COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	TECHNOLOGY		
DEPARTMENT	ENVIRONMENTAL SCIENCES		
LEVEL OF STUDY	*Undergraduate*		
COURSE UNIT CODE	NEW **COURSE**	**SEMESTER**	
COURSE TITLE	ENVIRONMENTAL MICROBIOLOGY		

INDEPENDENT TEACHING ACTIVITIES in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits	**WEEKLY TEACHNG HOURS**	**CREDITS**
THEORETICAL BACKGROUND	3	3
LABORATORY PRACTICE	2	2
TOTAL	5	5

COURSE TYPE Background knowledge, Scientific expertise, General Knowledge, Skills Development	Background Knowledge
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION &EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	-

(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 level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course the students are expected to

- *Acquire in depth knowledge and understanding of the cellular processes in microorganisms, prokaryotic and eukaryotic*
- *To get to know and acquire comprehensive knowledge of the different microbial life forms fond in the environment*
- *To acquire fundamental knowledge on the cultivation of microorganisms isolated from*

environmental matrices

- *To get a deep understanding of the role of microbes in ecosystem functioning*

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 aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness*
Adapting to new situations	*Social, professional and ethical responsibility and sensitivity to gender issues*
Decision-making	*Critical thinking*
Individual/Independent work	*Development of free, creative and inductive thinking* *……*
Group/Team work	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
Working in an international environment	*…….*
Working in an interdisciplinary environment	
Introduction of innovative research	

The teaching methods followed and the course content encourage:

1) The search, analysis and composing of information with the use of relevant technologies
2) Decision making upon critical evalution of data and information available
3) Independent working
4) Group working
5) Working in an international and multidisciplinary environment
6) Production of novel research ideas
7) Respect to environment and strengthening of environmental awareness
8) Liberal, constructive and inductive thinking

(3) COURSE CONTENT

The course will initially be a introduction to the general microbiology knowledge they have acquired through the course of BIOLOGY but this time with particular focus in the basic processes in microbial cells, the basic forms of microbial life in the environment (Bacteria, archae;a, fungi, viruses, protists) and how they grow and evolve in the environment. Following up there will be lectures with more focus on the role of microorganisms in ecosystem processes, the evolution mechanisms in the microbial world, the beneficial and pathogenic microorganisms. In particular

1. Introduction to microbiology – Fundamental definitions and overview of microbial life – forms of microbial growth in the environment (axenic cultures, microbial consortia, quorum sensing)
2. Cellular structure and function – biomolecules and their role
3. Basic cellular processes (transcription, translation, gene expression regulation)
4. Viruses and environment
5. Bacteria and Archaea in the environment
6. Fungi and their role in the environment
7. Protozoa and their role in the environment
8. Microbial genomics
9. Microbial evolutionary mechansisms – plasmid and mobile genetic elements – antbiotic resistance and dispersal mechanisms

10. Microbiome (basic terms, structure, function and analysis) and its role in human health and agriculture
11. The role of microorganisms in the ecosystem functioning (cycle of N, P, C, S and Fe)
12. Beneficial and pathogenic microbes

Practicals

1. Fundamentals in the cultivation of microorganisms
2. Microscopy
3. Isolation of bacteria and fungi from samples
4. DNA extraction from microbial cells and environmental samples - fundamentals
5. Molecular fingerprinting of microorganisms (Computer – based practical)
6. Molecular fingerprinting of microbial communities in environmental samples (DGGE)
7. Determination of potential nitrification in soil samples (N cycling)
8. Determination of microbial respiration in soil samples

(4) TEACHING METHODS-ASSESSMENT

MODES OF DELIVERY **Face-to-face, in-class lecturing, distance teaching and distance learning etc.**	In-class lecturing, face to face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY **Use of ICT in teaching, Laboratory Education, Communication with students**	Use of power point presentations Email communication with students Upload of literature, examination papers and teaching material through e-class
COURSE DESIGN **Description of teaching techniques, practices and methods:** **Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.** **The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.**	

Activity/Method	***Semester workload***
Lectures	39
Laboratory work	26
Theory study	35
Weekly individual evaluation reports for laboratory exercises	25
Course total (25 hours of workload per credit unit)	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS **Detailed description of the evaluation procedures:** **Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral**	**Students performance evaluation** • Through written exams at the end of the semester 80% of the final grade • The mean grades of students assignments in the frame of laboratory practicals contributes 20% of the final grade

exam, presentation, laboratory work, other……etc. **Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.**	

(5) SUGGESTED BIBLIOGRAPHY:

-***Suggested bibliography***

- BROCK: Biology of Microorganisms, Volume I, MICHAEL T. MADIGAN JOHN M. MARTINKO JACK PARKER
- BROCK: Biology of Microorganisms, Volume II, MICHAEL T. MADIGANJOHN M. MARTINKO JACK PARKER
- Environmental Microbiology, Ntougias Spyridon, Aivatzlidis Alexandros, Melidis Paraschos (EMBRYO Publishing)

-***Complementary bibliography***

Lecture notes: presentations of the lectures and of the lab practicals are available in the e-class platform for all students to download