

COURSE OF STUDY *Bachelor's degree in Agricultural Science and Technology (L25)*
ACADEMIC YEAR 2023-2024

ACADEMIC SUBJECT *Phytobacteriology – Batteriologia Fitopatologica; Module of Integrated Course in General Plant Pathology II (6 ECTS)*

General information	
Year of the course	<i>III year</i>
Academic calendar (starting and ending date)	<i>II semester (26-02-2024 – 14-06-2024)</i>
Credits (CFU/ETCS):	<i>3</i>
SSD	<i>Plant Pathology - AGR/12</i>
Language	<i>Italian</i>
Mode of attendance	<i>Strongly recommended</i>

Professor/ Lecturer	
Name and Surname	<i>Franco Nigro</i>
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Department and address	<i>DiSSPA – Plant Pathology section - Third floor</i>
Virtual room	<i>Teams: Franco Nigro – franco.nigro@uniba.it</i>
Office Hours (and modalities: e.g., by appointment, online, etc.)	<i>Please, contact the teacher via e-mail. Tutoring could be also on e-learning platforms.</i>

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<i>75</i>	<i>16</i>	<i>14</i>	<i>45</i>
CFU/ETCS			
<i>3</i>	<i>2</i>	<i>1</i>	

Learning Objectives	<i>In the first part, the course aims to provide knowledge on the morphology and overall characteristics of prokaryotes present on/in plants of agricultural interest, both with phytopathogenic and antagonistic activity. Furthermore, it aims to provide the characteristic elements of the different taxonomic groups of bacteria and the elements necessary for molecular identification. In the second part, some bacterial diseases of notable economic importance for tree and vegetable crops in the Mediterranean environment are analysed</i>
Course prerequisites	<i>Basic knowledges on diagnosis of plant pathogens, plant pathology, casual agents of plant disease.</i>

Teaching strategies	<i>The topics of the course will be covered with:</i> <ul style="list-style-type: none"> • <i>Lectures involving the use of PowerPoint presentations. These presentations are a teaching aid only and do not represent study material.</i> • <i>Resolution of case studies</i> • <i>For foreign students (LLP-Erasmus, Tempus, etc.) presentations and teaching materials will be provided in English.</i>
Expected learning outcomes in	

terms of	
Knowledge and understanding on:	<ul style="list-style-type: none"> ○ Knowledge on the morphology, taxonomy and classification of useful or phytopathogenic plant bacteria, as well as on the main bacterial diseases of Mediterranean plants; ○ understanding of the basic host/pathogen interaction mechanisms;
Applying knowledge and understanding on:	<ul style="list-style-type: none"> ○ Knowledge and understanding of the results of culture isolation techniques and modern techniques for the molecular identification of bacteria.
Soft skills	<ul style="list-style-type: none"> ● <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ At the end of the course the student must be able to ○ analyze the different phytopathological situations caused by bacteria in a production and market context and apply protective measures also using antagonistic bacteria ○ <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ At the end of the course the student must be able to interact critically using specific technical-scientific vocabulary for phytobacteriology, both in Italian and in English ○ <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ At the end of the course the student must be able to ○ implement diagnostic techniques suitable for the identification of bacterial diseases and protection criteria, both directly in the field and through the application of phytosanitary standards for the defense against quarantine pathogens.
Syllabus	
Content knowledge	<p>Historical notes and importance of phytobacteriology. General characteristics of phytopathogenic bacteria: morphology and physiology. Phenotypic and genotypic variability of bacterial populations. Habitat of plant pathogenic bacteria. Epidemiology, survival and dissemination. The infectious process. The secretion systems. Taxonomy, nomenclature and classification. Phylogeny and classification. Proteobacteria (α, β, γ, δ). Techniques and methods of isolation and identification of phytopathogenic bacteria. Strategies and methods of protection. Main diseases caused by bacterial species belonging to the genera <i>Agrobacterium</i>, <i>Acidovorax</i>, <i>Candidatus Liberibacter</i>, <i>Pseudomonas</i>, <i>Erwinia</i>, <i>Pectobacterium</i>, <i>Xanthomonas</i>, <i>Xylella</i>, <i>Clavibacter</i>, <i>Candidatus Phytoplasma phoenicium</i>.</p>
Texts and readings	<ul style="list-style-type: none"> ○ <i>Lecture notes and material distributed during the course;</i> ○ <i>Matta A., Buonauro R., Favaron F., Scala A., Scala F. (2017). Fondamenti di Patologia vegetale. Patron Editore Boogna;</i> ○ <i>Calzolari A., Ponti I., F. Laffi, 2006. Malattie batteriche delle piante. Edizioni l'Informatore Agrario, Verona.</i> ○ <i>Updated Reviews from journal specialized on Phytobacteriology (Phytopathology, Annual Review of Phytopathology, etc.).</i> ● <i>pdf files distributed during the course so.</i>
Notes, additional materials	In-depth learning is encouraged by consulting texts in English.
Repository	<i>The teaching material will be available in the Class Teams. The Teams code of the course will be provided at the beginning of the course attendance.</i>
Assessment	
Assessment methods	<i>For students enrolled in the year of the course in which the teaching is held, an</i>

	<p><i>intermediate evaluation test (called “Esonero”) will be scheduled, which consists of an oral test on the topics developed during the hours of theoretical lessons as reported in the Teaching Regulations of the Course Degree in Agricultural Science and Technology (art. 9) and in the study plan (attachment A). The outcome of this test contributes to the assessment of the profit exam and is valid for one academic year. The exam consists of an oral test, on the topics developed during the hours of theoretical lessons as reported in the Academic Regulations of the Degree Course in Agricultural Sciences and Technologies (Art. 9) and in the study plan (Annex A). Three/four questions will be asked of which a couple on the general part and a couple on the main bacterial diseases. For any foreign students, the mid-term evaluation and exams can be held in English and, where required, as a written test with three open-ended questions.</i></p>
Assessment criteria	<ul style="list-style-type: none"> • Knowledge and understanding • <i>knowledge of the morphology, taxonomy and classification of bacteria useful and harmful to plants, as well as the symptoms caused by the most common bacterial diseases in the Mediterranean environment;</i> • <i>Knowledge of the main mechanisms of interaction with the plant host of both phytopathogenic and plant-useful bacteria;</i> • Applied knowledge and understanding • <i>level of understanding of case studies related to bacterial diseases and the application of traditional or innovative approaches, for the protection of crop production.</i> • Making judgments • <i>Ability to identify the central aspects in the formulation of a diagnosis and in the interventions to protect against bacterial diseases.</i> • Communication skills • <i>Ability to use an appropriate language in the field of plant pathology and the protection of plants from bacterial diseases.</i> • Ability to learn • <i>Ability to understand scientific and popular articles concerning phytobacteriology.</i>
Final exam and grading criteria	<p><i>The final mark is given out of thirty. The evaluation of the student's preparation takes place based on pre-established criteria, as detailed in Annex A of the Academic Regulations of the Degree Course. For students who have taken the mid-term evaluation test (called “Esonero”), the evaluation of the profit exam is expressed considering the mark acquired with the exemption test not as an arithmetic mean but as a weighted weight with respect to the program covered by the exam. In assigning the final grade, the knowledge acquired, the ability to apply the afore mentioned knowledge, independent judgement, communication skills and the ability to integrate the knowledge acquired in a work project will be considered.</i></p> <p><i>The exam is considered passed when the final grade is greater than or equal to 18/30.</i></p>
Further information	
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