General information	
Academic subject	Fruit tree eco-physiology and strategies to cope with climate change
Degree course	International Master of Science in Innovation Development in Agrifood Systems (IDEAS)
ECTS credits	9 ECTS (6 ECTS of Lectures + 3 ECTS of lab and field classes)
Compulsory attendance	No
Teaching language	English

Subject teacher	Name Surname	Mail address
	Pasquale LOSCIALE	pasquale.losciale@uniba.it

ECTS credits details		
	6 ECTS Lectures	3 ECTS Lab and filed classes

Class schedule	
Period	2nd Semester
Course year	1st Year
Type of class	Lectures, 6ECTS (48 hours) Field and lab classes and training, 3CFU (42 hours)

Time management	
Hours	225
In-class study hours	90
Out-of-class study hours	135

Academic calendar	
Class begins	March 1st, 2021
Class ends	June 11th, 2021

Syllabus	
Prerequisites/requirements	
Expected learning outcomes	***Knowledge and understanding*** Knowledge and understanding on: • The relationship existing between the main microclimate/pedological variables and fruit tree physiology and functioning. • The low-input/high-efficiency agro-practices analysed during the class and how these can affect the orchard behaviour. • Basic knowledge for monitoring the orchard correctly. • The most used field sensors and their strength/weakness points. ***Applying knowledge and understanding*** Theoretical and practical knowledge on: • The measure of the main physiological processes determining the product formation. • The implementation of the low-input/high-efficiency agro-practices in the field. • The use of the most widespread orchard monitoring devices. • The correct interpretation of aDSS outputs and

	suggestions. ***Making informed judgements and choices*** • Ability to choose and combine the low-imput/high-efficiency agro-practices, addressed in the class, according to the pedo-climate, the input factors availability and the productive target to reach. • Ability to chose the most appropriate field sensors and aDSS taking into account their strength/weakness points, as well as the real the farm conditions to be faced. ***Communicating knowledge and understanding*** • Ability to communicate and discuss the issues addressed in the class with an appropriate terminology. ***Capacities to continue learning*** • Ability to deepen and upgrade the knowledge about the issues addressed in the class. The expected learning outcomes, in terms of knowledge and skills, are listed in Annex A of the Master Degree Course Regulation (expressed through the European Descriptors of Degree qualification).
Contents	• **About the class and the educational agreement** • **Fruit tree eco-physiology under a changing climate** o Leaf functionality: physiology, measurement, environmental effects and adaptation strategies. - Photosynthesis, thermoregulation and photoperiod. - How do we measure? - Environmental effects and adaptation strategies (light stress, heat stress, drought stress and sub optimal soil conditions). o Water relations within the Soil-Plant-Atmosphere Continuum (SPAC): physiology, measurement, environmental effects and adaptation strategies. - The trip of a drop: water movement from the soil to the atmosphere (matric potential, water potential, stomatal conductance, Vapour Pressure Deficit). - How do we measure? - Environmental effects and adaptation strategies (water limitation, waterlogging, drought avoidance/tolerance/resistance mechanisms). o Fruit growth and its quality: physiology, measurement, environmental effects and adaptation strategies. - Fruit growth models in some representative fruit tree species; the souce/sink relation within the tree - How do we measure? - Environmental effects and adaptation strategies. o Thermic requirements of fruit tree species in temperate zones: physiology, measurements, environmental effects and adaptation strategies. - Endodormancy, ecodormancy, chilling and heat requirements.

	- How do we measure and estimate? - Adaptation strategies. • **Innovative Agro-practices with low-input and high-efficiency** o Sustainability in the productive processes: definition and consequences. o Orchard design. o Canopy management. o Microclimate modulation. o "Carbon and water friendly" soil management. o Low-impact and high-efficiency water management. • **Orchard monitoring** o From Agriculture 1.0 toward Agriculture 5.0. o Knowing the orchard features to monitor it adequately. o Climate monitoring and the related sensors. o Soil monitoring and the related sensors o Plans Sensing and Sensors. o The multilayer approach. o Monitoring for managing: the Decision Support Systems in agriculture (aDSS) and the Internet of Things (IoT).

Course program	
Reference books	- Lecture notes, presentations, scientific papers and other didactic material will be provided by the teacher. - Selected chapters of the book: *Principles of Modern Fruit Science. Sansavini et al (ed). 2019. ISHS*
Notes	
Teaching methods	Classroom lectures, classroom experiences (practicum), filed and lab activities, case study discussions, seminars held by experts.
Evaluation methods	Intermediate evaluation tests (*esonero*) are foreseen in oral or written form, according to the number of candidates. The final exam, on the remaining part of the class not evaluated by the *esonero*, will be taken in oral form.
Evaluation criteria	(i) To identify the linkages existing between the pedo-climate variations and the tree functioning. (ii) To acquire the related skills for measuring the tree functioning and the productive performances. (iii) To acquire the know how to apply the low-imput/high-efficiency strategies for managing the orchard. (iv) To understand properly the meaning of the data provided by sensors and aDSSs used in the orchard. (v) To be able to communicate and discuss the issues addressed in the class with an appropriate terminology; to link what has been learned during the class with other acquired knowledge.
Receiving times	Monday-Friday. Appointment required: by e-mail, pasquale.losciale@uniba.it