UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali
ACADEMIC YEAR	2023/2024
MASTER'S DEGREE (MSC)	PRECISION AGRICULTURE
INTEGRATED COURSE	SUSTAINABLE AND PRECISION PHYTOSANITARY DEEFENCE - INTEGRATED COURSE
CODE	22803
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	AGR/11, AGR/12
HEAD PROFESSOR(S)	DAVINO SALVATORE Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	DAVINO SALVATORE Professore Ordinario Univ. di PALERMO CUSUMANO ANTONINO Professore Associato Univ. di PALERMO
CREDITS	9
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**CUSUMANO ANTONINO** Tuesday 14:00 16:00 Stanza dott. Cusumano, Consorzio Universitario di Caltanissetta, Caltanissetta Wednesday 10:00 12:00 Stanza dott. Cusumano, Dipartimento di Scienze Agrarie e Forestali, Edificio 5 ingresso A, primo piano, Palermo Thursday 10:00 12:00 Stanza dott. Cusumano, Dipartimento di Scienze Agrarie e Forestali, Edificio 5 ingresso A, primo piano, Palermo **DAVINO SALVATORE** Tuesday 16:00 19:00 Edificio 5 Stanza P1-50

PREREQUISITES	Basic knowledge of Plant Pathology, Entomology, genetics and plant breeding, statistics and data analysis
LEARNING OUTCOMES	Acquisition of the main diagnostic protocols with particular reference to Smart Diagnosis; On-field diagnosis and new biotechnologies; Acquisition of phytosanitary certification protocols; Acquisition of basic notions on forensic plant pathology; Further information on the data available on the website of the European and Mediterranean Plant Protection Organization (EPPO); Acquisition of knowledge on the main quarantine pathogens, from Alert list 1 and 2 and study of the EPPO Standards PM protocols; Acquisition of knowledge for the modification of traditional protocols to be used in smart diagnosis; Ability to organize and interpret diagnostic data; Ability to interpret epidemiological data; Ability to interpret Big data for the development of epidemiological containment protocols; Ability to use technical language; Be able to autonomously evaluate and interpret the implications and results of phytopathological studies to be used in plant pathology; Ability to update by consulting scientific publications and specific sector texts; Ability to follow, using the knowledge acquired during the course, masters, seminars and specific refresher meetings. At the end of the module the students will be able to know the entomological problems of the main agricultural crops and will have reached levels of knowledge and experience such as to allow them to understand and critically address new phytosanitary problems deriving from agronomic, ecological and/or or meteorological change. Students will also be able to autonomously collect and manage the data necessary to support decisions or to integrate any deficiencies based on previous experiential data or on a completely autonomous study of the scientific literature and on the development of surveys/experiments/ research to complete the knowledge gaps . They will also be able to communicate what they have learned in a clear, exhaustive and unambiguous way to their interlocutors, both specialists and non-specialists. They will also acquire the ability to organize and interpret diagnostic data and to interpret data relating to the population dynamics of the main phytophagous insects. Finally, they will have developed the ability to update by consulting scientific publications and specific texts in the sector.
ASSESSMENT METHODS	Oral test consisting of an interview, aimed at ascertaining the possession of the disciplinary skills and knowledge required by the program; the evaluation is expressed in thirtieths. The questions, a minimum of three, aim to verify the knowledge acquired, the processing skills, as well as the possession of adequate presentation skills. The threshold of sufficiency will be reached when the student has shown knowledge and understanding of the topics at least in general terms and has expressed minimum application skills in order to solve application cases; the candidate will also have to possess presentation skills and language properties appropriate to the type of teaching. Below this threshold, the examination will be insufficient. On the other hand, more the candidate demonstrates argumentative and expository skills and knowledge that goes into the details of the discipline being tested, more positive the evaluation will be up to the degree of excellence. In particular, the evaluation expressed out of thirty, with a minimum score of 18 for sufficient and a maximum of 30 cum laude, follows the following evaluation scheme: 1) knowledge of the topics, ability to deduce and process information, ability to apply and analyze , presentation ability assessed as just sufficient (score 18-21); 2) knowledge of the topics, ability to deduce and process information, ability to apply and analyze, ability to present a fair evaluation (score 22-25); 3) knowledge of the topics, ability to deduce and process information, ability to apply and analyze, presentation ability evaluated from good to high (grade 26-28); 4) knowledge of the topics, ability to deduce and process information, ability to apply and analyze presentation ability from excellent to advanced (grade 29-30 cum laude)
TEACHING METHODS	Lectures, laboratory activities and field activities

MODULE
APPLIED TECHNOLOGIES FOR THE MANAGEMENT OF PHYTOPHAGOUS ARTHROPODS

Prof. ANTONINO CUSUMANO

SUGGESTED BIBLIOGRAPHY

Colazza S., Peri E., Lo Bue P. (2018) Lineamenti di Entomologia in Agricoltura Biologica. Palermo University Press. pag. 1-268. ISBN: 9788831919104.
Pennacchio F. (2014) Gli Insetti e il loro controllo. Liguori ed., Napoli. 738 pp
Materiale didattico fornito durante il corso

AMBIT	21005-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	45
COURSE ACTIVITY (Hrs)	30

EDUCATIONAL OBJECTIVES OF THE MODULE

Students will acquire the critical ability to recognize the appropriate time to apply programs aimed at controlling insect pest populations, adopting the most appropriate techniques with emphasis on those with low environmental impact. They will also be able to apply decision support systems in modern integrated management with reference to major Mediterranean crops using recent sustainability indicators.

SYLLABUS

Hrs	Frontal teaching
1	The general criteria for precision defense in integrated and organic farming crops.
2	non-insect hexapod pests of crops (mites and nematodes)
1	Evolution of management strategies for controlling insect pest populations
4	Population dynamics of phytophagous insects; monitoring techniques using image recognition, counting, remote-sensing techniques.
4	Semiochemicals in multitrophic interactions and their use in biotechnical strategies applied to management programs of autochthonous and allochthonous phytophages of Mediterranean crops
3	Sampling of arthropod fauna for environmental monitoring
4	Traps for the detection and control of populations of main phytophagous insects of agricultural crops
3	Case studies of application of precision technologies in agricultural environment (drones, geostatistics, smartphone applications)

Hrs	Workshops
3	Computation of biodiversity indexes and logistic curves
2	The degree-days model
3	Main rearing techniques of entomophagous insects

MODULE
SUSTAINABLE DEFENCE FROM VEGETABLE PARASITES

Prof. SALVATORE DAVINO

SUGGESTED BIBLIOGRAPHY

- Forensic Plant Pathology - Jacqueline Fletcher, Neel G. Barnaby, James P. Burans, Ulrich Melcher, Forrest W. Nutter Jr., Carla
  Thomas, and Francisco M. Ochoa Corona - Microbial Forensics. DOI: 10.1016/B978-0-12-382006-8.00007-4
- Vannacci G. Patologia vegetale. EdiSES. edizione 2021. ISBN: 9788836230419
- Reverberi M., Ruocco M., Covarelli L. e Sella L. Patologia vegetale molecolare. Edizioni Piccin. SBN 9788829931415
- Matta A. Fondamenti di Patologia vegetale. Patron Editore. Edizione 2017. ISBN: 8855533827
- Belli G. Elementi di Patologia vegetale. Piccin Editore. ISBN:9788829921294
-Battilani P. Difesa sostenibile delle colture. Principi, sistemi e tecnologie applicate alle produzioni agricole. Edagricole Bologna. Edizione 2016. ISBN: 9788850655045
- Davino S. Avversità del pomodoro: Virus e funghi terricoli. Edizioni Informatore Agrario. Edizione 2018. ISBN: 9788872203873
- Lorenzini G., Principi di Fitoiatria. Edagricole Bologna. Edizione 2012. ISBN: 8850653883
- Materiale distribuito nel corso delle lezioni.

AMBIT	50545-Discipline della difesa
INDIVIDUAL STUDY (Hrs)	90
COURSE ACTIVITY (Hrs)	60

EDUCATIONAL OBJECTIVES OF THE MODULE

Plant Pathology associated with Smart Diagnosis supports the identification and characterization of a specific pathogen, the determination of the way in which it was introduced and the reconstruction of its introduction, thus providing scientific data that will be useful for researchers to link it to the perpetrator or perpetrators and to draw up defense plans to contain its expansion.

Smart diagnosis consists of a set of defined and validated techniques, which minimize the time between on-site sample collection, transfer to the laboratory and the time required for analysis in the laboratory.

The aim of the course is the acquisition of the main knowledge concerning phytosanitary certification and the development of defense strategies to be implemented in the various ecosystems, as well as at customs and in all access points of a Country.

On the other hand carried up or develop integrated defense strategies through smart analyzes.

In particular, the following activities will be carried out:

1) Field activities for the recognition of the main diseases; Observation of symptoms and differential diagnosis; Precision diagnosis through portable devices

2) Laboratory activities aimed at the isolation, identification and characterization of pathogens;

3) Disease prediction models;

4) Study of genetic variability for the identification of the origin of a disease;

5) Learning the main Smart Diagnosis techniques

6) Development of prophylactic protocols through the use of remote data transmission tools;

7) Forensic plant pathology aimed at crop protection

SYLLABUS

Hrs	Frontal teaching
6	Plant pathology: definition, objectives and historical notes. Concept of disease and classification. Symptomatology and pathological anatomy. Physiological alterations (photosynthesis, respiration, growth, phenolic metabolism and water balance). Diagnostic checks
3	Field diagnostic tests
7	Laboratory diagnostic tests
7	Smart diagnosis
5	Epidemiology: endemic and epidemic diseases. Evaluation of the severity of a disease. Development and forecasting of epidemic diseases. Protection against infectious diseases: prevention (exclusion, eradication, protection) and terapy (physical, chemical and biological). Genetic resistance.
2	Viroid diseases: symptoms, pathogenesis, transmission
2	Virus diseases: symptoms, pathogenesis, transmission
2	Phytoplasma diseases: symptoms, pathogenesis, transmission.
2	Bacterial diseases: bacterial pathogenesis, symptoms, transmission
2	Diseases caused by fungi and oomycetes: morphology, multiplication, reproduction, symptoms, transmission.
2	Epidemics: natural causes versus artificial introduction
2	Plant pathogens used as agricultural bioweapons
2	Forensic plant pathology
4	Nucleic acid mutation and molecular evolution as a forensic investigation tool

Hrs	Practice
12	Field and laboratory exercises