



University of Nicosia, Cyprus

Course Code BIOL-312	Course Title Analytical Biotechnology and Instrumentation	ECTS Credits 8
Department Life and Health Sciences	Semester Spring	Prerequisites BIOL-321, -322 Biochemistry I, II BIOL-311 Molecular Biology
Type of Course Required	Field Biology	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 3 rd or 4 th	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 contemporary analytical biotechnology, the instrumentation used and the impact of its applications on fields such as genomics and proteomics, medicine and the agricultural and pharmaceutical industries. The course covers a wide range of topics, some in more depth than others. The main objectives of the course are to:

- Draw from different disciplines and technologies to demonstrate how basic scientific principles translate into industrial, agricultural and medical/forensics analytical technology applications and products.
- Demonstrate how specific molecular biology and protein biochemistry principles relate to current biotechnology applications and instruments used in genomic and proteomic research, and in drug development.
- Provide an overview of modern instrumentation developed based on nanotechnology.
- Review scientific literature aimed at gaining an understanding of current practices and advancements in the relevant fields of modern biotechnology.

Learning Outcomes:

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

1. List the major categories of analytical biotechnology and use examples to demonstrate their application.
2. Describe the components and principles underpinning a range of analytical instruments developed to isolate, analyze and characterize biomolecules, reactions and molecular interactions.
3. Associate the development of modern biotechnology products and applications to the physicochemical properties of biological macromolecules.

4. Appraise the appropriateness of using a specific biotechnology application/system to carry out biological research at the molecular, cellular or whole tissue level.
5. Appraise the potential of analytical biotechnology in disease diagnosis and treatment and discuss the ethical issues related to biotechnology applications.
6. Review critically scientific literature and report on current practices in the relevant fields of analytical biotechnology.

Course Contents:

1. Immobilized biomolecules in bioanalysis and nanotechnology.
2. Fluorescence and chemiluminescence Technology
3. Separation and Analysis of biological materials (Ultracentrifugation)
4. Separation and Analysis of biological materials (Electrophoresis)
5. Separation and Analysis of biological materials (Chromatography, MS)
6. Automated DNA and protein sequencing
7. Monoclonal Antibodies Technology
8. Immunoanalytical Methods and Instrumentation
9. Flow Cytometry
10. Biosensors
11. Biochips; DNA/protein microarrays
12. Biomolecular engineering and cell and tissue engineering
13. Drug delivery technology
14. Nuclear analytical methods in Life Sciences
15. Electron and Atomic Force Microscopy

Learning Activities and Teaching Methods:

Lectures; presentations and discussions of biotechnology examples from scientific literature. Cooperative learning. Laboratory Demonstration: Familiarization with data/graphs of experimental output; video presentations of technological applications and analytical instruments used; on-site viewing of components and works of analytical laboratory instruments.

Assessment Methods:

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

Required 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

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Thomas G.M. Schalkham-mer	Analytical Biotechnology	Birkhäuser Basel	2002, 1 st ed.	3764365900

1. Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten	Molecular Biotechnology: Principles and Applications of Recombinant DNA	ASM Press	2009, 4 th ed.	1555814980
2. Seamus Higson	Analytical Biotechnology	John Wiley & Sons Inc	2011, 1 st ed.	0470723068