General information	
Academic subject	***Physiological plant pathology (module of I.C. Plant physiology and physiopathology)***
Degree course	*Master degree Plant Medicine (LM69)*
Academic Year	*1*
European Credit Transfer and Accumulation System (ECTS)	3
Language	*Italian (English will be used when required for foreign students)*
Academic calendar (starting and ending date)	*First semester (from 2021 September 27 to 2022 January 21)*
Attendance	*No*

Professor/ Lecturer	
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Department and address	*Department of Soil, Plant and Food Sciences (Di.S.S.P.A.) - Plant pathology Unit, Campus E. Quagliariello, Building former Faculty of Agricultural Sciences, 2nd floor, room 2*
Virtual headquarters	*Microsoft Teams code: h5pcb7s*
Tutoring (time and day)	10:30 - 12:30 a.m.; Tuesday, Wednesday, and Thursday by appointment via e-mail

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Syllabus	
Learning Objectives	*The student will acquire the basic knowledge on the:* *- methodologies useful to study cytological, morphological, biochemical, physiological, and genetic alterations caused by pathogens on diseased plants* *- tools adopted by pathogens to attack the host* *- molecules produced by pathogen and plant-host before, during and after the disease cycle* *- biomolecules produced by plant-pathogenic fungi and bacterial used in agriculture.*
Course prerequisites	*Knowledge of Physiology and pathology requests for admission to the Master course.*
Contents	*Refer on: disease, pathogenesis, and disease cycle.* *Cytological, morphological, biochemical, physiological, and genetic alterations caused by pathogens in plants and methodologies of study.* *Pathogen virulence factors (enzymes, microbial toxins, exopolysaccharides, growth regulator substances, plasmids, suppressors of plant defence response).* *Signal-molecules produced by the pathogen before, during and after plant-pathogen-interaction. Production, perception, and transduction of biochemical signals in plant defence. Activation of metabolic cycles involved in the resistance. Phenolic metabolism, phytoalexins. Induction of chemical defences. Study of molecular mechanism in the plant disease.* *Plant-pathogen-environment-interactions in order to prevent or contrast diseases development.* *Biomolecules produced by plant-pathogenic bacteria or fungi useful as chemicals.*
Books and bibliography	*- Notes on lectures distributed during the course.* *- Matta A., Pennazio S., 1984 - Elementi di fisiopatologia vegetale, Pitagora.* *- Stacey G., Mullin B., Gresshoff P.M. (Eds.), 1997 - Biology of plant-microbe interactions. International Society for molecular plant-microbe interactions, APS.* *- Keen N. T., Mayama S., Leach J.E., Tsuyumu S. (Eds.), 2001 - Delivery and*

	perception of pathogen signals in plants. APS. *- Prell H.H., Day P.R., 2000 - Plant-Fungal pathogen Interaction: A classical and molecular view. Springer-Verlag.* *- Buchanan B.B., Gruissem W., Jones R.L., 2003 - Biochemistry and Molecular Biology of Plants (cap. 20-21-24), ASPP*
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
75	*16*	*14*	*45*
ECTS			
	2	*1*	

Teaching strategy	*Lectures will be presented by:* *- PowerPoint presentations,* *-laboratory and field classroom,* *-working groups,* *-study case,* *-transferring of stakeholders' experiences.* *E-learning public (Teams) and dedicated (Agripodcast) platforms can be used, on demand as learning facilities for students with disabilities and for working students, student athletes and students with babies.*
Expected learning outcomes	
Knowledge and understanding on:	The student will acquire the basic knowledge on the: ○ the main morphological, biochemical, physiological, cytological, and genetic alterations caused by pathogens in plants and methodologies for studying ○ virulence factors and molecules-signal produced by plant-pathogens and their effects on physiological functions of plants ○ principal molecules synthesized by the plant as a response to the presence of pathogen ○ biomolecules produced by plant-pathogenic fungi and bacterial used in agriculture.
Applying knowledge and understanding on:	The student will manage the: ○ identification of the type of biotic stress which a plant is subjected, and the mechanisms associated with it ○ association pathogen-virulence-factors and plant-defence-molecules at the different stages of the infection process ○ biomolecules applied as chemicals.
Soft skills	• *Making informed judgments and choices* ○ Ability to analyse plant-pathogen interaction as physiological decayed pathway • *Communicating knowledge and understanding* ○ Ability to discuss critically the physio-pathological bases of plant-pathogen interaction-environment-resident organisms • *Capacities to continue learning* ○ recognize the physiological basis of plant-pathogen interaction. ○ suggest the virulence factors used by plant-pathogens and the defences

	carried out by the infected plant

Assessment and feedback	
Methods of assessment	*The exam, unique, and collegial for the Plant Physiology and Physiopathology I.C., consists of an oral test on the subjects of both modules "Plant physiology" and "Physiological Plant pathology" as reported in the Didactic regulation of the Master in "Plant medicine" (article 9) and in the syllabus (Annex A).* *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. For students enrolled in the academic year in which the IC is taught, there is an intermediate exemption oral test. This exemption regarding the subjects of lectures and laboratory classes held in the period before the test itself (about half of the program of each module). The exemption test for Plant Physiology and Physiopathology I.C., consists of an oral test about both modules ("Plant physiology" and "Physiological Plant pathology"). The positive results of exemption test of both modules contribute to the evaluation of the examination of I.C. and are valid for one academic year.* *Exemption test and final exam are expressed in thirtieths.* *For students fit to the exemption test, the final oral exam will point on topics of lectures and laboratory classes held in the subsequent period of the test itself. For these students, the assessment of the exam is expressed as an average between exemption test and final exam.* *For foreign students the exam can be done in English.*
Evaluation criteria	• *Knowledge and understanding* ○ Describe the main alterations caused by pathogens in diseased-plants and the appropriate methodologies of study ○ Describe the plant-pathogen-environment interactions in terms of virulence factors, molecules-signal, biochemical signals and their physio-pathological aspects and applications in agriculture • *Applying knowledge and understanding* ○ Describe the plant-pathogen-environment interactions from a phyto-pathological point of view • *Autonomy of judgment* ○ Express reasonable assumptions on Plant-pathogen-environment interaction in terms of changed physiological functions • *Communicating knowledge and understanding* ○ Express reasonable assumptions on Plant-pathogen-environment interaction in terms of changed physiological functions • *Communication skills* ○ Describe with appropriate language the physiopathology of plant-pathogen-environment interaction ○ Organize the acquired knowledge in form of didactic presentation and to articulate it for didactic purpose • *Capacities to continue learning* ○ Learning of knowledge of this module occurs during lectures and laboratory classroom, oral exemption test and final oral exam, testing and self-assessment-individual test learning available on ATutor and/or

	Agripodcast platform of asynchronous teaching ○ A useful parameter is the time-lapse between the course frequency and the exam.
Criteria for assessment and attribution of the final mark	*The assessment of the learning outcomes concerning single indicators will take place during the lessons, laboratories, ongoing tests and during the oral final exam. In particular, the student will correctly understand the question asked and provide in a concise manner but with adequate arguments, the details necessary to formulate the correct answer, also through cross references with similar topics covered in the teaching program. The evaluation of the exemption test and the exam is expressed in thirtieths.* *The evaluation of the student's preparation takes place based on pre-established criteria, as detailed in Annex A of the Didactic Regulations of the Master degree Plant Medicine.*
Additional information	