COURSE OUTLINE

(1) GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	BIOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	BIO_ZY02	**SEMESTER**	3
COURSE TITLE	MICROBIOLOGY		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory exercises	3L; 3LE	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific area
PREREQUISITE COURSES:	There are no prerequisite courses. Knowledge of General Biology, Biochemistry and Molecular Biology is desirable.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/BIO240/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

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

The course aims in understanding the organization and structure of the prokaryotic and eukaryotic cell and the viruses. Understanding the molecular biology of microorganisms and the mechanisms they use to produce energy. Understanding the importance of microorganisms for environmental processes and industrial production and the relationships they develop with other organisms. Students will be trained in Biology of important microbial genera (bacteria, fungi) and viruses.

At the laboratory level, students will be trained in media preparation, isolation of microorganisms from the environment and their cultivation in the laboratory. They will gain experience to distinguish cultures of fungi, yeasts and bacteria. They will be trained in assessing the density of microbial populations in food, microscopy of pure cultures, cell staining and the biological cycle of representative genera. They will be trained in quantitative estimation of bacterial susceptibility to antibiotics (antibiotic technique).

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

• know the structural, molecular, biochemical and physiological characteristics of microorganisms

• know the importance of micro-organisms for the environment and industry

• use basic microbiological techniques (aseptic techniques, microscopy, isolation, cultivation,

staining, etc.) and handle microbial crops.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Autonomous Work
- Teamwork
- Production of new ideas for research work
- Respect for the natural environment

(3) SYLLABUS

1. Introduction. Evolution of the science of microbiology.
2. Organization and structure of the microbial cell.

a) The prokaryotic cell. Cytoplasmic membrane of bacteria and archaea: structure and chemical composition, functional role. Cell wall of bacteria. Gram stain. Gram positive and negative bacteria. The action of lysozyme and penicillin. Cell wall of archaea. Capsule, slime and S layer. Reserve material. Flagellum. Chemotaxis, magnetotactism, phototactism. Pili, prosthecae. Endospore. Chromosomes and plasmids. Ribosomes.

b) The eukaryotic cell. Brief reference to membrane, wall, mitochondria and chloroplasts, endoplasmic reticulum and Golgi apparatus, vacuoles and storage materials, lysosomes, cytoskeleton, flagellum and cilia, spores, nucleus, ribosomes. Comparisons with the prokaryotic cell.

3. Molecular biology of microorganisms. Duplication of DNA and cell division. Gene expression. Regulation of gene expression. Transfer of DNA to bacterial cells. Plasmid transfer, transformation, transduction, conjugation.
4. Energy production in aerobic microorganisms. Production of energy in anaerobic microorganisms. Chemoautrophy. Photoautrophy. Methanogenesis. Nitrogen metabolism.
5. The phenomenon of microbial growth. Introductory concepts. Mathematical models. The equation of Monod.
6. Microorganisms without cellular organization.

7. The microbial world. Hierarchical classification and taxonomic unit. Bacteria: Spirochaetes, *Azospirillum, Bdellovibrio, Pseudomonas, Azotobacter, Rhizobium, Agrobacterium, Escherichia, Salmonella, Shigella, Vibrio, Photobacterium, Micrococcus, Staphylococcus, Streptococcus, Leuconostoc, Bacillus, Clostridium, Lactobacillus*. Archaea: Methanogens. Fungi: Introduction. Chytridiomycota - Genus *Alomyces*. Zygomycota - Zygomycetes - *Rhizopus, Mucor*. Mycorrhizae. Ascomycota - *Aspergillus, Penicillium, Claviceps, Tuber, Morchella*. Order of Saccharomycetales, *Saccharomyces* and related. Basidiomycota. Hynenomycetes. *Agaricus* and related. Fungus of white and brown rot. Urediniomycetes - The rust fungi. Ustilaginomycetes - Coals. Microorganisms studied with fungi. Oomycota - Phytophthora genus. Animal viruses (Adenoviruses, Retroviruses), Plant Viruses [Tobacco Mosaic Virus], Bacterial Virus [Phage T4, Phage λ].

8. The microbial culture. Introductory concepts. Batch systems. Cell growth and yield. The continuous culture. Single stage chemostat.

Methodology and Implementation of the teaching and pedagogical approach in Microbiology.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>In the classroom and in the laboratory</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Lectures using PC - Microsoft PowerPoint</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, 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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>26 (39 ώρες)</td></tr>
<tr><td>Laboratory Exercises in groups of 30 students</td><td>13 (39 ώρες)</td></tr>
<tr><td>Independent Study</td><td>72 ώρες</td></tr>
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<tr><td>Course total</td><td>150</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Student assessment includes:
• Written final examination with questions and exercises on the subject and practical examination in the laboratory (80%)
• Individual work during the semester (20%)</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:* «Microbiology and Microbial Technology» 2nd Edition, G. Aggelis, Unibooks Publishers, Athens 2017

- *Related academic journals:* International scientific journals