COURSE OUTLINE

1. GENERAL

SCHOOL	APPLIED BIOLOGY AND BIOTECHNOLOGY		
ACADEMIC UNIT	BIOTECHNOLOGY		
LEVEL OF STUDIES	BACHELOR OF SCIENCE		
COURSE CODE	**3180**	**SEMESTER**	6th (Summer)
COURSE TITLE	ANALYTICAL BIOTECHNOLOGY		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	0.12
Practical (lab work)	2	0.08
Group and/or individual works	1	0.04
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific background/Skills development/General and specialized knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-
COURSE WEBSITE (URL)	https://oeclass.aua.gr/eclass/courses/BIOTECH149/

2. LEARNING OUTCOMES

Learning outcomes

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.

Consult Appendix A
Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Are
Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B
Guidelines for writing Learning Outcomes

This course aims at acquiring knowledge on:

1) The basic principles of laboratory safety and security, management of laboratory waste and disposals.
2) The basic principles of chemometrics and sampling.
3) The evaluation of experimental data and errors, reliability and quality of laboratory measurements.
4) The rules of good laboratory practice, quality control and quality assurance procedures.
5) The basic principles of extraction and separation of biomolecules from various biological samples.
6) The analytical techniques used in the analysis of biomolecules and of the qualitative and quantitative analysis.
7) The selection and the evaluation the appropriate method for the study of unknown samples of biological interest.

8) Combine information from the different techniques for qualitative and quantitative analysis of complex biological samples.
9) The development of the appropriate method/laboratory protocol for the study of unknown samples of biological interest.
10) Designing research in analytical biotechnology.
11) Co-operation with other colleagues for the development of an analytical protocol/essay for the qualitative and quantitative analysis of a specific biological sample using multidisciplinary scientific literature.

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 situationsDecision-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…

1) Retrieve, analyze and synthesize data and information using contemporary technologies.
2) Make decisions.
3) Work autonomously.
4) Work in teams.
5) Create new research ideas.
6) Advance free, creative and causative thinking.

3. SYLLABUS

1. Safety management of analytical laboratory.
Safety rules for an analytical biotechnology laboratory.
Disposal and waste management.
Principles of Good Laboratory Practice.
Principles of Good Documentation Practice.

2. Evaluation and Treatment of Analytical Data.
Introduction to sampling and chemometrics for the optimization of analytical measurements.
Reliability of analytical methods.
Quality assurance and quality control of analytical data.
Errors and statistical treatment of analytical data.
Selection criteria and conditions for the development of analytical method and laboratory protocol.

3. Sample preparation.
Fundamentals of extraction - separation of biomolecules (wet extraction methods, solid phase extraction, extraction with supercritical fluids, ultrasound - microwave and, enzyme assistant extraction, dialysis, ultrafiltration, lyophilisation).

4. Methods and techniques.
Chromatography (physical chemistry, adsorption, distribution, reverse phase, gas chromatography, liquid chromatography)
Combined techniques (LC/MS, GC/MS , etc.)
Protein chromatography (methods and applications)
Electrophoretic analysis methods (isoelectric focusing, two-dimensional electrophoresis, capillary electrophoresis, immunoblotting)
Proteomics analysis
Enzymatic methods of analysis
High Throughput analytical nanosystems, protein nanostructures, magnetic nanoparticles
Atomic force microscopy and dynamic light scattering
Centrifugation techniques

5. Applications.
Specific applications and examples of analytical methods and protocols for biomolecules (e.g. carbohydrate/lipids, pesticides, natural products, drugs) with agricultural, industrial and clinical interest.

4. TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Power point presentations.
Discipline/subject specific software.
Email and internet platform (eclass).</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
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.

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</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39 h (1.56 ECTS)</td></tr><tr><td>Laboratory work</td><td>12 h (0.48 ECTS)</td></tr><tr><td>Group and/or individual works</td><td>13 h (0.52 ECTS)</td></tr><tr><td>Autonomous study</td><td>61 h (2.44 ECTS)</td></tr><tr><td>Total contact hours and training</td><td>125 h
(5 ECTS)</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMACE EVALUATION
Description of the evaluation procedure

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

Specifically-defined evaluation criteria are given and if and where are accessible to students.

,</td><td>I) Written final examination (60%), based on the lectures offered, containing:
- Multiple choice questions
- Theoretical knowledge questions
- Problems based on lecture material

II) Laboratory exercises/practical (30%). A written report for every laboratory exercise is required (see below).
- The average of the exercise grades counts 30% in the overall score of the course.

III. Group and/or individual assignments (homework) (10%).</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

-***Suggested bibliography:***

1) David G. Watson (2011), Φαρμακευτική Ανάλυση, Επιστημονικές Εκδόσεις Παρισιάνου Α.Ε.
2) P.R. Yadav (2005) Experimental Biotechnology, Discovery Publishing House.
3) Rodney F. Boyer (2000), Modern Experimental Biochemistry (3rd Edition) Addison Wesley Longman.
4) Keith Wilson and John Walker (2000) Principles and Techniques of Practical Biochemistry (5th edition), Cambridge University Press.
5) Clark jr. J.M. and Switzer R.L., (1992) Πειραματική Βιοχημεία, Πανεπιστημιακές Εκδόσεις Κρήτης, 1992.

6) Holme D. and Peck H. (2001) Analytical Biochemistry, Pearson Education Editions.

-***Suggested scientific journals***
Analytical chemistry
Analytical biochemistry
Nature biotechnology
Journal of Chromatography A
Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences