# **Applied Grapevine Eco-physiology**

## Prof. stefano poni

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

Students will deepen knowledge related to grapevine ecophysiology to master solutions suitable to solve practical issues in the vineyard. The course will include new perspectives bound to climate change and to a more efficient use of water and nutrient resources. Expected learning skills are better defined below.

**Knowledge and analysis ability**.

At the end of the course the student is expected to own fundamental knowledge about grapevine ecology, environmental effects and constraints related to vine efficiency and grape composition and applied physiology related to key vineyard practices such as summer and winter pruning.

**Know-how and its application**

The student must be able to apply the learned physiological principles to recognize limiting factors affecting a given vineyard scenario and providing suitable solutions. More specifically, the student is expected to successfully manage situation if vine unbalance, to judge and advise about winter and summer pruning as well as on any stress status of the vineyard. For each of these items, the student is expected to be able to provide the most suitable solutions.

**Autonomy in self-assessment**

In front of a given viticultural issue, the student is expected to provide autonomous analysis and thinking inspired to the acquired knowledge rather than based on popular “rule of thumbs” applications.

**Communications skills.**

The student is expected to be able to successfully deliver, in both oral and written forms, a correct diagnose and discussion of the different viticultural items, using suitable and proper technical language.

**Learning capacities**

Regardless of previous background, at the end of the course the student will have to hold learning capacities suitable to either lead him/her to higher study courses or to successfully tackle a job appointment.

***COURSE CONTENT***

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| **Topics** | ECTS |
| Bases of environmental physiology: photosynthesis and respiration; Xylem and phloem function. Yield formation, yield potential and its realization. Grape composition and fruit quality: water, sugar, acids, nitrogen compounds and mineral nutrients, phenolics, lipids and volatiles. | 1.0 |
| Environmental physiology and climate: radiation, temperature, water.  Environmental constraints and grape physiology: responses to stress. Water: too much or too little? Nutrients: deficiency and excess. Salinity. Temperature: too cold or too warm? | 1.5 |
| Climate change and impact on viticulture: main features of climate change and its effects on viticulture. Adaptation and mitigation techniques. New tools for better assessment and prediction of climate-change related effects. | 1.0 |
| Physiology of pruning and canopy management: winter pruning: an ideal case for applied physiology. Physiology of main summer pruning techniques: shoot thinning, shoot trimming, leaf removal, cluster thinning. | 1.5 |
| Training systems and physiology of training systems. Methods for assessing their efficiency and suitability to adapt to a specific site. Physiology of mechanical harvesting | 1.0 |

#### *READING LIST*

S. PONI. *Designing and managing a sustainable vineyard in a climate change scenario. Available online on Amazon, 2022, self-published.*

M. Keller. *The science of grapevines.* Elsevier, 2010.

# P. ILAND, P. Dry, D. Profitt, S. Tyerman. The Grapevine: from the science to the practice of growing vines for wine. P. Iland Wine Promotion, 2012.

A. Palliotti, S.Poni, O. Silvestroni. *La nuova viticoltura*. Edagricole, 2015 (in italiano).

Additional reading materials will be provided on BB platform during the course.

***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. Teaching methos will use high interactivity between teacher and students to stimulate discussion and also help breaking the barrier of shyness.

2) Indoor or outdoor (i.e. in–field) practical activities and exercises aimed at either direct appreciation of equipment functioning (e.g. sessions of gas exchange and pressure chamber measurements will be organized with subsequent discussion of the obtained results”) and “hands on” examples on how to perform some canopy management operations.

3) Field visits within the national territory for a better appreciation of the wine value chain. Topics covered uring the vist are intergap part of the cluster program.

***ASSESSMENT METHOD AND EVALUATION CRITERIA***

Final written exam. A test will be delivered consisting of: three open questions each one worth 5 points; 16 multiple choice questions (4 possibe answers) each one worth 1 point. Satisfactory and correct answers to all items will lead to a 30 *cum laude* score.

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

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

Required pre-requisites for attending the course are basic knowledge of plant biology and physiology, horticulture, and viticulture.

# In case the current Covid-19 health emergency does not allow frontal teaching, remote teaching will be carried out through synchronous or asynchronous procedures that will be promptly notified to students

Prof. Stefano Poni is available to meet with students on the days when lectures are held, at the Department of Sustainable Crop Production, Fruit Culture and Viticulture Section.