

COURSE: Food microbiology

ACADEMIC YEAR: **2016-2017**

TYPE OF EDUCATIONAL ACTIVITY: Characteristic

TEACHER: Patrizia Romano

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Language: Italian

ECTS: 9 (8 lessons; 1 laboratory practice)	n. of hours: (lessons e tutorials/practice) 64 lessons 16 laboratory practice	Campus: Potenza School: SAFE Program: Food Technology	Semester: II
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#### EDUCATIONAL GOALS

During the course, it will be treated the microbial ecology of foods. Ecological factors (intrinsic, extrinsic, implicit and technological) that affect the presence, survival, growth and death of microorganisms in food. Colonization and contamination. Control of microorganisms by acidification, aw lowering, low or high temperature, microwave, ionizing radiation, high pressure, pulsed electric currents, change of atmosphere and packaging, preservatives, fermentation. Fermented foods and starter cultures. Microbiology of dairy products, microbiology of meat products, microbiology of cereals and derivatives, microbiology of fermented beverages. Intestinal microbiota and probiotics.

The aim of the course is to provide knowledge of microorganisms (pro-technological, probiotic, pathogens and spoilage) associated with foods and their origin and role; Knowledge of the factors that determine the presence, growth and survival of microorganisms in food; knowledge of the main microbial groups involved in the production of fermented foods. Knowledge of the significance of starter culture. The knowledge required for the microbiological safety in food.

#### EXPECTED LEARNING OUTCOMES

At the end of the course, the students have acquired skills related to: the microbiological food control through appropriate and targeted applications of physical chemical and biological treatments; the use of basic microbiological methods for the evaluation of the microbial load in the different food matrices; the microbial monitoring of fermented foods; the use of selection scheme for starter cultures.

#### PRE-REQUIREMENTS

General microbiology

#### SYLLABUS

##### Lessons

Colonization, contamination and microbial metabolism. Knowledge of physicochemical factors influencing the presence and evolution of microorganisms in food. Primary and secondary microbial contamination sources.

Microbial ecology of the main foods. Pro-technological, probiotics, pathogens and spoilage microorganisms associated with foods and their origin and role. Methods for the measurement of the kinetics of microbial growth in food.

Microbial control in foods using physical, chemical and biological treatments or combinations thereof. Control of microorganisms in food by acidification, aw lowering, low or high temperatures, freezing. Control of microorganisms in foods by treatment with microwaves, ionizing radiation, through treatment with high pressure, pulsed electric currents. Microbial control in food control by chemical treatments. Preservatives and antimicrobial activity. Effect of treatments on different microbial groups through modification of the food atmosphere.

Microorganisms (bacteria, yeasts, molds) associated with foods. The role of microorganisms on the human health. Probiotic microorganisms. Microorganisms as indicators of quality and of food microbiological safety. Microorganisms of unfermented foods

The fermentation. Main microbial groups involved in the production of fermented foods. Role of microorganisms as starter in the production of fermented foods and knowledge of their metabolism to the enhancement of the

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organoleptic and healthy quality of the products. Dairy microbiology: microorganisms interest (lactic acid bacteria, yeasts, molds).

Microbiology of meat products. Evolution of different microorganisms during manufacture of salami. Lactic acid bacteria and positive characters. Microbiology of vegetable products. Microbiology of cereals and derived (bread): microbial species and role. Production of beer, yeast starter and formulation.

Microbiology of fermented beverages: microorganisms interest (lactic acid bacteria, yeasts, molds).

Alcoholic fermentation, malo-alcoholic and malolactic fermentations. Specific substrates for the isolation of the various microbial groups. Yeast starter and selective parameters: fermentative performance, antimicrobial resistance, killer character, production of secondary compounds.

#### **Practices**

- Food microbiological analysis, ie determination of the number and / or the presence of specific microbial populations
- Interpretation of analytical results: microbiological criteria and standards.
- In vitro test for the determination of the inhibition of the total microbial load as a function of chemical and physical changes in the culture media
- Isolation techniques and technological characterization of microorganisms to be used as starter cultures

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#### **TEACHING METHODS**

The course consists of 64 hours of theoretical lessons on all topics of the course and 16 hours of laboratory practices. During the practices, students will be divided into groups (maximum 15-20 students per group) for laboratory work and will be directed to apply all the steps for the microbiological control of a food and for the monitoring of an inoculated fermentation. At the end of the course, the students will prepare a report of the laboratory work, reporting the results analysis.

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#### **EVALUATION METHODS**

The aim of the examination is to assess the level of theoretical knowledges and laboratory practices, and the achievement of the educational objectives.

The exam is divided into 2 parts:

- A written intermediate assay (mainly quiz at multiple answers) on all the topics covered in the first part of the course, with the aim to evaluate the knowledge and understanding of the topics. To overcome the trial, the student must acquire the 18/30 vote. If the test is insufficient, the student will repeat the assay as an oral examination at the end of the course.
- At the end of the course, an oral examination on the second part; to overcome the assay, the student must acquire the 18/30 vote

The final vote is the sum of the two trials.

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#### **TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL**

- Galli Volonterio A. (2005) *Microbiologia degli alimenti*. Milano, Casa Editrice Ambrosiana
- Burgeois C.M., Mesclé J.F., Zucca J., *Microbiologia alimentare*, Milano, Ed. Tecniche Nuove, (1990)
- Farris G. A., Gobbetti M., Neviani E. (2012) *Microbiologia dei prodotti alimentari*, Milano, Casa Editrice Ambrosiana
- Jay J.M, Loessner M.J, Golden D.A (2009) *Microbiologia degli alimenti*. Ediz. Ital. a cura di Pulvirenti A.. Ed. Springer
- Ray B., *Fundamental of food microbiology*, London, CRC Press, (2004)
- Tiecco G., *Igiene e tecnologie degli alimenti*, Bologna, Edagricole, (2001)
- Zambonelli C., Papa F. Romano P., Suzzi G., Grazia L. *Microbiologia dei salumi*, Bologna, Edagricole, (1992)
- Zambonelli C. (2001) *Microbiologia degli alimenti fermentati Il Sole 24 Ore Edagricole*
- Vincenzini M., Romano P., Farris G.A. (Eds) "*Microbiologia del vino*", Edizioni CEA, Milano (2005)
- Notes and teaching materials distributed during lessons, related to the course content not available in the textbooks.

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#### **INTERACTIONS WITH STUDENTS**

At the beginning of the course, objectives, program and methods of evaluation will be described. Furthermore, the list and data of students attending the course will be drafted. During the lessons, teaching materials (shared folders)

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will be provided. Office hours: generally on Tuesday and Thursday from 9:30 to 10:30 in the teacher's study.  
In addition to the weekly reception, the teacher will be available by e-mail.

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**EXAMINATION SESSIONS (FORECAST)<sup>1</sup>**

Examination every month except August, usually on Monday

**EVALUATION BOARD**

Patrizia Romano

Angela Capece

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**SEMINARS BY EXTERNAL EXPERTS**    YES     NO

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**FURTHER INFORMATION**

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