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del Sacro Cuore

Applied Agronomy and Horticulture

PROF. ANDREA FERRARINI - PROF. MATTEO GATTI

Applied agronomy (4 CFU)

PROF. ANDREA FERRARINI

Course aims and intended learning outcomes

This course provides a basic understanding of the science and practical applications regarding the main factors affecting crop production. The course aims to give an overview on the fundamentals in applied agronomy to students hoping to build their knowledge and skills in the topics that are most needed for sustainable management of agroecosystems. The growing of crops has evolved significantly over recent decades. The focus of many of the recent agricultural initiatives has been the integration of environmental and biodiversity aspects on farm and crop production.

Upon completion the students should have a fundamental knowledge of soil and water, nutrients and crop management. The course illustrates the main principles of soil agricultural science, agronomy and crop physiology and how these principles can be applied to modern agricultural systems.

Successful in-field agronomy, applied to each decision, needs a combination of practical and academic knowledge. The course is taught using common education technology, but a variety of practical examples from recent successful projects and real-farm examples, field tours and lab exercises will be woven into content delivery to maximize understanding and its application in the field of applied agronomy.

The skilful blend of all these elements calls the student for extensive and in-depth autonomy in self-assessment, the use of proper language along with the knowledge of the basics of crop, soil and ecology sciences. More specifically, the student is expected to be able to recognize and manage crop production factors and to interpret numerical data behind them.

By recognising the wide ranging demands placed on agronomists, the student is also expected to be able to critically read and address the challenges that the existing farmers are facing nowadays. In front of a given farmer's needs (e.g. contrasting soil organic matter decline) the student is expected to provide the most suitable solution.

Course content

	ECTS CREDITS
Introduction. Role of agronomy and crop science. Sustainable and ecological intensification of agriculture narrative. Agroecosystem and ecosystem services concept.	0.5
The soil. Chemical, physical, and biological properties, Soil organic matter and soil health assessment. Soil exercises.	1.0
Cropping systems. Tillage, planting practices, residues management, cover crops, crop growth.	0.5
Plant nutrition and irrigation. Nutrients, the nitrogen and phosphorous cycle, organic amendments and fertilizers, water and solute movement, soil/plant water relations, irrigation, drainage.	1.0



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Practical and field visit: exercises on soil, nitrogen and water calculations	1.0
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Reading list

Notes and study materials will be supplied during the lectures.

Teaching method

Lectures mixing basic knowledge and practical examples (successful projects and real-farm technologies), lab practice and educational field trips to UCSC field trials.

Assessment method and criteria

Final written exam with 21 multiple-choice questions (4 choices) that cover all the main topics addressed during the course and 3 exercises (9 points). Students will be given 2 h time to answer all questions and to solve the exercise.

Other info and prerequisites

Required pre-requisites for attending the course are basic knowledge of the plant physiology, chemistry, biochemistry and math.

Prof. Andrea Ferrarini is available to meet the students every day, by appointment, at the Department of Sustainable Crop Production.

Horticulture (4 CFU)

PROF. MATTEO GATTI

Course aims and intended learning outcomes

Students will acquire fundamental knowledge as it concerns characteristics of plant organs and fruit trees products intended for human nutrition, their origin and valorization. The course aims at providing students with the fundamental scientific, technical and operational knowledge related to the establishment and management of fruit tree orchards. Expected learning outcomes are better defined below.

Knowledge and analysis ability

At the end of the course students are expected to own fundamental knowledge about fruit trees anatomy and physiology as well as origin and valorization of different plant organs. Students will also know the role of main factors affecting plant productivity and fruit quality towards sustainable orchard management.



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Know-how and its application

Students must be able to apply physiological principles in order to design a new orchard and to identify the most appropriate practices for canopy and soil management. Students will also be able to assess fruit ripening for setting harvest operations according to commercial targets.

Autonomy in self-assessment

At the end of the course students will be able to assess the impact of growing site and cultural practices on plant growth, yield and fruit composition. They will be able to identify several cultural issues affecting fruit trees, and to find solutions by considering technical and economic aspects.

Communication skills

Students are expected to be able to successfully provide a correct description of plant organs, phenology and physiological status. Students must be able to discuss different technical items by using appropriate language.

Learning capacities

At the end of the course students will be able to improve knowledge on fruit trees and orchard management issues even not discussed during class by consulting handbooks, specific websites as well as scientific and technical journals.

Course content

	ECTS CREDITS
Tree morphology and plant propagation: Morphology and growth of tree organs, flowers and fruits. Seed and vegetative propagation.	1.0
Fundamentals of tree physiology and ecophysiology: Factors affecting yield and fruit composition. Carbon assimilation and partitioning.	1.0
Orchard management: Pruning and training systems, orchard fertilization and irrigation, canopy management and soil management, fruit ripening and harvesting, orchard planting, mechanization for tree fruit crops	1.5
Invited seminars on specific topics; Audio-video listening of lectures and working groups; Indoor discussion of case studies; Lab practice; Field trip.	0.5

Reading list

JACKSOON D, LOONEY N, MORLEY-BUNKER M, THIELE G.(EDS.) 2011. Temperate and subtropical fruit production. Cabi pp.327

WESTWOOD MN.2009. Temperate-Zone Pomology: Physiology and Culture, Third Edition. Timber press pp. 523

TROMP, J., A.D. WEBSTER & S.J. WERTHEIM (EDS) 2005. Fundamentals of Temperate Zone Tree Fruit Production, 400 pp

Additional reading materials will be handed out during the course. Documents and teaching materials will be shared using the Blackboard platform.



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Teaching method

The teaching method will embrace the following activities:

- 1) Indoor class where main course topics will be covered along with several applied examples. Interactions between teacher and students will be promoted by stimulating discussion of specific case studies.
- 2) Indoor and outdoor practical activities including field visits for a better appreciation of topics covered during indoor class including orchard design, training systems and management protocols.

Assessment method and criteria

Student's performance will be assessed through written examination by combining multiple-choice and open questions; 15 multiple-choice questions will be valued a maximum score of 15 (true answer = 1 each). Additional 3 open questions with 5 rows available per each answer will be scored on a 0–5 scale corresponding to a maximum score of 15. Score will reflect the following items: a) knowledge of the subject; b) language clarity; c) ability to make connections between different topics. Final score will be the sum of the two section scores and will be expressed on a 0–30 scale. Indicator of success : Score $\geq 18/30$.

Other info and prerequisites

Participation at tutorials and technical field trip is recommended. Time schedule and location for students' colloquia: everyday after class at the Department of Sustainable Crop Production (DI.PRO.VE.S.) – Section of Fruit Culture and Viticulture (office 313).