COURSE OUTLINE

1. GENERAL INFORMATION

SCHOOL	MARITIME AND INDUSTRIAL STUDIES		
DEPARTMENT	INDUSTRIAL MANAGEMENT AND TECHNOLOGY		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	TETEX04	**SEMESTER OF STUDY**	8th
COURSE TITLE	BIOTECHNOLOGY (ELECTIVE COURSE)		

INDEPENDENT TEACHING ACTIVITIES *in case in which credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory, Project		5.5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at section 4.		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Special background
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATION/ASSESSMENT:	Greek / English (in ERASMUS class)
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.unipi.gr/courses/BDT210/

2. LEARNING OUTCOMES

LEARNING OUTCOMES

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each qualifications' cycle, according to the European Higher Education Area's Qualification Framework.*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and APPENDIX B*
- *Guidelines for writing Learning Outcomes*

Emerging technologies in the areas of medical, environmental and molecular biotechnology will be discussed in the context of their potential impact on the directions of current products and services, product development, research techniques, and manufacturing processes. Through lectures, laboratories and a team project, students will gain an understanding of the biotechnology concepts and tools and how the rapidly evolving background science is being commercialized to advance global social, economic and environmental development.

Upon successful completion of the course, the students will be able to:

- Understand the extent and significance of worldwide biotechnology industry
- Use the science and technology that supports the main biotechnology sectors
- Acknowledge the possibilities granted by biotechnology for the production of goods
- Understand bioethical issues
- Demonstrate knowledge on the policy making process in national and international level
- Use the biotechnology methods and tools so that to work in this sector after their

graduation
- Manage quality systems and food safety
- Understand, from the managerial viewpoint, the tradeoff between innovation and investment risk in the biotechnology sector
- Understand and manage biosafety issues

Upon successful completion of the laboratory part, students will be able to:
- Construct and use models for the quality control of biotechnology products
- Treat and evaluate lab results from the control of materials of biological origin (enzyme kinetics, biosensor monitoring, simulation of bioprocesses, measuring of environmental parameters, molecular modeling)

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aims

Search for, analysis and synthesis of data and information, by the use of technologies that are necessary according the case
Adapting to new situations
Decision-making
Independent work
Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for difference and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical consciousness, criticism and self-criticism
Development of free, creative and inductive thinking

- Search for, analysis and synthesis of data and information, by the use of technologies that are necessary according the case
- Adapting to new situations
- Decision-making
- Independent work
- Team work
- Working in an international environment (ERASMUS)
- Working in an interdisciplinary environment (ERASMUS)
- Introduction of innovative research
- Respect for difference and multiculturalism
- Environmental awareness
- Social, professional and ethical responsibility and sensitivity to gender issues
- Critical consciousness, criticism and self-criticism
- Development of free, creative and inductive thinking

2. COURSE CONTENT

The course involves lectures and lab practice. The course is organized as follows:

Week	Topic
1	The technology of the biological systems and the industry of biotechnology. ▪ *Assignment of students to groups*.
2	Bioprocess engineering: bioreactors, design, optimization, scale up, mass transfer in biochemical systems, the foaming problem, sterilization methods. ▪ *Assignment of projects.*
3	Enzyme biotechnology: sources, immobilization, enzyme kinetics, deactivation, mechanisms of action, molecular design.
4	Microbial biotechnology: culture, cellular kinetics, biotransformations, determination of biomass and metabolites.
5	Biotechnology applications in the food industry: fermented foods and products, product preservation, fortified food products.

6	Quality management systems and food safety management in industry: Hazard Analysis & Critical Control Points (HACCP).
7	Environmental applications of biotechnology: environmental remediation, wastewater treatment, biomarkers, environmental metrology.
8	Pharmaceutical and medical biotechnology: biopharmaceuticals, targeted therapies, drug administration vehicles, modern diagnostics.
9	Biotechnology applications in industry: biocatalysts, bioprocesses, biomaterials, single-cell proteins.
10	Biotechnology in the agrifoods sector: cultivation and production, animal husbandry, hydroponics, genetically modified food, agrochemistry.
11	Biotechnology in the energy sector: biofuels.
12	Trends in biotechnology research: biosecurity, bioinformatics, blue biotechnology, biomedicine, bioagricultural economy, materials technology, nanotechnology. ▪ *Assignment due.*
13	Socio-economic dimensions and critical aspects of the biotechnology sector: policy, legislation, traceability, bioethics, intellectual property.

Students form three-member teams for doing a project on a specific topic. The available topics are posted at eclass by the 2nd week of lectures. Project specifications, evaluation criteria and examples are also posted at eclass.

Students also attend a laboratory training program in the Laboratory of Simulation of Industrial Processes in order to develop an intuitive and hands-on understanding of the concepts presented in the lectures, such as handling of diagnostic systems of biological origin, quality control, research, etc. The software used is MS EXCEL or equivalent (Open Office, etc.) as well as in house software. Students are trained in workshops with a rotation system. The workshop program is presented below:

Week	Laboratory Syllabus
3	Estimating kinetic parameters of enzyme reactions.
4	Optimization of biological wastewater treatment system.
5	Bioprocess simulation: penicillin production.
7	Determination of peroxide with peroxidase biosensor.
8	Simulation and control of metabolic pathways –Application of the Gepasi software.
9	Determination of wastewater BOD/COD.
12	Application of the pyMOL molecular modelling software in the investigation of enzyme structure.

In addition, articles, audiovisual lecture material, web addresses, useful information, exercises and case studies are posted at eclass.

3. TEACHING METHODS - ASSESSMENT

TEACHING MODE *Face-to-face, in-class lecturing, on distance teaching and distance learning etc.*	In-class lecturing / Laboratory teaching
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in Teaching, Laboratory Education, Communication with students*	**Teaching:** Lectures with audiovisual media, support of the learning process through the eclass platform **Laboratory Education:** Use of open access and specialized software for laboratory exercises **Communication with students:** face-to-face at office hours, email, eclass
COURSE DESIGN *Description of teaching techniques, practices and methods:*	

Activity / Method	***Semester Workload***
Lectures	39
Laboratory	13

Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, clinical practice, Art Workshop, Interactive teaching, Educational visits, project, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of non- directed study are given according to the principles of the ECTS*	Project: 50 Self-study of lecture material: 33 Counselling: 0.5 Exams (written): 2 Course Total: ***137.5***
STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice questionnaires, short- answer questions, open-ended questions, problem solving, written work, Essay/report, oral exam, public presentation, laboratory work, art interpretation, other……etc* *Evaluation criteria are specifically defined and given as well as if and where they are reported and accessible to students.*	**Language of exams:** Greek / English (in ERASMUS class) **Assessment Methods:** After the last lecture, the exam material is posted at eclass. The final course grade is formed as follows: • By the project (40%) • By the written exams (60%) taken in the examination period of the spring semester and, in case of failure, in the September resits The written examination includes problem solving/exercises, short-answer and open-ended questions. It is conducted with open books. The evaluation of students with special learning difficulties in writing and reading (as certified and qualified by a competent institution) is performed according to the relevant procedure decided by the Department Assembly. **Notification of the Assessment Criteria:** The evaluation criteria are made known during the first lecture and are clearly stated on the course website and e-class. The answers to the exam questions are posted at eclass after the exam date. Students have the opportunity to discuss their exam paper with the course instructor (at the posted office hours) after the announcement of the course grades.

4. SUGGESTED BIBLIOGRAPHY

-Suggested Bibliography :

- Book [86200256]: Biotechnology and Industrial Fermentations [in Greek], I. Nerantzis, P. Tataridis, S. Logothetis
- Book [18548933]: Processes in Biotechnology [in Greek], A. Zoumboulis, K.A. Matis .

-Scientific Journals: not applicable

-Lecture Notes

-Laboratory Workbook