

Didactic Activities Academic Year 2023/24

Lectures	Course	n. hours	Description
Bartolini Susanna	Eco-biology and geography of the olive tree: olive growing in Italy and in the world	20	The course will deal with the relationship between environmental factors and the biological cycle of the olive tree, illustrating in particular the climatic elements and their effects on the physiological processes, on the phenology and on the qualitative characteristics of olives and oils. The various problems will also be addressed in the light of climate change and the cultivation area expansion. A part of the course will be dedicated to the diffusion of varieties in Italy and in the world and to olive growing in emerging countries too.
Bartolini Susanna	Biological cycles and perennial species floral phenology under current and changing climate conditions	20	The course deals with the biological cycles and phenology evolution of the main fruit tree species of Mediterranean temperate areas. Relationships between different factors involved in biological processes, and interactions between genotype and environment will be proposed. The knowledge and study of these elements is extremely topical for the purpose of enhancing genetic resources in a future scenario considering that the current climate change is seriously impacting on phenological phases of fruit tree species.
Stefano Brizzolara	Metabolomics: basic principles and applications	10	Gas/liquid-chromatography coupled to mass spectrometry represents the most powerful and effective tool for plant tissues and biological samples chemical characterization. Therefore, this technology also represents the most utilized tool for Metabolomics. Understanding compositional variations induced by specific experimental/stress conditions is crucial for unravelling the mechanisms involved in physiological responses. Theoretical lectures and practical experiences in the lab will provide basic information on the equipment structure and functioning. A panel of potential application of this technology in crop and plant sciences will be presented.
Camilla Moonen	Agroecological Crop Protection in an EU context	20	The first part of this course will focus on EU regulations and recent modifications thereof regarding Integrated Pest Management. Participants will have the opportunity to get familiar with the EU policies, the integration and uptake at national level and finally the on-farm application of IPM. The second part of the course will focus on Agroecological Crop Protection and how this can support farmers in reaching high-standard IPM levels. Examples from research and practice will be provided and participants will be asked to critically analyse these examples.
Dell'Acqua Matteo, Leonardo Caproni, Svenja Mager	Introduction to genomics	20	An introductory course focusing on genomics and applied genomics. We will discuss about elements of genetics and genome organization; Sequencing approaches of first, second, and third generation; applications of genomics to study different aspects of genomes and groups of genomes, including epigenetics, transcriptomics, metagenomics, pangenomics, ancient DNA, environmental DNA; rudiments of sequence alignment approaches; use of genomics for the characterization of diversity in populations; elements of quantitative genetics and genomic selection approaches.

Ercoli Laura	Journal club on plant/soil Interactions	10	The course aims to discuss some cutting-edge scientific papers published in research journals on the topic of the soil-plant interactions under the challenging climate change scenario. Students present a summary of the chosen paper that the whole group has read. Then, the discussion begin. Attendees ask clarifying questions, inquire about different aspects of the experimental design, critique the methods, and praise (or criticize) the results.
Ercoli Laura	Applied Agroecology	20	The course provides students with a comprehensive view of soil-plant interactions at the field scale in order to optimize the management of the cropping system and its impacts on soil and crop. It addresses the interactions between plants, soil and soil organisms, the roles played by soil organisms in decomposition of organic material and nutrient cycling. Other topics include the importance of soil organisms for soil fertility, mycorrhizas and their effects on crop productivity. The course will also provide detailed information on plant nutrition and fertilizer and biostimulant application.
Francini Alessandra	Photosynthetic performance of agricultural crops: chlorophyll fluorescence and gas exchanges approach	5	Chlorophyll a fluorescence and gas exchange parameters are not destructive measurements useful for the characterization of plants responses to environmental stress and phenotyping. While the fluorescence quenching analyses, it is possible to deliver the information about the energy absorption, utilization, dissipation, and the electron transport in PSII. These information, crossed with data of stomatal conductance and evapotranspiration rate, provide a complete picture of the photosynthetic response of plants during the growth.
Mensuali Anna	Advanced plant tissue cultures techniques	20	The course aims to introduce students to in vitro technologies for crop species. They will be enabled to orient themselves in the choice of in vitro culture to use, according to their work and / or research objectives in the field of plant biology, breeding, biodiversity conservation, production of secondary metabolites. Basic information on plant in vitro culture and novel approaches for in vitro propagation will be provided. The course will be structured as follows: classroom lectures, lab experience, bibliographic research, seminars
Mensuali Anna	In vitro plant cultures as biofactories	20	The course will be focused on the production of useful plant secondary metabolites. Biological basis of in vitro plant cells, tissues and organs culture. Callus culture and cell suspension. Bioreactors. Evaluation of cultured cells viability. Strategies to increase secondary metabolites production. Biotransformations. Immobilized cells. "Hairy roots". Production of metabolites from undifferentiated cells or from in vitro plant differentiated biomass. Plant biotechnologies applied to the cultivation of aromatic and medicinal plants. Plant cell cultures as novel foods. Presentation of case studies. The course will be structured as follows: classroom lectures, lab
Pellegrino Elisa	Introduction to systematic review and meta-analysis	10	Introduction: How and why perform a Meta-Analysis, and when does it make sense? Effect Size and Precision, effect Sizes Based on Means, Effect Sizes Based on Binary Data (2x2 Tables), effect Sizes Based on Correlations; Converting Among Effect Sizes, Factors that Affect Precision Fixed-Effect Versus Random-Effects Models, Fixed-Effect Model, Random-Effects Model, Fixed-Effect Versus Random-Effects Models: Worked Examples. Heterogeneity, Identifying and Quantifying Heterogeneity, Prediction Intervals. Worked Examples Power Analysis for Meta-Analysis Publication Bias. Reporting the Results of a Meta-Analysis. The course is based on the use of the software: Comprehensive Meta-Analysis Software (CMA), and on lectures and practical session. The student can prepare its own dataset and work on it or work in shared datasets.

Perata Pierdomenico	Experimental plant physiology for ABS	20	The course is aimed to provide a forum of discussion about experiments performed by PhD students within the framework of their PhD projects. Contributions from experimental activities of post-docs and Ms students are also planned. The Course is active during the whole year, with one-two hour class every week. The presentations are discussed and placed in the context of the future publication of results thanks to the contribution of all the participants to the class. The main topics discussed are the research themes described in the PlantLab website: www.plantlab.santannapisa.it .
Pucciariello Chiara	Principles of plant-microbe molecular interactions	20	The course "Principles of Plant-Microbe Molecular Interactions" faces friendly and hostile interactions between plants and microorganisms, focusing on molecular recognition processes and signal exchange. The contents of the course include: molecular strategies of plant-microbe interactions; plant defense mechanisms to hostile microorganisms: pathogenesis or resistance; plant-microbe symbiotic interactions: legume-rhizobia and arbuscular mycorrhiza fungi-plant associations; molecular methods for studying plant-microbe interactions; improvement of plant protection/fitness through molecular techniques. The bibliography of reference includes selected recent scientific publications.
Rossetto Rudy	Geographic information systems: theory and applications	20	Theory and application of Geographic Information Systems (GIS) is an entry-level course designed for students with little to no-formal GIS training aiming at developing the necessary skills to integrate GIS into their scientific curriculum. As location-aware technologies becomes increasingly important, GIS constitute relevant tools for analyzing scientific spatially-distributed data. Students will learn the basics of GIS and how to prepare and store data in spatial database, to analyze spatial data, and to use cartography techniques to communicate results by means of maps and graphs. Specific applications to the agronomic research area will be presented and discussed.
Sebastiani Luca	Experimental approaches and data analysis in crops	20	The course introduces to statistical techniques used to perform a correct experimental planning in plant and crop sciences, the analysis of experimental data. Main topics will be: a) theoretical and statistical distributions; b) z-test and t-test; c) analysis of variance; d) regression and correlation analysis. Practical examples of experimental designs and data analysis in plant and crop sciences will be analysed using R program.
Sebastiani Luca	An introduction to R	10	The course introduces the use of the R, an open-source program for statistical analysis and graphical restitution. Students will learn how to install R and R-Studio. Basic commands will be explained and "scripts" will be done. Students will create objects in R (vectors, dataframes) and perform operations with them. Data reading from external files (txt, xlsx, csv) and graphical representation will be performed.
Tonutti, Sebastiani	Trends in horticultural science (journal club)	20	The course is organized as "Journal club". Students will be assigned specific papers, published on top Journals, dealing with innovative topics concerning Horticultural Science. Students will present the data and the main results of these articles and will comment these papers in the class, with a discussion involving all participants. In addition to the scientific hypotheses, students will be asked, in particular, to analyze and evaluate the methodological aspects and the experimental plans of the papers, pointing out the strength and the weaknesses of the articles.

Tonutti Pietro	Ethylene physiology in plant science and horticultural productions	20	Ethylene , the gaseous hormone, has many and diverse roles in plant growth and development. In addition, some plant growth regulators are practically used to amplify or repress the ethylene responses. After some historical aspects regarding the discovery of ethylene, the course will analyze and describe the physiological, biochemical and molecular mechanisms regulating ethylene biosynthesis, perception and signal transduction in model species such as Arabidopsis and , concerning fruit crops, tomato. Ripening physiology in relation to ethylene will also be described in climacteric and non-climacteric fruits.
Tonutti Pietro	Fruit ripening and postharvest physiology	20	Fruit ripening is the developmental stage, genetically controlled, characterized by a number a processes, some of them strictly correlated often under the control of ethylene. Ripening allows fruits to reach the edible feature through the acquisition of specific quality parameters. The different factors (pre- and post-harvest) affecting the quality parameters will be described. The specific changes occurring during ripening in terms of physiology (respiration, ethylene biosynthesis) and commercial parameters (e.g. colour, texture, aroma) will be analyzed. Special emphasis will be dedicated to the description of the effects of storage techniques (refrigeration, controlled/modified atmosphere) on the evolution of ripening.
to be defined	Scientific English	20	The Course has the dual purpose of consolidating English language proficiency and developing both oral and written communication skills in science. Ample space is left for conversation and critical review of papers