# Viticulture 1

## Prof. Luigi Bavaresco; Prof. Matteo Gatti

***Text under revision. Not yet approved by academic staff.***

Ampelography and Vines Module

Prof. Luigi Bavaresco

COURSE AIMS AND INTENDED LEARNING OUTCOMES

 Provide a basic knowledge of ampelography and the genetic improvement of the vine, teaching students the methodology for characterising and recognising vines.

INTENDED LEARNING OUTCOMES

Knowledge and ability to understand

At the end of the course, students will know and understand:

1. The various methods of varietal characterisation.
2. The level of detail and precision of varietal characterisation.
3. The broad inter-varietal variability and salient characteristics of the main wine vines cultivated across the world.
4. The remarkable clonal selection work done in Italy aimed at exploiting intra-varietal variability.
5. The distant and recent history of hybridisation (interspecific) done with the aim of obtaining vines resistant to disease and of good quality.
6. The global situation of the new varieties (especially from wine) obtained through crossing (intraspecific).

Understanding and applying knowledge

At the end of the course, students will be able to:

1. perform varietal characterisation using the various ampelographic methods, from the simplest and most direct (such as the classic ampelographic sheet), to those of a more performative and precise nature (such as DNA analysis);
2. recognise the most common wine vines in the vineyard, through a comparison between the observed features and those reported in the ampelographic charts;
3. choose and agronomically manage the different vines based on their productive, qualitative and adaptive characteristics;
4. perform a clonal selection process;
5. set up and manage a crossing/hybridisation programme.

Autonomous judging skills

At the end of the course, students will be able to:

1. choose the most appropriate ampelographic method based on the contingent needs;
2. choose a breeding strategy (clonal selection, crossbreeding, hybridisation) according to the objectives to be achieved.

Communication skills

At the end of the course, students will be able to:

1. appropriately use the scientific language and specific lexicon of ampelography and genetic improvement to describe and transfer their knowledge both in writing and orally.

Learning ability

At the end of the course, students will be able to:

1. increase their knowledge on ampelography and vines, through the consultation of dedicated texts, scientific and popular magazines, even beyond those aspects discussed during lectures.

COURSE CONTENT

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|  | ECTS |
| Ampelography: definition, history, description of traditional and innovative methods, with examples taken from the scientific literature; the combined use of different methods.  | 0.5 |
| Wine vines: para-domestication and domestication of *V. vinifera* *silvestris;* origin of today's cultivated vines, classification according to oenological objective; varietal families; distribution in the world and in Italy; description of the main cultivated varieties: historical information, spread, ampelographic features (morphological, physiological, phenological, technological), type of wine obtained and sensory profile.  | 1.5 |
| Genetics and traditional genetic improvement: clonal selection, crossbreeding, hybridisation: usable methodology and main results. Brief notes on innovative methods (cis-genesis and genome editing).  | 1.0 |
| TUTORIALS. Field and greenhouse visits for the recognition of vines. Ampelography tutorial in the classroom. Sensory analysis of wines from new vines (hybrids). | 1.0 |

READING LIST

Adopted books:

Bavaresco L., Gardiman M., 2015. Vitigni italiani – Italian Wine Grape Varieties. Gianni Sartori Editore, Ponte di Piave.

Calò A., Scienza A., Costacurta A., 2006. Vitigni d’Italia. Edagricole, Bologna.

Recommended books

Anderson K., 2013*.*Which Winegrape Varieties are Grown Where? University of Adelaide Press, e-book.

Anderson K., Nelgen S. (2020) - Which Winegrape Varieties are Grown Where? - A Global Empirical Picture. Revised Edition. Univ. Of Adelaide Press, e-book.

Christensen L.P., Dokoozlian N.K., Walker M.A., Wolpert J.A., 2003. Wine Grape Varieties in California. University of California ANR, Publ. 3419.

Fregoni M., 2013. Viticoltura di qualità. Tecniche Nuove, Milan.

Fregoni M., Lorieri PP, Bavaresco L. 2022. Vermentino - Vitigno dei cambiamenti climatici. Città del Vino.

Maghradze D., Rustioni L., Tukor J., Scienza A., Failla O., 2012. Caucasus and Northern Black Sea Region Ampelography. Vitis, Siebeldingen, Germany.

Reynolds A., 2015. Grapevine Breeding Programs for the Wine Industry. Woodhead Publishing, Cambridge, UK.

Robinson J., Harding J., Vouillamoz J. (2012) - Wine Grapes. Harper Collins Publishers, NY, USA, 1242 pp.

Silvestroni O., Palliotti A., Poni S. 2022. Atlante dei vitigni e vini di territorio. Edagricole.

TEACHING METHOD

1. Theoretical frontal lectures in which the main topics of the course will be addressed.
2. Tutorials in the classroom and in the field on the OIV (International Organisation of Vine and Wine) ampelographic features.
3. A half-day excursion to a vineyard-collection.
4. Tasting of wines obtained from disease-resistant vines.
5. The slides used during lectures will be provided weekly to students.
6. The slides are considered an integral part of the teaching material.
7. At the end of each course chapter, students will be provided with a reading list to consult should they wish to study some of the topics covered in lectures in more detail.

ASSESSMENT METHOD AND CRITERIA

# Final oral exam, which will consist of three general questions related to the topics of ampelography, vine characteristics and genetic improvement (maximum 10 marks each). Within each question, the mark is broken down as follows:

5 marks: objective correctness of the answer provided;

2 marks: ability to make connections between different topics, proving to have an overall view of the subject;

3 marks: ability to be synthetic and to confront the topics with a command of the language and a critical eye, also presenting them with a personalised interpretation.

NOTES AND PREREQUISITES

Participation in the tutorials is recommended as the topics covered will also be the subject of the final exam.

The necessary prerequisite is a basic knowledge of plant biology and physiology.

Information on office hours available on the teacher's personal page at http://docenti.unicatt.it/.

# Morphology and Physiology Module

## Prof. Matteo Gatti

COURSE AIMS AND INTENDED LEARNING OUTCOMES

 The aim of the course is to provide a key basic knowledge of wine viticulture (the history, spread, anatomy, physiology, ecology, and vegetative and reproductive cycles).

Knowledge and ability to understand

At the end of the course, students will know and understand:

1) Types of organs and related growth processes within the vine.

2) Abnormal growth cases (excessive or insufficient vigour, overproduction, etc.).

Understanding and applying knowledge

At the end of the course, students will be able to:

1) Apply their acquired knowledge of vine organography and the anomalous growth and maturation states of grapes.

2) Perform a correct diagnosis of vegetative-productive imbalances, and suggest the most appropriate corrective solutions.

Autonomous judging skills

At the end of the course, students will be able to:

1) Produce objective and site-specific analyses of a vineyard's state of equilibrium and source-sink relationships, without automatically turning to, not always applicable, general principles.

Communication skills

At the end of the course, students will be able to:

1) Appropriately use the scientific language and specific technical vocabulary of viticulture to clearly communicate the concepts learnt.

2) enter into and support a discussion within a technical group frequented by various stakeholders in the wine-vine supply chain.

Learning ability

At the end of the course, students will be able to:

1) Increase their knowledge of the anatomy, physiology, and growth and maturation cycles of the vine through independent consultation of specialised texts and scientific and sector magazines, as well as interact within technical blogs or dedicated social groups.

COURSE CONTENT

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|  | ECTS |
| History. Worldwide spread of viticulture in European and non-European countries. Market trends. Taxonomy of the *Vitis* genus. | 0.5 |
| Morphology and functions of the root. Organography of the epigeal part: the permanent structures, the germination complex, the bud, inflorescence, the cluster. | 1 |
| Lifecycle and annual cycle. Description and dynamics of the phenological phases of the vine. The vegetative cycle. The reproductive cycle: bud formation, flower differentiation, flowering and fruiting.  | 1 |
| Gas exchanges. The effect of light, temperature and leaf age on photosynthesis. Water relations and water use efficiency. Source-sink *relations* and crown efficiency. | 1.5 |
| Growth and maturation of the berry: anatomical, physiological and biochemical aspects of maturation. Mechanisms of solute accumulation in the berries. Definition and determination of grape maturity. | 1.5 |
| Ecology: role of the grape variety, rootstock, climate and soil in grape quality. Climate change and effects on viticulture. | 1.5 |
| Tutorials. Recognising the organs of the vine, the phenological phases and the characterisation of the crowns. Tools for monitoring the physiological state of the vine. Visit to a vineyard. | 1 |

### **READING LIST**

Main reference text:

Palliotti A., Poni S., Silvestroni O. Manuale di viticoltura. 1st edition (2018). Ed. New Business Media.

Further texts for in-depth reading:

Various Authors 2008. *La vite e il vino*. Collana Coltura e Cultura, Bayer Crop Science.

Palliotti A., Poni S., Silvestroni O. 2015. *La nuova viticoltura*. Edagricole, Bologna.

Fregoni M., 2013. *Viticoltura di qualità*. Tecniche Nuove, Milan.

TEACHING METHOD

1) Theoretical frontal lectures in which the main topics of the course will be addressed. The teaching method is highly interactive with frequent requests for students to provide opinions on or answers to the case studies presented.

2) Outdoor tutorials (potted plant or mini-vineyard teachings) for hands-on experience in some of the topics dealt with in class: possible subjects include direct participation of students in recognising the various organs present in the plant, or conduction, and physiological measurement sessions (eg. gas exchange or water potential through the leaves).

3) Classroom tutorials during which the data acquired from the external measurements are presented and discussed.

4) Educational visits to vineyards within and/or outside the region. The course includes one guided tour/year lasting 6 hours. The visit also includes a discussion with the host company on their cultivation choices and the crown management applied in different plots.

ASSESSMENT METHOD AND CRITERIA

A final oral exam.

Three general questions will be asked on the macro-topics of anatomy, physiology, and growth cycles. Each question carries a maximum mark of 10/30.

Within each question, the mark is broken down as follows:

6 marks: objective correctness of the answer given;

2 marks: ability to express oneself with a proper command of the technical language and in good Italian;

2 marks: ability to produce conceptual links between the course topics.

NOTES AND PREREQUISITES

Participation in the tutorials is recommended. The topics dealt with during the tutorials will be fully covered in the exam.

The necessary prerequisites are a basic knowledge of plant biology and physiology, and the elements of general arboriculture.

Information on office hours available on the teacher's personal page at http://docenti.unicatt.it/.