

<b>Course title</b> Diagnostyka molekularna / Molecular diagnostics		<b>ECTS code</b> 13.3.0502	
<b>Name of unit administrating study</b> Faculty of Chemistry			
<b>Studies</b>			
<b>Field of study</b>	<b>Type</b>	<b>Form</b>	
Chemistry	Bachelor	Full-time studies	
<b>Teaching staff</b> Agnieszka Żylicz-Stachula, PhD DSc; dr hab. Agnieszka Żylicz-Stachula, prof. nadzw. UG			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b> 2	
<b>A. Forms of classes, in accordance with the UG Rector's regulations</b> lecture, laboratory classes		classes - 30 h tutorial classes – 5 h student's own work – 15 h	
<b>B. The realization of activities</b> in-class learning		Total: 50 h - 2 ECTS	
<b>C. Number of hours</b> 15 h lecture, 15 h laboratory classes			
<b>The academic cycle</b> Third year, winter semester			
<b>Type of course</b> obligatory		<b>Language of instruction</b> Polish	
<b>Teaching methods</b>  Lecture with multimedia presentation Designing of experiments Group work Performing experiments		<b>Form and method of assessment and basic criteria for evaluation or examination requirements</b>	
		<b>A. Final evaluation, in accordance with the UG study regulations</b> course completion (with a grade)	
		<b>B. Assessment methods</b>  implementation of a specific laboratory work, written experimental report  single-choice test questions, essay or presentation, assessed for advanced ability to locate and evaluate Web-based information	
		<b>C. The basic criteria for evaluation or exam requirements</b>  <ul style="list-style-type: none"> <li>• final written test consisting of test questions, covering issues mentioned in the lecture's program content</li> <li>• final grade according to the scale of grades given in the Study Regulations</li> <li>• supplementary oral or written evaluation for students who did not obtain the required 51% in the first term</li> </ul>	
<b>Required courses and introductory requirements</b>  general chemistry, organic chemistry, biochemistry proper use of the chemical/biological terminology and nomenclature, knowledge of nucleic acids and protein structure			
<b>Aims of education</b>  <ul style="list-style-type: none"> <li>• acquainting students with all issues mentioned in the lecture's program content</li> </ul>			

- acquainting students with modern methods used in molecular diagnostics
- acquainting students with the current possibilities, limitations and the anticipated trends in modern molecular diagnostics

### Course contents

#### A. Lecture: major issues

Techniques for isolation, separation and sequencing of nucleic acids. Methods for genome analysis. Screening methods for detection of point mutations. Immunological and molecular hybridization detection techniques. DNA microarrays. Molecular diagnostics of microorganisms. Molecular diagnostics of inherited diseases. Selected methods used in medical diagnostics and forensic medicine.

#### B. Laboratory classes: major issues

Molecular diagnostics of the variants of the human alcohol dehydrogenase gene. Isolation of nucleic acids from self-prepared swabs. Amplification of the gene using PCR technology. Separation of the obtained PCR products by agarose gel electrophoresis. The interpretation of the diagnostic test.

### Bibliography of literature

#### A. Literature required to pass the course

##### A1. Literature used during the course

1. Czech E, Hartleb M, Polimorfizm genetyczny dehydrogenazy alkoholowej – znaczenie patofizjologiczne, *Advances in Clinical and Experimental Medicine*, 2003, 12, 801–809
2. Cichoż-Lach H, Partcka J, Nesina I, Celiński K, Słomka M, Wojcierowski J, Genetic polymorphism of alcohol dehydrogenase 3 in alcohol liver cirrhosis and in alcohol chronic pancreatitis. *Alcohol and Alcoholism* vol 41, no1 pp 14-17, 2006
3. Łaniewska-Dunaj M, Jelski W, Szmitkowski M, Dehydrogenaza alkoholowa-znaczenie fizjologiczne i diagnostyczne. *Postępy Hig Med Dosw.*, 2013; 67:901-907
4. Pöschl G, Stickel F, Wang XD, Seitz H, Alcohol and cancer: genetic and nutritional aspects. *Proceedings of the Nutrition Society* (2004), 63, 65-71
5. Software for visualisation and manipulation of DNA sequences: SNAP GENE 3.1.4.
6. DNA sequence of the human alcohol dehydrogenase encoding gene (class I, gamma subunit (ADH3)): <http://www.ncbi.nlm.nih.gov/nuccore/M12272.1> .

##### A2. Literature studied individually

Positions 5 and 6.

#### B. Extracurricular readings

1. Diagnostyka molekularna z zastosowaniem techniki PCR: ćwiczenia laboratoryjne. Beata Krawczyk [et al.]. Wydawnictwo Politechniki Gdańskiej, 2012.
2. Buckingham, M.L., Flaws, L.: *Molecular diagnostics: Fundamentals, Methods and Clinical Applications*. 2007

### Knowledge

1. Student lists, characterizes and understands the methods used in molecular diagnostics, including PCR, qPCR, DNA sequencing techniques, genomic analysis methods, DNA polymorphism testing methods, hybridization and immunological techniques.
2. Student lists and describes exemplary applications of modern technologies used in medical diagnostics and forensic medicine.
3. Student lists and describes exemplary applications of modern techniques used for detection and identification of microorganisms.
4. Student lists and describes examples of commercially available diagnostic tests.

**Skills**

1. Designs DNA primers and PCR reaction conditions.
2. Reads and analyzes DNA sequences.
3. Provides the possibilities of practical application of the techniques learned.
4. Proposes the use of specific techniques to solve the problem.
5. Interprets the results of selected diagnostic tests.
6. Purifies DNA from swabs and detects a variant of the gene, using the PCR method. Analyzes the results using agarose gel electrophoresis.

**Social competence**

1. Understands the need for further education,
2. Being cautious and critical when expressing opinions,
3. Obtains an awareness of the relationship between human genetic material and human health and life span,
4. Realizes and appreciates the possibilities created by modern molecular diagnostics,
5. Appreciates the importance of screening tests,
6. Discuss the importance of medical prophylaxis,
7. Works in groups and individually.