COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Technology		
ACADEMIC UNIT	Department of Environmental Sciences		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**AY301**	**SEMESTER**	**3rd**
COURSE TITLE	**ENVIRONMENTAL MICROBIOLOGY**		
INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**		**CREDITS**
Teaching Hours	5		5
COURSE TYPE	General Background		
PREREQUISITE COURSES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/ENV_U_116		

(2) LEARNING OUTCOMES

Learning outcomes

Prokaryotic and eukaryotic unicellular organisms are the most abundant life forms in the biosphere. Microorganisms interact extensively with the natural environment and play crucial roles in the biogeochemical cycles of elements and the evolution of life on our planet. Microorganisms are involved in metabolic processes, which influence terrestrial and aquatic ecosystems, such as phototrophy, chemolithotrophy, anaerobic metabolism, competition for nutrients, symbiosis, and predation. These processes not only impact on the micro-scale of the ecosystems where the microorganisms reside but they also have global implications. The course introduces students to the primary groups of microorganisms found in the environment and helps them explore the mechanisms of interaction among microorganisms themselves and with higher organisms such as animals and plants. Emphasis is placed on studying microorganism groups that contribute significantly to environmental protection and the overall ecosystem functioning.

Upon successful completion of the course, students will have acquired the following specific knowledge, skills, and competences:

- Familiarity with various life forms and thorough understanding of environmental microorganisms.
- Comprehension of microorganisms' interactions with biotic and abiotic environments.
- Recognition of microorganisms' role in the ecosystem functioning, and the prevention of environmental degradation.
- Proficiency in utilizing new technologies and methodological tools to address key questions in Environmental Microbiology and Microbial Ecology.

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Team work
- Working in an interdisciplinary environment
- Production of new research ideas
- Respect for the natural environment
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

- Introductory concepts. Principles of Environmental Microbiology and Microbial Ecology.

- Microbial Diversity: Diversity of Bacteria, Archaea and Eukaryotic Microorganisms.
- Metabolic diversity of microorganisms.
- Methods of Environmental Microbiology and Microbial Ecology.
- Microbial ecosystems.
- The physico-chemical environment of microorganisms.
- Interactions between microbial populations.
- Interactions between microorganisms and plants – animals.
- Role of microorganisms in nutrient recycling (nitrogen, phosphorus, carbon, sulphur, iron cycles); (ii) in detoxification of pollutants in the environment; (iii) in waste treatment (iv) in the recovery of minerals.

Laboratory exercises:

- Isolation of bacteria and fungi from environmental samples.
- DNA extraction from microbial cells and environmental samples.
- Polymerase Chain Reaction (PCR).
- Molecular identification of microorganisms.
- Measurement of potential nitrification rate in soil samples (N cycle).
- Measurement of microbial respiration rate in soil samples.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>• Use of PowerPoint slides
• View material in video
• Accessing and utilizing resources from websites
• Communication with students via e-mail
• Use of asynchronous distance learning (e-class)</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory practice</td><td>26</td></tr>
<tr><td>Study and analysis of bibliography</td><td>35</td></tr>
<tr><td>Essay writing</td><td>25</td></tr>
<tr><td>Course total
(25 hours workload per credit)</td><td>125</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students' performance is evaluated in the Greek language. The final grade is determined by:
• A written exam (at the end of the semester) that contributes 80% to the final grade, applying one or more of the following evaluation methods: Multiple-choice questions, short-answer questions, true/false, fill in the blanks, matching.
• The students' participation in laboratory practice activities, and the preparation and delivery of related assignments, during the semester, that contributes 20% to the final grade.
Final Grade = 80% Exam Grade + 20% Assignments Grade</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

- Dougias, Spyridon, Aivazidis, Alexandros, & Melidis, Paraschos (2012) *Environmental Microbiology.* Athens: Embryo Publications. ISBN: 978-960-524-634-1. (in Greek)
- Kirchman, David L. (2021) *Processes in Microbial Ecology* (2nd ed). Heraklion: Crete University Press, Foundation for Research and Technology Hellas. ISBN: 978-960-524-523-8. (in Greek)
- Madigan, M.T., Martinko, J.M., Bender, K.S., Buckley, D.H. & Stahl, D.A. (2023) *Brock Biology of Microorganisms*. Heraklion: Crete University Press, Foundation for Research and Technology Hellas. ISBN: 978-960-524-523-8. (in Greek)
- Pepper, Ian L., Gerba, Charles P., and Gentry, Terry J. (2014) *Environmental Microbiology* (3rd ed). Cambridge, MA: Elsevier Academic Press. ISBN-13:978-0123946263.