COURSE OUTLINE "MOLECULAR MICROBIOLOGY"

1. GENERAL

SCHOOL	HEALTH SCIENCES		
DEPARTMENT	MOLECULAR BIOLOGY AND GENETICS		
STUDY LEVEL	ISCED LEVEL 6		
COURSE CODE	**MBG215**	**SEMESTER**	3rd
COURSE TITLE	MOLECULAR MICROBIOLOGY		
TEACHING ACTIVITIES *In case credits are awarded to individual components of the course eg. Lectures, laboratory practicals, etc. If credit units are awarded for the whole course, indicate the weekly teaching hours and total credits*		**HOURS/WEEK**	**ECTS CREDITS**
		3	4
COURSE TYPE *General, Background, Scientific field course, Expertise Course, Skills Development etc*	SCIENTIFIC FIELD		
PREREQUISITE COURSES:	NO		
LANGUAGE OF TEACHING AND EXAMINATIONS:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://eclass.duth.gr/courses/ALEX01117/		

2. LEARNING OUTCOMES

Learning outcomes

Describe the learning outcomes of the course, the specific knowledge, skills and competencies that students will acquire after successfully completing the course. Refer to Appendix A.

• Description of learning outcomes for the course according to the level of study - refer to the European Higher Education Area Qualifications Framework

• Descriptive Indicators of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B Curriculum Vitae Summary Guide

The course objectives of the course are:

a) Understanding of the basic principles governing the science of microbiology.

b) Understanding the molecular mechanisms that govern the structure, function and integration of microorganisms into their environment.

c) Understanding microbial life at the molecular level and clarifying the complete genetic "recipe" of microorganisms (genomic analysis).

d) Understanding the fundamental social and economic applications in medicine, industry, agriculture and biotechnology.

Learning results:

Upon successful completion of the course the student will:

• Know the basic principles of microbiology.

• Understand microbial life at the molecular level.

• Know and understand the basic molecular mechanisms that govern the structure, function and integration of microorganisms into their environment.

• Understand the evolutionary microbial associations.

• Understand the potential of micro-organisms in biotechnological applications.

• Understand the integral role of microorganisms in human biology.

• Know and understand the emerging technologies in Microbiology.

• Suggest solutions to microbiology problems / questions, formulating hypotheses and designing appropriate methodological approaches.

General Skills

Which of the general competencies that the student will have acquired on the completion of the studies (see also the Diploma Supplement and below) are relevant to this course?

Research, analysis and synthesize of data and information, using the necessary technologies	*Work in an interdisciplinary environment*
Adaptation to new situations	*Production of new research ideas*
Decision making	*Project design and management*
Autonomous work	*Respect for diversity and multiculturalism*
Team work	*Respect for the natural environment*
Work in an international environment	*Development of social, professional and moral responsibility and gender sensitivity*

Promotion of free, creative and inductive thinking

- Analysis and synthesis of data and information.
- Creation of new research ideas.
- Promote free, creative and inductive thinking.
- Decision making.

3. COURSE CONTENT

1. **Microorganisms and Microbiology.** Overview of microbial life, Microbial macromolecules.
2. **Cell Structure and Function:** Cell morphology, Prokaryotic cell wall, Microbial movement, Surface structures and prokaryotic inclusions, Endospores.
3. **Nutrition, Laboratory Cultivation and Metabolism of Microorganisms.**
4. **Microbial Growth:** Cell Growth, Environmental Impacts on Microbial Growth.
5. **Microbial Evolution**: Primitive Life: The World of RNA, Endosymbiosis, Biological Classification Systems, New Classification Methods, Evolutionary History Timers, The Species Concept.
6. **Classification of Bacteria-Part I:** Proteobacteria: Nitrifying bacteria, Sulphur-oxidizing and Iron-oxidizing bacteria, Hydrogen-oxidizing bacteria, Methanotrophic and Methyltrophic bacteria, *Pseudomonas*, Acetic acid bacteria, Non-symbiotic aerobic nitrogen-binding bacteria, Enterobacteria, Ricketssia, Filamentous bacteria, Myxobacteria, Sulfate and Sulfur-reducing Proteobacteria. Gram (+) bacteria: *Staphylococcus*, Lactic acid bacteria.
7. **Classification of Bacteria-Part II:** *Listeria*, *Bacillus*, *Clostridium*, *Mycoplasma*, Corynebacteria, Propionic acid bacteria, Mycobacteria, *Streptomyces*. Cyanobacteria, *Chlamydia*, Verrucomicrobia, Flavobacteria, *Cytophaga*, Green sulfur bacteria, Spirochetes, Deinococci, Green non-sulfur bacteria, Hyperthermophiles with early phylogenetic branches.
8. **Classification of Archaea:** Crenarchaeota, Euryarchaeota, Evolution and life at high temperatures.
9. **Classification of Eukaryotic Microorganisms:** Overview of eukaryotic genetics, Protozoa, Fungi, Algae.
10. **Virology:** General properties of viruses, virus quantification, viral proliferation, bacteriophages, animal viruses, retro-viruses, viruses and prion proteins.
11. **Control of Microbial Growth-Antimicrobial Factors:** Determination of antimicrobial activity, Antiseptics, disinfectants, and sterilizers, Synthetic antimicrobial drugs (growth factor analogs, quinolones), Natural antimicrobial drugs-Antibiotics (antibiotics affecting protein synthesis, antibiotics affecting transcription, β-Lactam antibiotics, Prokaryotic antibiotics, Antifungal drugs, New antibiotics), Antiviral drugs, Antimicrobial resistance, Research on new antimicrobial drugs.
12. **Pathogenesis of Microorganisms-Microbial Toxins:** Pathogenicity and Infection, Adhesion, Invasion, Infection and infectious factors, Toxins, Host factors in infection and disease.
13. **Biotechnological Microbial Applications:** Bacteria applications, Yeast applications, Antibiotic production, Enzymes production.

4. TEACHING and LEARNING METHODS - EVALUATION

TYPE OF TRAINING *Face-to-face, Distance learning, etc..*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, and in communication with the students*	Use of ICT in Teaching Use of ICT in Laboratory Education Use of ICT in Communication with students
MODES OF DELIVERY *Describe the teaching methods in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, practicum, 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*	Interactive teaching methods are used to assist the development of the student's scientific thinking. In this way, the student not only acquires new information and knowledge, but also develops the skills of experimental design and interpretation of results, while working with both his colleagues and the teacher at the same time.

Activity	***Workload/semester***
Lectures	40
Interactive teaching	40
Study and analysis of	40
Course Total	**120**

STUDENT PERFORMANCE EVALUATION *Describe of the methods of evaluation language, methods of evaluation, types of exams, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Are evaluation criteria known to the students?*	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** Written exam with multiple choice test (80%) Written Exam with Essay Development Questions (20%) The evaluation criteria are known to the students through the *e-class* platform.

5. SUGGESTED BIBLIOGRAPHY

1. Title: Brock Biology of Microorganisms.

Authors: M. T. Madigan, J.M. Martinko, K. S. Bender, D. H. Buckley & D. A. Stahl.

Publisher: Foundation for Research and Technology-Crete University Press.

Publication year: 2018.

ISBN: 978-960-524-523-8.

Eudoxus code: 77106995.

2. Title: Microbiology and Microbial Technology.

Authors: G. Aggelis.

Publisher: Stamoulis Publications S.A.

Publication year: 2007.

ISBN: 978-960-351-717-7.

Eudoxus code: 22904.

Course Notes

Course notes are available through the *e-class* platform.

1. Title: Molecular Microbiology Notes.

Authors: I. Kourkoutas.

Publication date & place: Department of Molecular Biology & Genetics-DUTH, Alexandroupolis, 2010.