

COURSE OF STUDY: Master's degree Plant Medicine (LM69)

ACADEMIC YEAR: 2023-2024

ACADEMIC SUBJECT Chemistry and Biochemistry of Plant Protection Products -
module of I.C. Plant Protection (3 ETCS)

General information	
Year of the course	First Year
Academic calendar (starting and ending date)	February 26 th 2024 - June 14 th 2024 (Pause April 22 nd – May 3 rd 2023, for midterm exam)
Credits (CFU/ETCS):	3
SSD	Agricultural Chemistry (AGR13)
Language	Italian
Mode of attendance	No mandatory

Professor/ Lecturer	
Name and Surname	Matteo Spagnuolo
E-mail	matteo.spagnuolo@uniba.it
Telephone	080 5442851
Department and address	Department of Soil, Plant and Food Sciences – Chemistry and Biochemistry Section, First floor room n. 9
Virtual room	Microsoft Teams code: vlv013t
Office Hours (and modalities: e.g., by appointment, on line, etc.)	From Monday to Friday, 9.00 a.m. to 1.30 p.m., following an established appointment requested by phone, e-mail or Teams.

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	

Learning Objectives	<i>The course, part of the IC -Crop Protection, aims to provide knowledge about the composition of plant protection products (PPP) and physical-chemical properties of pesticides and their mechanism of action in the biochemical pathways of target organisms. The transformation of active substances in plants and their fate in the soil environment will be also addressed. Students will be able to take sustainable measures to mitigate the harmful effects resulting from the application of plant protection products.</i>
Course prerequisites	Knowledge of Soil Chemistry and Plant Biochemistry request for the admission to the Master course.

Teaching strategies	<i>Oral presentation supported by Power Point slides, web sites and multimedia, by using the blackboard, documents prepared by the teacher, practical exercises in classroom and laboratory and visits in open field and companies.</i>
Expected learning outcomes in terms of	
Knowledge and understanding	○ Good knowledge about the composition and properties of pesticides and

<p>on:</p>	<p>their mechanism of action in the biochemical pathways of target organisms.</p> <ul style="list-style-type: none"> ○ Deep knowledge on the pesticide interaction with plant and the environment. ○ Good knowledge of the Italian and European legislation on pesticides,
<p>Applying knowledge and understanding on:</p>	<ul style="list-style-type: none"> ○ Very good ability to apply the legislation on the use and commercialization of plant protection products. ○ The student will acquire a very good competence for a sustainable use of pesticides in crop protection for reducing their environmental impact and for obtaining safe food products.
<p>Soft skills</p>	<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ Good analytical and problem solving skills to independently analyze different technical and market situations in terms of sustainable use of pesticides. • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Good ability to relate to other subjects in a multidisciplinary way on technical, human and ethical issues. ○ Ability to organize the acquired knowledge in form of didactic presentation and to articulate it for didactic purposes • <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Ability to use cognitive tools such as the information technology (IT) and the English language for the continuing self-education.
<p>Syllabus</p>	
<p>Content knowledge</p>	<p><i>Introduction on definitions and composition of PPP. Registration of pesticides. Principles of toxicology: toxicity towards humans and the environment. Chemical and functional classification. Physical and chemical properties of active substances. Formulation of pesticides. Mechanisms of action of pesticides. Transport and accumulation of pesticides in plant. Influence of physical-chemical properties on the absorption and translocation of pesticides in plant. Absorption, translocation and mechanisms of action of insecticides. Absorption, translocation and mechanisms of action of herbicides. Metabolism of pesticides in plant. Detoxification reactions: red-ox, hydrolysis, conjugation, role of glutathione, glucose and amino acids. Resistance and selectivity of pesticides. Fate of pesticides in soil. Diffusion, volatilization and mass transfer. Adsorption of soil components. Transformation: persistence, phototransformation, chemical degradation, microbial and enzymatic degradation, polymerization, oxidative coupling. Chemical and biotechnological processes of soil remediation. Hands on learning (Laboratory, working groups, seminars, field trips) Pesticide Residues in food. Criteria of compliance for big retailers. Analytical methods for the determination of pesticide residues. Sorption isotherms and analysis of pesticides in soil. Ecotoxicological assessment of pesticides.</i></p>
<p>Texts and readings</p>	<ul style="list-style-type: none"> • <i>Personal notes of the lectures and didactic materials distributed during the course.</i> • <i>Gennari M., Trevisan M., 2008 - Agrofarmaci. Conoscenze per un uso sostenibile. Gruppo Perdisa Editore/Airplane s.r.l. Bologna</i> • <i>Fitogest+ - Image line Network</i>

Notes, additional materials	<p><i>Additional learning tools</i></p> <ul style="list-style-type: none"> • http://fitogest.imaginenetwork.com • https://www.plantprotection.org/ • http://www.agrofarma.info/ • http://croplife-europe.org/ • https://www.salute.gov.it/portale/fitosanitari/homeFitosanitari.jsp • https://food.ec.europa.eu/plants/pesticides/eu-pesticides-database_en • https://www.epa.gov/pesticides • PAN International Pesticides don't respect national borders (pan-international.org) • PAN Europe (pan-europe.info) • https://www.hracglobal.com/ • https://irac-online.org/ • http://www.topps-life. • https://www.grifa.org/org/ • https://www.efsa.europa.eu/it/topics/topic/pesticides • https://www.arfd-calculator.com/
Repository	<p>The teaching material is available in the Microsoft Teams Class: Chemistry and Biochemistry of Plant Protection Products 2023/24 (teams code vlv013t)</p>

Assessment	
Assessment methods	<p>A mid-term exam will be held for active students (students enrolled in the academic year during which this discipline is offered). It will be an oral exam. The result of this mid-term exam will be valid for the whole academic year.</p> <p>The mid-term exam will be given on the subjects treated during the lessons and the practical activities as reported in the Didactic Regulation of the course (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>At the end of teaching period, students who passed positively the mid-term exam, can give the final exam on the subjects treated after the mid-term break, as reported in the Didactic Regulation of the Course (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>Students who did not pass or give the mid-term exam will be examined on the whole subjects treated during the lessons and the practical activities as reported in the Didactic Regulation of the course (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>The mid-term and the final exams consist of an oral test. The exam for foreign students can be given in English according to the above reported modalities.</p>
Assessment criteria	<ul style="list-style-type: none"> • <i>Knowledge and understanding</i> <ul style="list-style-type: none"> ○ Good knowledge about the composition and properties of pesticides and their mechanism of action in the biochemical pathways of target organisms. ○ Deep knowledge on the pesticide interaction with plant and the environment. ○ Good knowledge of the Italian and European legislation on pesticides, • <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> ○ Very good ability to apply the legislation on the use and commercialization of plant protection products. ○ The student will acquire a very good competence for a sustainable use of pesticides in crop protection for reducing their environmental impact and for obtaining safe agricultural products. • <i>Autonomy of judgment</i>

	<ul style="list-style-type: none"> ○ Good analytical and problem solving skills to independently analyze different technical and market situations in terms of sustainable use of pesticides. ● <i>Communication skills</i> <ul style="list-style-type: none"> ○ Good ability to relate to other subjects in a multidisciplinary way on technical, human and ethical issues. ○ Ability to organize the acquired knowledge in form of didactic presentation and to articulate it for didactic purposes ● <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Ability to use cognitive tools such as the information technology (IT) and the English language for the continuing self-education
Final exam and grading criteria	<p>The final mark will consider the theoretical and practical knowledge acquired, the ability to apply the knowledge, autonomy of judgment, communication skills and on the ability to integrate the acquired knowledge in a project work. The evaluation of the student is based on criteria previously fixed such as reported in the Annex A of the Didactic Regulation of the Master Course in Plant Medicine. The final mark is awarded in thirtieths. The exam is passed when the mark is greater than or equal to 18.</p>
Further information	