



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	
ACADEMIC YEAR	
ANNO ACCADEMICO EROGAZIONE	
SUBJECT	
CODE	
SCIENTIFIC SECTOR(S)	
HEAD PROFESSOR(S)	FRANCESCA NICOLA Ricercatore a tempo determinato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	
TERM (SEMESTER)	
ATTENDANCE	
EVALUATION	
TEACHER OFFICE HOURS	FRANCESCA NICOLA Monday 09:00 13:00 Studio e Laboratori di microbiologia Tuesday 09:00 13:00 Studio e Laboratori di microbiologia Wednesday 09:00 13:00 Studio e Laboratori di microbiologia Thursday 09:00 13:00 Studio e Laboratori di microbiologia Friday 09:00 13:00 Studio e Laboratori di microbiologia

DOCENTE: Prof. NICOLA FRANCESCA

PREREQUISITES	General knowledge of biology, chemistry and also mathematics and physics.
LEARNING OUTCOMES	<p>Knowledge and ability to understand. Acquisition of advanced tools for Microbiological understanding and evaluation. Ability to use the specific and detailed language to describe Microbiology of foods.</p> <p>Ability to apply knowledge and understanding. Ability to assess the main characteristics associated to the growth of microorganisms associated to food environments.</p> <p>Making judgements. To be able to evaluate the implications and results of the microbiological studies performed. In the light of the knowledge acquired, to interpret the determining factors in the microbial ecosystems. To be able to act specifically to prevent or limit the imbalances or the irreversible changes in the relationships between the microbial populations of a given food environment and to limit the development of spoilage and/or pathogenic microorganisms in foods.</p> <p>Communication abilities. Ability to expose the mechanisms of microbial interactions to laboratory technicians, and the results of the analysis also to a non-expert public. To be able to apply a suitable synthetic and technical language to communicate problems and to suggest useful solutions.</p> <p>Learning skills. To acquire the ability to identify the biological aspects relevant for the food sector and to suggest intervention solutions with modern techniques and methodologies through continuous updates and scientific consultations.</p>
ASSESSMENT METHODS	<p>The assessment of learning is expressed through two tests to reach the final judgment, a written test, lasting three hours, and an oral one. The first test verifies the student skills and abilities; it will take into account not only the quality and accuracy for solving assigned problems (usually three/five in number, and with particular reference to the central themes of the study of growth of microorganisms and food fermentations), but also it will evaluate the methodology used and the relative processing power and synthesis. The oral test consists of an interview (at least three questions on the different topics of the course) to ascertain the knowledge acquired through the ability to establish connections among the different topics of the course; the processing abilities through the comprehension of the applications or their implications within the course; the reaching of presentation/speaking skills through the demonstration of an appropriate technical language within the professional context.</p> <p>The pass mark will be reached when the student shows knowledge and understanding of the issues at least in general terms, and has minimal application skills (however reaching an acceptable threshold of overall cure).</p> <p>The student will reach also the argumentative skills to allow the transmission of his/her knowledge to the examiner. Below this threshold, the final score of examination will be insufficient.</p> <p>The evaluation is expressed in thirtieths.</p>
EDUCATIONAL OBJECTIVES	<p>The course aims to provide detailed knowledge on microorganisms associated to foods through the study of the microbiological processes of raw materials transformation. It will provide the basis of microbial growth during fermentation of several foods of animal and vegetable origins. The course will provide detailed knowledge on the effect of thermal treatment to destroy microbial cells during food production as well as the role of HACCP to improve quality and safety of foods.</p> <p>The activity based on the exercises sessions will focus on the methods to perform the inoculum of starter strains into raw material as well as on the analysis of amount of reagents to be used during microbiological analysis. The course, through laboratory sessions, aims to provide the student manual skills necessary for the microbiological analyses of raw materials and final products. The approach applied will include classical culture tools as well as genotypic techniques.</p>
TEACHING METHODS	The course includes 56 hours of lecture, 20 hours of laboratory sessions and 4 hours of exercises sessions.
SUGGESTED BIBLIOGRAPHY	<p>Willey M., Sherwood M., Woolverton J. (2009) PRESCOTT 1, Microbiologia Generale, McGraw-Hill</p> <p>Farris G.A., Gobbetti M., Neviani E., Vincenzini M. (2012) Microbiologia dei prodotti alimentari, Casa Editrice Ambrosiana</p>

SYLLABUS

Hrs	Frontal teaching
1	History of food microbiology and focus on the role of biotechnology on food environment.
4	Structure and functions of prokaryotic cell: plasma membrane; cytoplasm; cellular inclusions; ribosomes; nucleoid; plasmids; cell wall; bacterial toxins; protein secretion; structures external to the cell wall; microbial biofilms; pili, fimbriae and flagella and cell mobility; spore.
2	Microbial nutrition; nutrient requirements; transport systems; culture media.
1	Pure culture technique, colony and cell morphologies.

SYLLABUS

Hrs	Frontal teaching
4	Prokaryotic and eukaryotic cell cycle; microbial growth kinetics; growth curve; estimation of growth by direct and indirect methods.
4	Environmental factors affecting the growth of microorganisms: activity water; pH; temperature; oxygen; pressure; radiations.
4	Methods for the control of microorganisms; the rate of microbial death; measurements of antimicrobial activity.
2	Main features of selected bacterial strains with technological characteristics associated to food productions.
2	Spoilage microorganisms.
2	Pathogenic microorganisms.
1	Microorganisms indicators of microbiological quality and safety of foods.
2	Canned food and monitoring of microbiological growth by thermal treatments.
4	Microbiology of wine, beer and fruit sider; innovative methods to improve the quality of beverage spontaneously fermented; autochthonous selected strains of yeast and lactic acid bacteria to produce beverages with low concentration of ethanol.
2	Microorganisms of honey and fermentation of mead products.
1	The microorganisms associated to ice and water.
4	Biotechnology of fermented bakery products: "sourdoughs" and traditional italian bread.
4	Biotechnology of fermented table olives and microbiological quality of olive oils.
4	Microbiology of milk and dairy foods: lactic acid bacteria selected as starter and non-starter cultures, microbial biofilms to improve the lactic acid fermentations performed by autochthonous selected strains; the role of wood equipment on quality of traditional Italian and French cheeses.
2	Microbiology fermented and not-fermented cured meats; innovative protocol to produce "salami".
2	Microorganisms of fish and salted fishes.
2	Innovative natural antimicrobial adjuvants (essential oils from citrus and aromatic plant from Mediterranean basin) to improve shel-life of vegetable and fishery foods.
2	Genotypic methods to identify at species and strain level microbial cultures associated to foods.
Hrs	Practice
2	Qualitative and quantitative management of inoculum amount of strain starter and adjuvants during fermentation of foods carried out at pilote and large-scale productions.
2	Management of material and reagent amounts to be used during microbiological analysis.
Hrs	Workshops
4	Classical microbiological analysis of raw materials (wine, fermented table olives, raw milk, fish and salted fish, minced meat and fermented cured meat, ingredients).
4	Isolation of yeast and filamentous fungi from grape must, wine, beer and vegetable raw materials.
4	Isolation and phenotypic characterization of lactic acid bacteria from fermented table olives, cheeses and salami during ripening.
4	Microbiological analysis of potential spoilage and pathogen microorganisms associated to food safety.
4	Basis of phylogenetic analysis for detailed identification of microorganisms and technological selection of starter cultures.