



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

HELLENIC REPUBLIC

ΕΘ.Α.Α.Ε.

H. A .H. E.

ΕΘΝΙΚΗ ΑΡΧΗ ΑΝΩΤΑΤΗΣ ΕΚΠΑΙΔΕΥΣΗΣ

HELLENIC AUTHORITY FOR HIGHER EDUCATION

University of West Attica

School of Health and Care Sciences

Department of Biomedical Sciences

Postgraduate/Master Program

“Biomedical Methods and Technology in Diagnosis”

Course Outline

CURRENT METHODS IN MOLECULAR MICROBIOLOGY



ATHENS 2023

COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Health & Care Sciences		
ACADEMIC UNIT	Biomedical Sciences		
LEVEL OF STUDIES	Postgraduate Studies		
COURSE CODE	IA7	SEMESTER	2nd
COURSE TITLE	CURRENT METHODS IN MOLECULAR MICROBIOLOGY		
INDEPENDENT TEACHING ACTIVITIES <i>If credits are awarded for separate components of the course, e.g. lectures, laboratory Exercises etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>		WEEKLY TEACHING HOURS	CREDITS
Review of existing literature		4	8
Experimental procedure			
<i>Add rows if needed. The teaching organization and teaching methods used are described in detail in (d).</i>			
COURSE TYPE <i>general background, special background, specialization general knowledge, skills development</i>	Skills development Special background-Specialization of general knowledge		
PREREQUISITE COURSES:	GENERAL MICROBIOLOGY, CLINICAL MICROBIOLOGY, MOLECULAR BIOLOGY, VIROLOGY, BACTERIOLOGY, PARASITOLOGY, MYCOLOGY		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED IN ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/DML117/		

(2) LEARNING OUTCOMES

<p>Learning Outcomes</p> <p><i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire after the successful completion of the course are described.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the Level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i>
<p>The course includes lectures and demonstrations of laboratory applying methods and techniques of Molecular Biology and their application in Bacteriology, Virology, Parasitology, Mycology both in clinical and environmental samples. The course emphasizes Molecular epidemiology, which is necessary today for the investigation of epidemics, due to the increased movement of people and products, a result of globalization. The presentation of European and Global networks will demonstrate to students the application of these techniques in global public health and ensuring citizens' health.</p>

General Competences

Taking into consideration the general competencies that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?.

<i>Search for, analysis and synthesis of data, and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>.....</i>
<i>Production of new research ideas</i>	<i>Others...</i>
	<i>.....</i>

The aim of the course is to inform the students, to deepen their knowledge and to familiarize them with molecular methods applied in laboratory diagnosis and in the epidemiological study of outbreaks and epidemics.

(3) SYLLABUS

1. Polymerase chain reaction and hybridization - tools that strives to marry the increasingly powerful tools of genomics and computational biology with clinical medicine.
2. Molecular techniques as a key tool for investigating contemporary public health issues
3. Risk assessment as a tool for the study of epidemics. The applications of the doctrine of Molecular Biology to the treatment of infections
4. Introduction to Molecular Environmental Microbiology & Virology
5. Special groups of viruses (HIV, Noro, H1, Hepatitis viruses, HTLV-I, HTLV-II, CMV, Herpes viruses, etc.)
6. Virus survival in the environment
7. Applications of next-generation sequencing technologies (Next Generation Sequencing) in diagnosis
8. Use of transgenic animals in molecular Microbiology and Virology
9. SSCP, DGGE, and ASO molecular biology techniques in Clinical Microbiology.
10. An introduction to Molecular Epidemiology. Molecular Epidemiology and epidemiological surveillance – theory and examples.
11. Bacterial interactions with host epithelium. Gut microbiota genomic profiling and metabolomics.
12. Infected epithelial tissue homeostasis. Regenerative inflammation and bacteria.
13. Molecular parasite detection, genotyping, molecular epidemiology in Parasitology.
14. Example of molecular epidemiology application in Parasitology
15. Applications of Molecular Epidemiology in Virology and in the study of phylogenetic analysis and molecular evolution of viruses. molecular epidemiology in the management of nosocomial epidemics
16. Molecular typing and epidemiologic surveillance of foodborne infections/ Outbreak Investigation
17. Bacterial resistance mechanisms. Molecular investigation of bacterial development
18. Mechanisms of interaction of microbes with their host
19. The effect of viruses on the host cell and induction non-apoptotic cell death mechanics
20. Bacteriophage – an overview
21. Innovative Diagnostic Methods for the Molecular Detection and Characterization of Pathogens: Applications of Nanoparticles in Low-Cost Method Development

14. Flow cytometry.
15. Genetic predisposition and early diagnosis in endocrine tumors.

Laboratory / Tutorial Exercises

1. PCR-based detection and typing of parasites
2. Population Structure Analysis using Structure Software
3. Deep sequencing data analysis, microarrays
4. File format - Sequencing (DNA, proteins) - phylogenetic trees construction using evolutionary distance, and maximum parsimony
5. Phenotypic detection methods for antimicrobial resistance
6. Genotypic detection methods for bacterial resistance
7. Pulsed-field gel electrophoresis for molecular epidemiology

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face to face in the classroom and in the lab. Utilization of distance learning technology (contemporary and non-contemporary teaching) using digital tools such as MS Teams, Zoom, Skype, etc.	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	Support of the learning process through the e-class platform. Specialized laboratory equipment	
<p style="text-align: center;">TEACHING METHODS</p> <p><i>The manner and methods are described in detail.</i></p> <p><i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS.</i></p>	Activity	Semester Workload
	Lectures	30
	Laboratory / Tutorial Exercises	15
	Interactive teaching	15
	Literature study and analysis	20
	Elaboration of a research project	20
	Writing a paper	20
	Educational visits	20
	Independent study	60
	Course total	200
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i>	<p>Final written exam (60%) including:</p> <ul style="list-style-type: none"> • Multiple choice questions • Short analysis questions • Case study and/or clinical cases • Problem solving <p>Presentation of optional individual study (40%)</p>	
<p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice, questionnaires short answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically--defined evaluation criteria are given, and where they are accessible to students are mentioned.</i></p>		

• **ATTACHED BIBLIOGRAPHY**

-Suggested bibliography :

A. Greek

1. Ιολογία-Εξερευνώντας τους Ιούς, Shors Teri
2. Μοριακή Βιολογία του Κυττάρου, Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter, John Wilson, Tim Hunt
3. Εισαγωγή στη Μικροβιολογία 2η έκδοση, Tortora Gerard, Funke Berdell, Case Christine
4. Μοριακή Βιολογία του Γονιδίου, James Watson, Tania Baker, Stephen Bell, Alexander Gann, Michael Levine, Richard Losick
5. Μικροβιολογία, Mims Cedric A., Playfair J., Roitt I., Wakelin D., Williams R.
6. Γονιδιώματα - Σύγχρονες Ερευνητικές Προσεγγίσεις, Brown T. A.
7. Εισαγωγή στη σύγχρονη Ιολογία, Dimmock J. Nigel, Easton J. Andrew, Leppard N. Keith, Επιμ. Μήτκα Στέλλα, Μπελούκας Απόστολος

B. Foreign language

1. Nature Reviews Microbiology <https://www.nature.com/nrmicro/>
2. Microbiology and Molecular Biology Reviews <https://mmb.asm.org>
3. Molecular microbiology <https://onlinelibrary.wiley.com/journal/13652958>
4. Vizzi E, Angulo Medina LA. Enteropathogens responsible for gastrointestinal disorders in HIV patients. Invest Clin. 2013 Mar;54(1):90-108. Review.
5. MacMicking JD. Interferon inducible effector mechanisms in cell autonomous immunity Nat Rev Immunol. 2012 Apr 25;12(5):367-82. doi: 10.1038/nri3210. Review
6. Khor CC, Hibberd ML. Revealing the molecular signatures of host pathogen interactions Genome Biol. 2011 Oct 19;12(10):229. doi: 10.1186/gb-2011-12-10-229. Review.
7. Levine B, Mizushima N, Virgin HW. Autophagy in immunity and inflammation Nature. 2011 Jan 20;469(7330):323-35. doi: 10.1038/nature09782. Review.
8. Lina Ma , Frederick A Jakobiec, Thaddeus P Dryja. A Review of Next-Generation Sequencing (NGS): Applications to the Diagnosis of Ocular Infectious Diseases. Semin Ophthalmol 2019;34(4):223-231. Review.
9. Murphy SC, Shott JP, Parikh S, Etter P, Prescott WR, Stewart VA. Malaria diagnostics in clinical trials Am J Trop Med Hyg. 2013 Nov;89(5):824-39. doi: 10.4269/ajtmh.12-0675. Epub 2013 Sep 23. Review.
10. Jabbar A, Gasser RB. Mutation scanning *analysis* of genetic variation within and among Echinococcus species: implications and future prospects Electrophoresis. 2013, 34(13):1852-62. Review.