applications of these methods to	K_W04

	the diagnosis and prognosis oh human disease	
	SKILLS	
U_01	The student follows and apply related protocols and tools in clinical and pre-clinical research	K_U11
U_02	Comprehend current laboratory diagnostic approaches through applying biochemical and molecular biology principles	K_U01
U_03	Utilize tools used in clinical research with biomedical applications on different level of genetic information	K_U01, K_U08
U_04	Is able to recognize the importance of strong work ethics, persistence and intellectual integrity	K_U10, K_U17
	SOCIAL COMPETENCIES	
K_01	Is ready to use good laboratory and clinical practice	K_K02, K_K03, K_K04

IV. Course Content

Classification of neoplasms, molecular basis of cancer; oncogenes, tumor-supressors.
Analytical targets of molecular testing; gene and chromosomal mutations in solid tumors: HEGF receptor, EGF receptor, Ras proteins, Ewing sarcoma.
Analytical targets of molecular testing; Gene and chromosomal mutations in solid tumors: synovial sarcoma translocation, PAX3, ATM gene, BRCA 1 and BRCA 2 genes.
Von Lippen-Hindau Gene, V-myc, Ret protooncogene, other molecular abnormalities, Microsatellite Instability, Loss of Heterozygosity.
Leukemia and Lymphoma: Molecular targets in haematological malignancies.
Gene rearrangement in leukemia and lymphoma; VDJ recombination.
Ig Heavy and light chain gene rearrangement in B cells; TCR gene rearrangement.
Case study; Detection of clonality, translocations in hematological malignancies.
Gene mutations in haematological malignancies, test panels, additional abnormalities.
Molecular detection of inherited diseases: Molecular basis of inherited diseases; chromosomal abnormalities; patterns of inheritance in single-gene disorders.
Lysosomal storage diseases; Molecular diagnosis of single-gene disorders.
Thrombophilia risk factors, Factor V Leiden, CS, hemochromatosis, Cyt450
Single gene disorders with non-classical patterns of inheritance; mutations in Mt genes.
Techniques in the clinical laboratory: DNA polymorphisms and Human identification: RLFP, STR typing.
Bone marrow engraftment; testing using DNA polymorphisms, linkage analysis.
Laboratory activities:
qRT-PCR detection of inherited risk factors, genotyping, Viral-DNA copy-number quantification.
ELISA techniques- serological analyses of different human pathogens.
Blotting techniques- detection of specific Immunoglobulins (IgG, IgA, IgM, IgE).

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*

KNOWLEDGE			
W_01	Conventional lecture/Discussion	Written test	Evaluated written test/test
W_02	Conventional lecture/Discussion	Written test	Evaluated written test/test
W_03	Conventional lecture/Discussion	Written test	Evaluated written test/test
SKILLS			
U_01	Laboratory classes	Observation and Report	Report printout
U_02	Laboratory classes	Test of practical skills	Rating card
U_03	Practical classes	Test of practical skills	Rating card
U_04	Laboratory classes	Report	Report printout
COMPETENCIES			
K_01	Laboratory classes	Observation	Observation report

VI. Grading criteria, weighting factors, student workload

Written test to pass the lecture: 100%
Laboratory classes:

75% grades from written tests
10% reports/journal club
15% practical skills

Mark	**Evaluation criteria**	
Very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 95-100%
overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 85-94 %
Good (4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 75-84%
Quite good (3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 65-74%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 55-64%
insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 55%

VII Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	69 (60 + 9 individual consultation)
Number of hours of individual student work	**81**

VIII Literature

Basic literature
1. George Patrinos, Wilhelm Ansorge, Phillip B. Danielson: Molecular Diagnostics, 3rd Edition, Academic Press-Elsevier (2017)
2. Lela Buckingham PhD MB DLM(ASCP): Molecular Diagnostics, Fundamentals, Methods and Clinical Applications, 3rd Edition, F.A. Davis Company (2019)
Additional literature
1. The World of the Cell by Hardin, Bertoni, Kleinsmith (PEARSON) (2012)
2. Biochemistry. 5th edition, Berg JM, Tymoczko JL, Stryer L, New York: W H Freeman (2002)