



MICROBIOLOGY (2015-16)

GENERAL INFORMATION

Code 26524

ECTS Credits 6

Departments and areas

Department	Area	Area	Report R.
PHYSIOLOGY, GENETICS AND MICROBIOLOGY	MICROBIOLOGY	YES	YES

Studies

DEGREE IN MARINE SCIENCES

DEGREE IN BIOLOGY

Context of subject

Microbiology is the branch of Biology that focuses on the study of microbes. The goal of this subject is to provide a basic vision of the essential characteristics of microorganisms, with special emphasis on prokaryotic microbes (Bacteria and Archaea) and viruses. Microbiology is taught during the third semester of Biology and Sea Sciences Degrees, after the students have taken the basic subjects needed to the correct understanding of this matter.

Microbes are the most abundant living organisms on Earth and constitute a significant part of its biomass. Through their central role in biogeochemical cycles (some processes such as nitrogen fixation or methanogenesis are exclusively carried out by prokaryotes), microbes have an essential role in the global functioning of the planet and help to the sustainable development of the biosphere. Moreover, they play a very relevant function in human activities, either as human pathogens or protecting humans from infection, and can be used in processes related to economic and environmental interests. Microbes are also important tools for the study of evolution and diversification of living organisms.

The knowledge of Microbiology is a key for the comprehension of life and is an instrumental subject for the basic training of future biologists and sea scientists. Furthermore, Microbiology is especially required for the professional activity within sanitary fields (laboratories for disease diagnoses or food safety, for instance), industrial activities and research areas (spanning from Molecular Microbiology to Microbial Ecology).



OBJECTIVES

Subject objectives/competences (2015-16)

- To identify microbes as the most abundant and diverse living organisms on Earth
- To know the diversity and ubiquity of microorganisms



CONTENTS

Theoretical and practical contents (2015-16)

LECTURE PROGRAM

Lecture 1. Microbiology. Concept of Microbiology. History of Microbiology. Abundance and significance of microorganisms. Classification. The three domains. Taxonomy and phylogeny. Molecular clocks. Evolution and diversity of microorganisms.

Lecture 2. Structure and function of the prokaryotic cell. Morphology. Cytoplasm and prokaryotic organelles. Cytoplasmic membrane in prokaryotes. Prokaryotic cell walls. External structures. Prokaryotic mobility. The bacterial endospore.

Lecture 3. Microbial metabolism. Energy and carbon sources. Metabolic categories. Respiration. Fermentation. Prokaryotic photosynthesis. Chemolithotrophy. Autotrophy. Nitrogen fixation.

Lecture 4. Microbial growth. Cellular division in prokaryotes. Batch and continuous cultures. Factors affecting microbial growth. Microbial growth control. Culture media. The aseptic technique. Extremophiles. Strategies for survival.

Lecture 5. Genetics of prokaryotes. The prokaryotic genome. Chromosomes and plasmids. Genomics and metagenomics. Lateral gene transfer mechanisms: transformation, conjugation and transduction. Transposable elements. Genetic engineering.

Lecture 6. The Bacteria domain. Diversity and phylogeny of Bacteria domain. Applied and environmental significance. Phylum Cyanobacteria. Phylum Proteobacteria. Phylum Spirochaetes. Phylum Bacteroidetes. Phylum Actinobacteria. Phylum Chlamydiae. Phylum Firmicutes. Phylum Tenericutes. Other phyla.

Lecture 7. The Archaea domain. Diversity and phylogeny of Archaea domain. Applied and environmental significance. Phylum Euryarchaeota. Superphylum 'DPANN?'. Superphylum 'TACK'.

Lecture 8. Microorganisms of the Eukarya domain. Eukaryotic microbes. Applied and environmental significance.

Lecture 9. Viruses. The 'viriosphere'. General properties of viruses. Strategies of virus replication and synthesis of components. Prokaryotic and eukaryotic viruses. Viral lifecycles. Techniques for studying viruses. Applied and medical significance. Subviral agents.

LABORATORY SESSIONS

Practical lesson (PL) 1. Preparation of culture media

PL 2. Techniques of isolation, plating and incubation of microorganisms

PL 3. Ubiquity of microorganisms

PL 4. Sterility and contamination

PL 5. Microbial growth

PL 6. Effect of ventilation and antibiotics on microbial growth

PL 7. Bacterial identification

PL 8. Antimicrobial agents' valuation

PL 9. Bacteriophage infection

EVALUATION

Instruments and criteria of Evaluation 2015-16

Evaluation

There are two blocks: continuous evaluation (CE) and final written exam (FE) that contribute each 50% to the final mark.

CE includes the following activities, with their respective contribution to the final mark:

- Laboratory written exam (20%)
- Laboratory oral presentation (10%)
- Laboratory practical skills (5%)
- Case solving activities ("tutorías grupales") (5%)
- Written exercises on Metabolism and Biogeochemical Cycles (10%)

FE includes questions on the contents of the case solving activities and the lectures. It will include multiple choice, short answer and short essay questions

In order to pass the subject, a 4 over 10 is needed both in CE and FE, and both marks averaged have to be ≥ 5 . If the average of both marks is ≥ 5 but one of the individual marks of CE and FE is ≤ 4 , the final mark will be the lowest of both.

Important remarks:

• The assistance to the lab and case solving sessions, as indicated in the schedule provided by the University, is mandatory. Only in extraordinary cases the students missing some sessions will be allocated in other groups.

• EC marks will be kept during two academic years although the students can repeat the activities and the corresponding exams if they wish to do so.

• During the extraordinary calls (July and December) the student will be able to repeat only the FE and will keep the previous CE marks. Those students with marks ≤ 4 (over 10) in the previous CE will have to take also a written exam on the lab sessions contents.

• The chronogram only reflects the activities corresponding to the student of a given lab group and has to be adapted accordingly to the specific schedules of the individual groups.

Type	Criterion	Description	Ponderation
FINAL TEST	Examen escrito individual donde se evaluará el aprendizaje de los contenidos de las clases teóricas y tutorías grupales	PRUEBA FINAL	50
ACTIVITIES OF EVALUATION DURING THE SEMESTER			5
ACTIVITIES OF EVALUATION DURING THE SEMESTER			10
ACTIVITIES OF EVALUATION DURING THE SEMESTER			5
ACTIVITIES OF EVALUATION DURING THE SEMESTER			30

