**Applied Agronomy and Horticulture**

## Prof. Andrea Ferrarini, Prof. Sergio Tombesi

**Horticulture (4 CFU)**

## Prof. Sergio Tombesi

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

Students will acquire fundamental knowledge about plant organs and fruit tree products intended for human nutrition. 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. Students will also know the role of main factors affecting plant productivity and fruit quality towards sustainable orchard management.

**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 cropping 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***

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|  | 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***

SANSAVINI S, COSTA G, GUCCI R, INGLESE P, RAMINA A, XILOYANNIS C, DESJARDINS Y (EDS.) 2019. Principles of modern fruit science. ISHS pp 421

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.

***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***

Written exam. 11 open questions with 5 rows available per each answer. Score will reflect the following items: a) effective knowledge of the subject and good overal handling of the matter; b) language clarity; c) ability to make connections and links between different topics.

## ***NOTES AND PREREQUISITES***

It is highly recommended that students attend outdoor class and visits as topics covered during these sessions have to be considered part of the teaching program.

Students are encouraged to meet Dr. Sergio Tombesi after lectures for clarification about course topics, at the Department of Sustainable Crop Production, Pomology and Viticulture Section (ex Istituto di Frutti-Viticoltura).

**Applied agronomy (4 CFU)**

## Prof. Andrea Ferrarini

***COURSE AIMS AND EXPECTED LEARNING SKILLS***

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 climate change mitigation and soil health on farm and crop production.

**Knowledge and analysis ability**

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, regenerative agriculture and how these principles can be applied to modern farming systems.

**Know-how and its application**

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.

**Autonomy in self-assessment**

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.

**Learning capacities**

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***

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| --- | --- |
|  | ECTS CREDITS |
| **Introduction**. Role of agronomy and crop science. Regenerative agriculture and carbon farming 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**. Principle of plant nutrition, organic amendments and fertilizers, water and solute movement, soil/plant water relations, irrigation, drainage. | 1.0 |
| **Practical and field visit:** exercises on soil, nitrogen and water calculations | 1.0 |

***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 EVALUATION CRITERIA***

Final written exam with 16 multiple-choice questions (3 choices) and 1 open question (5 points) that cover all the main topics addressed during the course and 2 exercises (9 points). Students will be given 2 h time to answer all questions and to solve the exercise.

## ***OTHER INFO AND PRE-REQUISITES***

Required pre-requisites for attending the course are basic knowledge of plant physiology, chemistry, biochemistry and math. Prof. Andrea Ferrarini is available to meet with students every day, by appointment, at the Department of Sustainable Crop Production.