COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Technology		
ACADEMIC UNIT	Department of Environmental Sciences		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**AY205**	**SEMESTER**	**2nd**
COURSE TITLE	**GENERAL 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	No		
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/ENV_U_186		

(2) LEARNING OUTCOMES

Learning outcomes

The course introduces students to the basic concepts of Microbiology. The main objective of the course is for students to understand the structure and function of microorganisms and their impacts on the environment and the living organisms. Applications of microorganisms in medicine, agriculture, biotechnology and the environment are examined. Upon successful completion of the course, students will be able to:

- Understand the basic principles and concepts of Microbiology, mainly concerning the structure and function of the prokaryotic cell.
- Comprehend the principles of microbial nutrition and growth, as well as their environmental impacts, along with the mechanisms controlling microbial growth and their connection to the environment.
- Identify the basic metabolic pathways of microorganisms and the fundamental mechanisms regulating their metabolism.
- Understand issues of bacterial genetics and their significance in the evolution and ecology of microorganisms, as well as the utilization of these mechanisms in biotechnology.
- Evaluate contemporary issues and applications of Microbiology in Medicine, the environment, agriculture, waste management, etc.
- Apply the knowledge gained in the course to other subjects in subsequent semesters, such as Environmental Microbiology, Environmental Biotechnology, Ecological Engineering, etc.
- Apply basic methods of isolation, counting, identification, and standardization of microorganisms from various samples such as water, sewage, food, etc.

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Team work
- Production of new research ideas
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

Theory:

- Introductory concepts - Historical framework of Microbiology.
- Microscopy. Structure and function of prokaryotic cells. Cell membranes and cell walls. Structure and function of eukaryotic cells. Movement of microorganisms.
- Microbial growth. Measurement of microbial growth. Nutrition and laboratory cultures. Environmental

impacts of microbial growth.

- Control of microbial growth. Chemical control and control of microbial growth in the environment.
- Theory and practice of microbial growth. Environmental impacts on microbial growth.
- Microbial metabolism. Enzymes and activity. Energy conservation. Oxidation-reduction reactions, respiration, fermentations. Biosynthesis.
- Molecular Microbiology: replication, transcription, and translation in bacteria.
- Metabolic Regulation of Bacteria.
- Bacterial Genetics. Mutations, recombination, transformation, transduction, conjugation.
- Microbial genomics. Genome sequencing, Bioinformatics, Metabolomics, Metagenomics. Evolution of genomes.
- Viruses. Structure of viruses and virions. Life cycle of viruses. Viral diversity and ecology. Viroids and prions.
- Basic methods for detection and identification of microorganisms.

Laboratories – Seminars:

- Principles of laboratory safety in microbiology.
- Simple and complex staining of bacteria. Gram staining.
- Cultivation of bacteria in liquid and solid nutrient media. Aseptic technique.
- Methods for bacterial counting. Plate counting. Measurement by photometry.
- Method for bacterial counting by serial dilutions. Calculation of cfu/ml.
- Evaluation of antimicrobial action of disinfectants and antiseptics.
- Identification of Bacteria. Biochemical tests for bacteria.

(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
• 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>Seminars</td><td>12</td></tr>
<tr><td>Laboratory practice</td><td>14</td></tr>
<tr><td>Study and analysis of bibliography</td><td>46</td></tr>
<tr><td>Essay writing</td><td>14</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 examination at the end of the semester, only if the laboratory exercises have been completed successfully.
• The evaluation of the laboratory practice which includes: completion of laboratory exercises, submission of a written report for each laboratory exercise, and a written examination.
Final Grade = 70% Theory Exam Grade + 30% Laboratory Grade</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

- Angelis, G., (2017) *Microbiology and Microbial Technology*. Athens: UNIBOOKS-Stamoulis Publications.
- Michael T.M., John, M., Kelly, S., Buckley, D.H. & Stahl, D.A., (2018) *Brock Biology of Microorganisms*. Heraklion: Crete University Press, Foundation for Research and Technology Hellas. (in Greek)
- Tortora, J. G., Funke, B. & Case, C. (2017) *Microbiology: An Introduction*. Nicosia: Broken Hill Publishers Ltd. (in Greek)
- Willey, J. M. (2023) *Prescott's Microbiology*. Nicosia: Broken Hill Publishers Ltd.