COURSE OUTLINE "APPLIED BIOTECNOLOGY"

1. GENERAL

SCHOOL	HEALTH SCIENCES		
DEPARTMENT	MOLECULAR BIOLOGY AND GENETICS		
STUDY LEVEL	ISCED LEVEL 6		
COURSE CODE	**MBG311**	**SEMESTER**	6th
COURSE TITLE	APPLIED BIOTECHNOLOGY		
TEACHING ACTIVITIES *In case credits are awarded to individual components of the course eg. Lectures, laboratory practicals, etc. If credit units are awarded for the whole course, indicate the weekly teaching hours and total credits*		**HOURS/WEEK**	**ECTS CREDITS**
		3	4
COURSE TYPE *General, Background, Scientific field course, Expertise Course, Skills Development etc*	SCIENTIFIC FIELD		
PREREQUISITE COURSES:	NO		
LANGUAGE OF TEACHING AND EXAMINATIONS:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://eclass.duth.gr/courses/ALEX01115/		

2. LEARNING OUTCOMES

Learning outcomes

Describe the learning outcomes of the course, the specific knowledge, skills and competencies that students will acquire after successfully completing the course. Refer to Appendix A.

• Description of learning outcomes for the course according to the level of study - refer to the European Higher Education Area Qualifications Framework

• Descriptive Indicators of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B Curriculum Vitae Summary Guide

The course objectives of the course are:

a) Understanding of the basic principles governing the science of enzyme and microbial biotechnology.

b) Understanding the basic principles of enzyme purification technology.

c) Understanding the basic principles of enzyme and cell immobilization.

d) Understanding the basic principles of enzyme and bioreactor kinetics.

e) Understanding the bioprocesses for the production of improved bio-products and the provision of services in the fields of health, food production, environmental protection, production of energy and agriculture.

Learning results:

Upon successful completion of the course the student will:

• Know the basic principles of enzyme and microbial biotechnology.

• Know and understand the basic principles of enzyme purification technology.

• Know and understand the basic principles of enzyme and cell immobilization.

• Know and understand the basic principles of enzyme and bioreactor kinetics.

• Know and understand the bioprocesses for the production of improved bio-products and the provision of services in the fields of health, food production, environmental protection, production of energy and agriculture.

• Know and understand the emerging technologies in biotechnology.

• Suggest solutions to biotechnology problems / questions, formulating hypotheses and designing appropriate methodological approaches.

General Skills

Which of the general competencies that the student will have acquired on the completion of the studies (see also the Diploma Supplement and below) are relevant to this course?

Research, analysis and synthesize of data and information, using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Team work
Work in an international environment
Work in an interdisciplinary environment
Production of new research ideas
Project design and management
Respect for diversity and multiculturalism
Respect for the natural environment
Development of social, professional and moral responsibility and gender sensitivity
Promotion of free, creative and inductive thinking

- Analysis and synthesis of data and information
- Creation of new research ideas
- Promote free, creative and inductive thinking

3. COURSE CONTENT

1. **Introduction to Enzymatic and Microbial Biotechnology.**
2. **Enzyme Purification Technology:** Down Stream Processing, Chromatographic Techniques (Size-exclusion chromatography, Ion-exchange chromatography, Affinity chromatography), Scale-up of liquid chromatography, Product formation.
3. **Enzymatic Kinetics:** Kinetic equations, Enzymatic reaction inhibition, Effect of temperature and pH on enzymatic reactions.
4. **Immobilized Biocatalysts:** Enzyme immobilization techniques, Cell immobilization techniques, Advantages of immobilization, Requirements of immobilization supports, Effect of immobilization on enzyme molecular and kinetic characteristics, Effect of immobilization on cell.
5. **Bioreactors:** Bioreactor types (Stirred batch bioreactors, Continuous stirred-tank bioreactors, Tower bioreactors, Fluidized bed bioreactors), Bioreactors kinetics, Air supply systems, The problem of foaming, Sterilization systems.
6. **Biotechnological Applications in the Food Industry:** Applications in the wine, brewing, bakery, cheese-making, edible oil and fruit industry.
7. **Degradation of Agro-Industrial Wastes - Production of High-Added Value Products:** Production of potable and energy ethanol from agro-industrial wastes, Enzymatic hydrolysis of starch, Enzymatic hydrolysis of cellulosic materials, Whey exploitation, Animal feed production.
8. **Applications of Biotechnology in the Production of Protein Products:** Single cell protein production, Production of aminoacids.
9. **Biological Treatment:** Aerobic and anaerobic treatment.
10. **Biotechnological Applications in Paper, Textile and Tanning Industry.**
11. **Analytical Applications:** Biosensors, Homogeneous and heterogeneous ELISA.
12. **Therapeutic and Pharmaceutical Applications:** Genetic disorders, Cancer treatment, Cardiovascular system problems, Antibiotic production, Insulin production.
13. **Introduction to Industrial Quality Management Systems (ISO) and Food Safety Management Systems (HAACP).**

4. TEACHING and LEARNING METHODS - EVALUATION

TYPE OF TRAINING *Face-to-face, Distance learning, etc..*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, and in communication with the students*	Use of ICT in teaching Use of ICT in communication with the students
MODES OF DELIVERY *Describe the teaching methods in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, practicum, 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*	Interactive teaching methods are used to assist the development of the student's scientific thinking. In this way, the student not only acquires new information and knowledge, but also develops the skills of experimental design and interpretation of results, while working with both his/her colleagues and the teacher at the same time.

Activity	***Workload/semester***
Lectures	40

Seminars	10	
Interactive learning	10	
Study visits	10	
Study & analysis of bibliography	50	
Course Total	**120**	

STUDENT PERFORMANCE EVALUATION *Describe of the methods of evaluation language, methods of evaluation, types of exams, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Are evaluation criteria known to the students?*	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** Written exam with multiple choice test (80%) Written Exam with Essay Development Questions (20%) The evaluation criteria are known to the students through the eclass platform.

5. SUGGESTED BIBLIOGRAPHY

1. Title: Enzyme Biotechnology.

Authors: I. Klonis.
Publisher: Foundation for Research and Technology-Crete University Press.
Publication year: 2010.
ISBN: 978-960-524-304-3.
Eudoxus code: 356.

2. Title: Biotechnology and Industrial Fermentations
Authors: H. Nerantzis, P. Tataridis, S. Logothetis.
Publisher: Stylianos Basileiadis.
Publication year: 2014.
ISBN: 978-960-8002-79-1.
Eudoxus code: 41956116.

Course Notes
Course notes are available through the e-class platform.
Title: Applied Biotechnology Notes. Authors: I. Kourkoutas. Publication date & place: Department of Molecular Biology & Genetics-DUTH, Alexandroupolis, 2010.