



Subject card

Subject name and code	Supramolecular Chemistry and Medicine, PG_00050125						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2025		Academic year of realisation of subject			2025/2026	
Education level	second-cycle studies		Subject group			Optional subject group Specialty subject group Subject group related to scientific research in the field of study	
Mode of study	Full-time studies		Mode of delivery			at the university	
Year of study	2		Language of instruction			Polish	
Semester of study	3		ECTS credits			3.0	
Learning profile	general academic profile		Assessment form			exam	
Conducting unit	Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Beata Krawczyk				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	45		6.0		24.0	75
Subject objectives	The aim of the course is to acquaint the student with molecular methods, applied for medical diagnosis.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U12] is able, to an increased extent, to analyze the operation of components and systems related to the field of study, as well as to measure their parameters and study their technical characteristics, and to plan and carry out experiments related to the field of study, including computer simulations, interpret the obtained results and draw conclusions	The student can evaluate the efficiency of the PCR reaction, interpret errors and propose a solution.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K7_W53] Knows and understands, to an increased extent, selected aspects of biomedical diagnostics.	The student can answer the question: who can become a diagnostician and with what tools can work.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
	[K7_U53] can apply advanced equipment used in biomedical diagnostics	The student can isolate the genetic material. The student acquires the ability to prepare the PCR reaction. The student knows how a thermal cycler works and he can use it. The student can choose and apply diagnostic and analytical methods in the field of his specialty, with particular emphasis on molecular diagnostics.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	The student can design a research system to identify a selected group of microorganisms. The student has acquired skills in using bioinformatics programs. The student can conduct a phylogenetic analysis.	[SU5] Assessment of ability to present the results of task
Subject contents	<p>Lecture: Range of applications of molecular diagnostics in medicine. Discoveries in molecular diagnostics. Standardization of molecular diagnostics and verification of molecular assays. Genetic material from nuclear region and mitochondrion (Prokaryotic and Eukaryotic Genomes). Genetic polymorphism and evolutionary conservation of DNA regions. DNA amplification by Polymerase Chain Reaction (PCR). Advantages of PCR. Pitfalls in PCR. The problem of DNA contamination. Detection of bacteria in clinical samples by PCR. Variations on the basic PCR technique and applications: multiplex PCR, nested-PCR, RT-PCR. Real-time PCR and application. Alternative methods for amplified nucleic acid testing. Molecular epidemiology the basics (short- term epidemic and epidemiological surveillance. REA-PFGE and PCR fingerprinting methods for differentiation of microorganisms. Ribotyping. Interpretation of gel electrophoresis patterns for molecular typing. Application of molecular typing methods in epidemiology. Molecular diagnostics in virology. An overview of new and traditional methods of DNA sequencing. Methodology of hybridization methods. Blotting Methods and applications (Southern and northern blot). Microarray cDNA and Chip DNA. Karyotype. Cytogenetic methods. Fluorescence in situ hybridization and CGH.</p> <p>Exercise: 1. Design of diagnostic system: selection of primers, PCR reaction profile; 2. Phylogenetic analysis and epidemic studies; 3. Design of system based on PCR/t-RFLP technique</p> <p>Laboratory: 1. Identification of <i>E. faecium</i> and <i>E. faecalis</i> species by PCR. 2. Application of multiplex PCR for identification of <i>Staphylococcus aureus</i>, and the -lactam antibiotics resistance. 3. Amplification of the human CCR5 gene - the detection of deletions 32pz-resistance to HIV infection. 4. Identification of the human sex by analysis of amelogenin gene (AMGXY). 5. Random amplified of polymorphic DNA for bacterial strains genotyping</p>		
Prerequisites and co-requisites	General Microbiology, Molecular biology		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	presentation, report	60.0%	25.0%
	written exam	60.0%	50.0%
	Laboratory - written report, test	60.0%	25.0%

Recommended reading	Basic literature	Diagnostyka molekularna w mikrobiologii. B.Krawczyk, J.Kur. Wydawnictwo PG.2008. Biologia molekularna w medycynie. Elementy genetyki medycznej. Pod red. Jerzy Bal; PWN W-wa 2008. Genetyka medyczna. L.B. Jorde, J.C. Carey, M.J. Bamshad, R.L. White. Redakcja naukowa wydania polskiego Jacek Wojciorowski. Lublin 2002. Genomy. T.A. Brown. Przekład P. Węgleński. PWN W-wa 2001. PCR Application Manual. 2006. Roche Diagnostics GmbH, Mannheim (www.roche-applied-science.com) Analiza DNA - teoria i praktyka pod red. Ryszarda Słomskiego Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu. 2008. Diagnostyka molekularna z zastosowaniem techniki PCR. Krawczyk B. i in. Wyd. PG-2012 Podstawy techniki PCR ćwiczenia laboratoryjne. Wyd. PG 2012.. enetyka medyczna" G. Drewa, T. Ferenc, wyd. ELSEVIER 2012.
	Supplementary literature	articles from web. http://www.ncbi.nlm.nih.gov/pubmed/
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>The student knows what equipment to use for a given method.?</p> <p>What determines the efficiency of the PCR?</p> <p>Molecular epidemiology - methods</p>	
Work placement	Not applicable	

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