



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

HELLENIC REPUBLIC

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ΕΘΝΙΚΗ ΑΡΧΗ ΑΝΩΤΑΤΗΣ ΕΚΠΑΙΔΕΥΣΗΣ

HELLENIC AUTHORITY FOR HIGHER EDUCATION

University of West Attica

School of Health and Care Sciences

Department of Biomedical Sciences

Postgraduate Studies

“Biomedical Methods and Technology in Diagnosis”

Course Outline

Modern Analytical Methods – Nanotechnology in Biomedical Laboratories



ATHENS 2023

COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Health and Care Sciences		
ACADEMIC UNIT	Biomedical Sciences		
LEVEL OF STUDIES	Postgraduate Studies		
COURSE CODE	IA2	SEMESTER	First
COURSE TITLE	Modern Analytical Methods – Nanotechnology in Biomedical Laboratories		
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	7
Experimental procedure			
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Skills development Special background-general knowledge specialization		
PREREQUISITE COURSES:	CHEMISTRY		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/DML112/		

(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 with 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 for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i>

The purpose of the course is to introduce, primarily to graduate students in the health sciences, an impressive array of powerful and sophisticated tools for gathering qualitative and quantitative analytical information in biomedical laboratories. Particular emphasis is placed on spectroscopic, electrochemical and chromatographic methods of analysis, which constitute the majority of the techniques used. Postgraduate students, upon completion of the thematic units, will acquire demonstrated knowledge and understanding, which will build upon and extend and/or enhance knowledge acquired at undergraduate level. They will have acquired a comprehensive understanding of almost all modern methods of instrumental biomedical analysis, which will form the background for the development and successful implementation of ideas, often in the context of research activity. They will be aware of the trends of modern diagnostic technology in biomedical laboratories and will develop the ability to update their knowledge. They will be also able to clearly and concisely communicate their conclusions, as well as the knowledge and reasoning on which they are based. They will have the necessary learning skills, which allow them to continue their studies, in a largely self-reliant and/or autonomous manner.

General Competences

Taking into consideration the general competences 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?

Search for, analysis and synthesis of data and information,
with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas

Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and
sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
.....
Others...
.....

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations in the modern hematology laboratory
- Autonomous work
- Teamwork
- Work in an interdisciplinary environment

(3) SYLLABUS

1. Introduction to Analytical Chemistry
2. Basic principles of photometry and color analyses
3. Molecular Spectroscopy. UV-VIS-NIR spectroscopy combined with chemometric statistical tools
4. Atomic spectroscopy methods
5. Chromatography methods
6. Applications of HPLC in clinical and drug analysis.
7. Methods of Immunochemical Determinations (Elisa)
8. Infrared spectroscopy
9. Methods of Immunochemical Determinations (immunochromatography and immunoblotting)
10. PCR. A modern method of molecular analysis
11. The use of fluorescent substances in diagnosis
12. Nanoparticles as drug delivery carriers
13. Mass Spectroscopy, Nuclear Magnetic Resonance

Laboratory/Tutorial Exercises

1. Optical Spectroscopy in the investigation of medical/biological systems.
2. Applications of Nuclear Magnetic Resonance Spectroscopy
3. Applications of Gas Chromatography and High-Performance Liquid Chromatography
4. Chemical biosensors
5. Application of immunoenzymatically method and evaluation of radioimmunoassay data method.
6. Applications of Atomic Force Microscopy in biological systems

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	In the classroom and in the Lab face to face.	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	Video recording and/or simulation of Molecular Histopathology - Oncology techniques	
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <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> <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>	Activity	Semester workload
	Lectures	45
	Laboratory/Tutorial	45
	Exercises	
	Writing Assignment	30
	Specialized seminars	30
	Writing Assignment	50
	Course total	200
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <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> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	1. Written final exam (100%) which includes: <ul style="list-style-type: none"> • Multiple choice questions • Short Answer Questions • Written exam in a selected thematic section • Laboratory work in techniques 2. Presentation of optional individual work (40%)	

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography: Greek <ol style="list-style-type: none"> 1. Clark John W. Jr., Neuman Michael R., Olson Walter H., «Ιατρική Οργανολογία, Εφαρμογή και Σχεδιασμός» (μετ. Ι. Βαλαής, Ν. Κοντοδημόπουλος, Ι. Λούκος), ISBN: 978-960-286-824-9, αρ. σελ. 751,1η έκδ. /2004. 2. Skoog, «Αρχές Ενόργανης Ανάλυσης», ISBN: 978-960-99858-1-9, αρ. σελ. 1088,1η έκδ./2010. Foreign <ol style="list-style-type: none"> 1. Sergio Caroli (Editor), Gyula Zaray (Editor), «Analytical Techniques for Clinical Chemistry: Methods and Applications», ISBN: 978-0-470-44527-3, 838 pages, August 2012. - Related academic journals: <ol style="list-style-type: none"> 1. Journal of Pharmaceutical and Biomedical Analysis 2. Journal of Chromatography B: Biomedical Sciences and Applications 3. Journal of Electron Spectroscopy and Related Phenomena 4. Journal of Microscopy and Ultrastructure 5. Journal of Molecular Spectroscopy 6. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 7. Spectrochimica Acta Part B: Atomic Spectroscopy
