

## COURSE OF STUDY: Master Course in Plant Medicine (LM69)

ACADEMIC YEAR: 2023-2024

ACADEMIC SUBJECT: Genetic resistance (IC Biodiversity and ecosystem services)

General information	
Year of the course	<i>Second</i>
Academic calendar (starting and ending date)	<i>Second semester (February 26, 2024 – June 14, 2024)</i>
Credits (CFU/ETCS):	3
SSD	<i>AGR/12</i>
Language	<i>Italian</i>
Mode of attendance	<i>Not mandatory, but recommended</i>

Professor/ Lecturer	
Name and Surname	Giovanni Luigi BRUNO
E-mail	<a href="mailto:giovanniluigi.bruno@uniba.it">giovanniluigi.bruno@uniba.it</a>
Telephone	080 544 3085 / 347 26 11185
Department and address	<i>Campus E. Quagliariello, Dipartimento di Scienze del Suolo della Pianta e degli Alimenti, Sez. Patologia vegetale, 2° piano</i>
Virtual room	<i>Microsoft Teams Code: qrvrkal</i>
Office Hours (and modalities: e.g., by appointment, on line, etc.)	<i>Monday to Friday 10:30 - 12:30 according to an established appointment requested by phone or e-mail</i>

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

<b>Learning Objectives</b>	<i>The course aims to provide in-depth knowledge about Plant resistance to diseases; variability of plant response to diseases and variability of pathogens; types and sources of resistance; formae specialis and races, and resistance managements; exogenous and endogenous factors affecting resistance expression; resistance transfer to susceptible cultivars through classical and biotechnological techniques; screening and evaluation of resistance; resistance in the most important Mediterranean crops.</i>
<b>Course prerequisites</b>	<i>Knowledge of plant pathology requests for admission to the Master Course in Plant Medicine</i>

<b>Teaching strategies</b>	<p><i>The topics of the course will be treated with:</i></p> <ul style="list-style-type: none"> <li>• <i>Lectures presented through PowerPoint and other supports.</i></li> <li>• <i>Class or laboratory exercises.</i></li> <li>• <i>Working groups and class discussion.</i></li> <li>• <i>Lab, field, and greenhouse training.</i></li> <li>• <i>Case studies.</i></li> <li>• <i>Bibliographic research on specialized databases (Scopus, Agricola, ...).</i></li> </ul>
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	<ul style="list-style-type: none"> <li>• <i>Comparison with the experiences of stakeholders.</i></li> </ul> <p><i>Public platforms (e.g., Teams) and dedicated platforms (Agripodcast) will be used in E-learning mode, especially at the request of students with disabilities, working students, student athletes and students with new-borns.</i></p> <p><i>The topics of the course presented as case studies and in frontal teaching, will be discussed in the classroom and will be the subject of exercises and lab experiences. The results of the exercises and lab experiences will be also discussed jointly and in group work.</i></p>
<b>Expected learning outcomes in terms of</b>	<p><i>At the end of the training course, the student will be able to:</i></p> <ul style="list-style-type: none"> <li>o <i>Know the physiological and genetic basis of plant resistance to disease.</i></li> <li>o <i>Apply methods of identifying sources of resistance.</i></li> <li>o <i>Know and apply traditional and biotechnological techniques for resistance transfer.</i></li> <li>o <i>Apply resistance management strategies.</i></li> </ul>
<b>Knowledge and understanding on:</b>	<p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> <li>o understand the potential and limits of plants with different resistance.</li> <li>o define breeding programs for resistance.</li> <li>o manage cultivars with genetic resistance.</li> <li>o apply the knowledge acquired during the course to specific problems on plant disease resistance.</li> </ul>
<b>Applying knowledge and understanding on:</b>	<p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> <li>o Select suitable cultivars according to useful resistance.</li> <li>o Identify and select sources of genetic resistance.</li> </ul>
<b>Soft skills</b>	<ul style="list-style-type: none"> <li>• <i>Making informed judgments and choices</i></li> </ul> <p><i>At the end of the course, through lectures, laboratory tests, case studies, group work and classroom discussion and comparison with the experiences of stakeholders, the student will be able to:</i></p> <ul style="list-style-type: none"> <li>o critically assimilate the course contents.</li> <li>o evaluate the acquired knowledge.</li> <li>o evaluate the usefulness of genetic resistance as a defence opportunity for crops.</li> <li>o choose the cultivars appropriate for a specific area.</li> </ul> <ul style="list-style-type: none"> <li>• <i>Communicating knowledge and understanding</i></li> </ul> <p><i>At the end of the course, through lectures, laboratory tests, case studies, group work and classroom discussion and comparison with the experiences of stakeholders, the student will be able to:</i></p> <ul style="list-style-type: none"> <li>o critically discuss the topics presented during the course with specialist and non-specialist interlocutors.</li> </ul> <p><i>use the specific disciplinary lexicon.</i></p> <ul style="list-style-type: none"> <li>• <i>Capacities to continue learning</i></li> </ul> <p><i>At the end of the course, through lectures, laboratory tests, case studies, group work and classroom discussion and comparison with the experiences of stakeholders, the student will be able to:</i></p> <ul style="list-style-type: none"> <li>o Search in the bibliographic databases references useful for the knowledge and updating of information relevant to the topics of the course.</li> <li>o Reading and understanding scientific literature.</li> <li>o Upgrade new knowledge on plant resistance.</li> </ul>
<b>Syllabus</b>	
<b>Content knowledge</b>	<p><i>Refer to: disease, pathogens, pathogenesis, disease cycle and defence reactions of plants. Disease management strategies. Plants resistance to pathogens. Plant resistance variability. Variability of pathogens. Types and sources of resistance. Genetic basis of resistance. The gene-for-gene theory and the plant-</i></p>

	<i>pathogen co-evolution. Formae speciales and physiological race and resistance managing strategies. Factors affecting the expression of resistance. Production of resistant varieties by breeding for resistance and bio-technological methods. Disease resistance of some important crops (wheat, barley, and other cereals; tomato, potato, pepper and eggplant; melon, watermelon and cucumber; lettuce; peas; apple: plum; olive; cypress). Screening and selecting for resistance. Case studies of resistance breeding of greenhouse and field crops.</i>
<b>Texts and readings</b>	<ul style="list-style-type: none"> <li>• Notes on lectures distributed during the course.</li> <li>• Crinò P. et al., 1993. <i>Miglioramento genetico delle piante per resistenza a patogeni e parassiti. Edagricole.</i></li> <li>• Crute E.B. et al., 1997. <i>The gene-for-gene relationship in plant-parasite interactions. CAB International.</i></li> <li>• Slusarenko A.J. et al., 2001. <i>Mechanisms of resistance to plant diseases. Kluwer Academic Publishers.</i></li> <li>• Agrios G.N., fifth edition. <i>Plant Pathology. Elsevier Academic Press.</i></li> </ul>
<b>Notes, additional materials</b>	<i>The texts are available at the Di.S.S.P.A. Plant Pathology section library and the office of the teacher.</i>
<b>Repository</b>	<i>Microsoft Teams class: qrvrkal</i>

<b>Assessment</b>	
Assessment methods	<p><i>The exam, unique, and collegial for the IC Biodiversity and Ecosystem services is an oral test on the topics developed during lectures, class, or laboratory exercises, working groups, Lab, field, and greenhouse training as reported in the Didactic regulation of the Master Course in Plant Medicine (article 9) and in the syllabus (Annex A).</i></p> <p><i>The evaluation of the student's preparation is based on established criteria, as detailed in Annex A of the study regulations of the master's degree program.</i></p> <p><i>For students enrolled in the academic year in which the module is taught, there is an intermediate exemption written test. This exemption regards the subjects of lectures and laboratory classes held in the period before the test itself (about half of the program). The exemption test for the "Genetic resistance" module consists at least of three oral questions about lectures and laboratory classes held in the period before the test itself. The positive result of the exemption test is valid for one academic year.</i></p> <p><i>For students who fit the exemption test, the final oral exam will point to topics of lectures and laboratory classes held in the subsequent period of the test itself. For the "Genetic resistance" module, at least three oral questions will be given. For these students, the assessment of the exam is expressed as an average between the exemption test and the final exam. For students who have NOT passed/supported the exemption test, the exam for the "Genetic resistance" module consists of at least six questions.</i></p> <p><i>For foreign students, the exam can be done in English.</i></p>
Assessment criteria	<ul style="list-style-type: none"> <li>• <b>Knowledge and understanding</b> <ul style="list-style-type: none"> <li>○ Reach sufficient knowledge on genetic resistance to plant diseases.</li> <li>○ Describe the variability of resistance in plants.</li> <li>○ Describe the variability of pathogens.</li> <li>○ Describe types and sources of resistance and the genetic basis of resistance.</li> <li>○ Describe the influence of exogenous and endogenous factors on the expression of resistance.</li> <li>○ Describe methods and strategies to transfer resistance into new cultivars.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ Describe examples of resistance in crops.</li> <li>● <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> <li>○ Describe traditional and innovative techniques for the use of genetic resistance in disease management.</li> </ul> </li> <li>● <i>Autonomy of judgment</i> <ul style="list-style-type: none"> <li>○ Express reasonable assumptions of programs for the exploitation of resistance to biotic stress.</li> </ul> </li> <li>● <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> <li>○ The students have to be able to explain topics acquired during classes.</li> </ul> </li> <li>● <i>Communication skills</i> <ul style="list-style-type: none"> <li>○ Describe with appropriate language the traditional and innovative techniques for the use of genetic resistance in the management of plant diseases.</li> </ul> </li> <li>● <i>Capacities to continue learning</i></li> </ul> <p>The learning of the knowledge of this module is verified in the lessons, in the class and laboratory exercises, in the exemption, in the exam and through self-assessment tests of individual learning that the ATutor platform and/or Agripodcast asynchronous teaching allows. A parameter to be used is also the time elapsed between attending the course and passing the exam.</p>
Final exam and grading criteria	<p><i>The learning outcomes related to the individual indicators will be verified during the lessons, laboratories, ongoing tests, and final exam. It is expected that the student correctly understands the question posed and provides it in a synthetic way but with adequate arguments, the details necessary to formulate the correct answer, also through links to similar topics covered in the teaching program. The evaluation of the ongoing test and the exam is expressed in thirtieths.</i></p>
<b>Further information</b>	