

COURSE: Applied Microbiology

ACADEMIC YEAR: 2019-2020

TYPE OF EDUCATIONAL ACTIVITY: Characteristic

LECTURER: Prof. Annamaria Ricciardi

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mobile (optional):

Language: Italian

ECTS: 6 (5 Lectures + 1
practicals)

56 hours: 40 h lectures + 16
h practicals

Campus: Potenza
Dept./School: School of
Agriculture, Forest, Food and
Environmental Sciences

Semester: 1

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

This is a course of general microbiology applied microbiology, with particular reference to dairy and oenological production

- **knowledge and understanding:** differences between prokaryotic and eukaryotic cells; structure and function of microbic cells; microbial metabolism and genetic; microbial growth; factors influencing the growth and the survival of microorganisms; microbial taxonomy; microbial ecology of agricultural foods (dairy and oenological), with particular reference to the fermented foods .
- **applying knowledge and understanding :** ability to use the general microbial techniques techniques (optical microscopy, cell count methods, simple and differential staining, media preparation, isolation of microorganisms from foods). Ability to analyze the role of microorganisms in the production of fermented foods.
- **making judgements:** ability to identify the (positive and negative) role of microorganisms in the production of foods (fermented and not)
- **communication skills :** ability to communicate briefly written texts as learned in the course. Ability to present laboratory experiences with an oral presentation or a lab notebook. Ability to communicate the impact of microorganisms on food production.
- **learning skill:** ability to document on the topics of general and applied microbiology, with particular reference to fermented foods

PRE-REQUIREMENTS

To understand the material presented in this course the following knowledges and skills are needed: general and inorganic chemistry, organic chemistry, physics and mathematics.

SYLLABUS

The group is divided in 6 teaching blocks..

Block 1. Introduction to the course. Structure of microorganisms cells (4 h, lectures)

Distinctions between eukaryotic cells and prokaryotic cell; virus. Basic knowledge on the structure and function of microbial cells (prokaryotic and eukaryotic): capsule, wall membrane, pili and flagella, ribosomes, nucleoid, organelles delimited by non unitary membranes.

Block 2. Nutrition, Growth of microorganisms (6 h, lectures)

Growth, differentiation, formation of endospores. Laboratory media for microbial growth. Methods for the assessment of the growth of microorganisms. Factors influencing the growth and survival of microorganisms: pH, water activity, nutrient availability, temperature, oxygen..

Block 3. Genetics and metabolism of microorganisms. Elements of microbial taxonomy (10 h, lectures)
Genome of microorganisms (prokaryotic and eukaryotic chromosome, extracromosomal genetic elements), mutations, gene exchange and recombination, bacteriophages. Energy metabolism, biosynthesis, polymerization, assembling. Elements of microbial taxonomy (classification, nomenclature, identification)

Block 4. Elements of dairy microbiology (12 h, lectures).

Dairy microorganisms: bacteria, yeasts and moulds. Microbiology of milk, fermented milk, butter, creams and cheese.

Block 5. Elements of oenological microbiology (8 h, lectures).

Oenological microorganisms: yeasts, bacteria (lactic acid and acetic bacteria) and moulds. Alcoholic fermentation: chemistry, yield, secondary fermentations. Maloalcoholic and malolactic fermentations.

Block 6. Practical activity (16h, laboratory)

Microscopy and morphology of microorganisms: optical and epifluorescence microscopy, simple and differential staining. Preparation of microbiological media. Evaluation of microbial growth by direct and indirect methods counts. Isolation of microorganisms from a food matrix.

TEACHING METHODS

The course includes 40 h lectures and 16 h practical (laboratory). In addition to lectures, students will be encouraged to participate to practicals and to write a lab notebook and/or a power point presentation of one of the activities.

EVALUATION METHODS

The students attending the course need to pass two written (mid term, end of course) examinations (multiple choice, true/false, short text, short essay).

The students not attending the course or who are unable to pass the written examinations will have to sit for an oral examination.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

The study of a textbook of general and agricultural microbiology, together with attendance at lectures and practicals, is more than enough to overcome the written tests or the oral examination. Course materials (lectures and experimental protocols) will be provided during course.

The students are also encouraged to widen their knowledge using textbooks available in the library :

- Biavati B., Sorlini M. Microbiologia generale ed agraria. Casa Editrice Ambrosiana. ISBN 978-88-408-1394-3.
- Madigan, M.T., Martinko, J. M. Brock Biologia dei microrganismi vol. 1 Casa editrice ambrosiana, ISBN 978-88-408-1375-2

INTERACTION WITH STUDENTS

During the first lecture the structure and organization of the course and the evaluation procedure will be presented. The teaching material (slide print-outs, experimental protocols) will be made available on-line (esse3). The outcome of written examinations will be made available by E-mail.

The lecturer will be available for receiving students at least 4 h a week (on Tuesdays and Wednesdays). The students can also communicate with the lecturer via E-mail.

EXAMINATION SESSIONS (TENTATIVE)¹

¹ Subject to possible changes: check the web site of the Teacher or the Department/School for updates.



**SCUOLA DI SCIENZE
AGRARIE, FORESTALI,
ALIMENTARI
ED AMBIENTALI**

21/2/2020, 12/3/2020, 16/4/2020, 14/5/2020, 18/6/2020, 16/7/2020, 17/9/2020, 15/10/2020, 19/11/2020,
17/12/2020, 21/1/2021, 25/2/2021, 25/3/2021.

EVALUATION COMMITTEE

Prof. Annamaria Ricciardi (president), Prof. Eugenio Parente (member), Prof. Angela Capece (replacement member)

SEMINARS BY EXTERNAL EXPERTS YES X NO

FURTHER INFORMATION
