



University of Nicosia, Cyprus

Course Code BISC-512	Course Title Bioanalytical and Diagnostic Technologies	ECTS Credits 8
Department Life and Health Sciences	Semester Spring	Prerequisites None
Type of Course Required	Field Biomedical Sciences	Language of Instruction English
Level of Course 2 st Cycle	Year of Study 1 st	Lecturer Dr. Demoliou Catherine
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

This course aims to provide a specialized understanding of fundamental techniques and contemporary molecular and proteomics tools that are used to analyze biological processes and molecules in state-of-the-art research and diagnosis. The main objectives of the course are to:

- Demonstrate how basic scientific principles and natural molecules have been used to develop products for analytical technology applications.
- Demonstrate how biological processes and nonotechnology have been adopted in the development of modern bioanalytical techniques in genomic and proteomic research.
- Demonstrate the scientific basis of modern instrumentation and the possibilities of database technology.
- Review scientific literature that shows current practices and advancements in the relevant fields of modern technologies used in biosciences.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. List the major categories of laboratory related chemical and biotechnology tools and account for their application in the analysis of biological samples.
2. Describe the function of basic analytical instruments and the principles of how they work in the isolation, analysis and characterization of cells, molecules, reactions and molecular interactions.
3. Relate modern nonotechnology and biotechnology products and applications to the physicochemical properties of biological macromolecules to be diagnosed/isolated.
4. Appraise the appropriateness of a specific biotechnology application/system for

molecular, cellular or whole tissue level identification/isolation.

5. Appraise the potential of analytical technology tools and data based technology in disease diagnosis
6. Review critically scientific literature and report on current practices in the relevant fields of analytical technology for biological samples.

Course Contents:

1. Tissue and cell isolation-characterization, functional studies on isolated cells
2. Separation and Analysis of biological materials (Ultracentrifugation)
3. Nonotechnology: Immobilized biomolecules in bioanalysis.
4. Fluorescence and chemiluminescence Principles and Technology
5. Flow Cytometry applications
6. Enzyme assay: Types, Kinetics, Inhibition
7. Separation and Analysis of biological materials (Electrophoresis)
8. Separation and Analysis of biological materials (Chromatography, Spectroscopy)
9. Automated DNA sequencing, in situ hybridization, DNA microarray
10. Protein sequencing strategies and analyses; proteomics
11. Biomolecular engineering and cell and tissue engineering
12. Biosensors
13. Drug delivery technology
14. Nuclear analytical methods in Life Sciences
15. Fluorescence, Electron and Atomic Force Microscopy

Learning Activities and Teaching Methods:

Lectures; presentations and discussions of biotechnology/nonotechnology examples from scientific literature. Cooperative learning. Demonstration: Familiarization with data/graphs of experimental output; video presentations of technological applications and analytical instruments used.

Assessment Methods:

Assignments/Exercises; Oral presentations and written reports; Mid-term and Final Exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Prakash Singh Bisen, Anjana Sharma	Introduction to Instrumentation in Life Sciences	September 26, 2012 by CRC Press	CRC Press; 2012	ISBN-10: 1466512407 ISBN-13: 978- 1466512405
Seamus Higson	Analytical Biotechnology	John Wiley & Sons Inc	2011, 1 st ed.	0470723068

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
D. P. Clark, Nanette Pazdernik	Biotechnology: Applying the Genetic Revolution	Academic Press	2008, 1st ed.	ISBN-10: 0121755525
Editor CHALLA S.S.R. KUMAR	Nanotechnologies for the Life Sciences	John Wiley and Sons, Inc	2012	Online ISBN: 9783527610419 DOI: 10.1002/9783527610419
Edited by: Claudia Plant and Christian Böhm	Database Technology for Life Sciences and Medicine	World Scientific Publishing Company	2010	ISBN: 978-981-4464- 81-9 (ebook) ISBN: 978-981-4307- 71-0 (ebook - Institutions Only)
Victor A. Gault, Neville H. McClenaghan	Understanding Bioanalytical Chemistry: Principles and Applications	Wiley	2009	ISBN: 978-0-470- 02907-7
<u>SABARI</u> <u>GHOSAL,</u> <u>A.K.</u> <u>SRIVASTAVA</u>	Fundamentals of Bioanalytical Techniques and Instrumentation [Kindle Edition]	PHI Learning Private Limited	(July 14, 2013)	ASIN: B00DY6FVDI