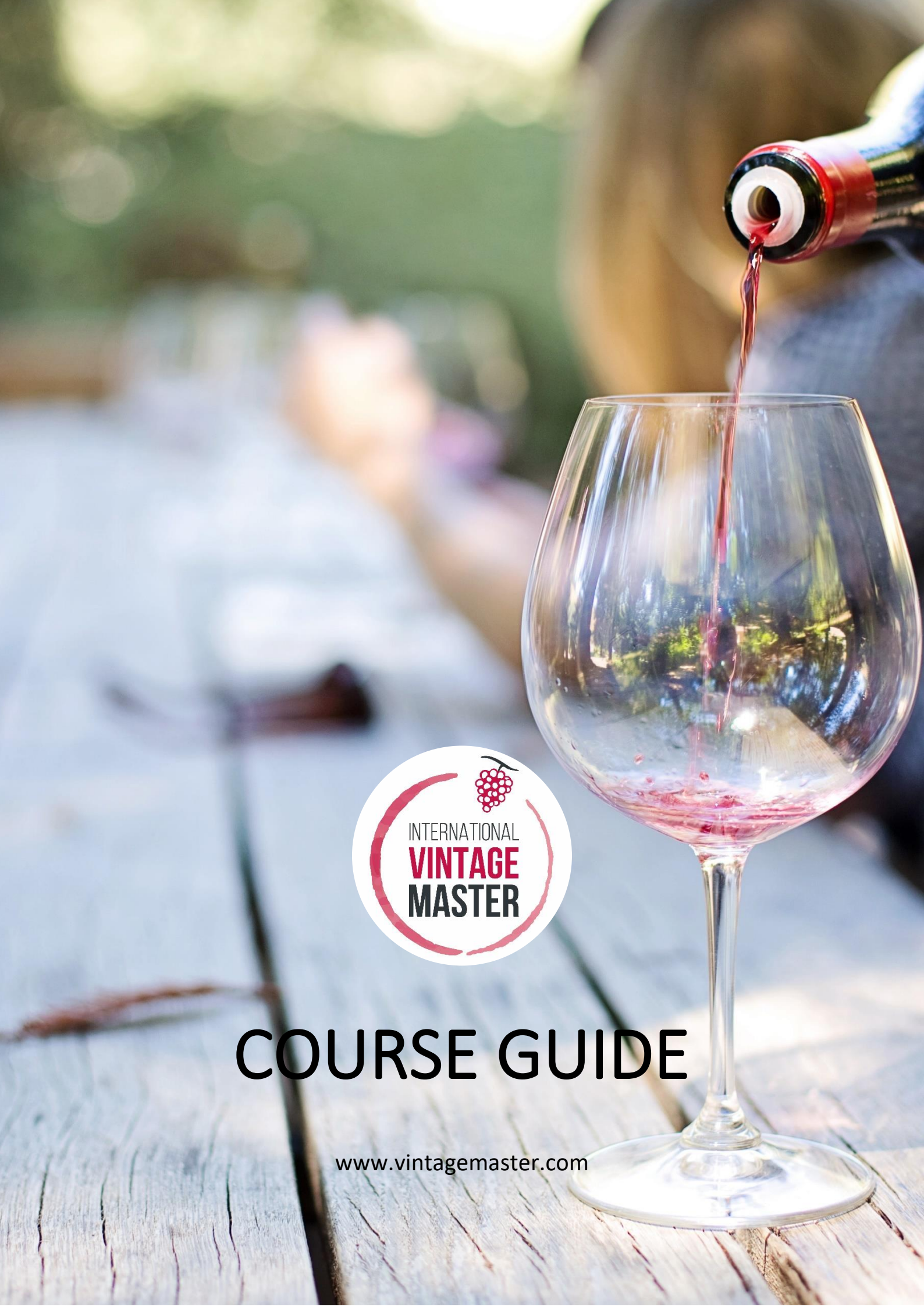

INTERNATIONAL VINTAGE MASTER

# COURSE GUIDE

www.vintagemaster.com

## FOREWORD

The International Vintage Master seeks to place emphasis on the fact that the wine industry has three main areas of activity: grape growing, wine making and wine management. By dedicating one semester to each area of activity, students will be familiar with the various elements throughout the wine supply chain, from soil to consumer. The general objective is to make sure students acquire in-depth scientific knowledge and hands-on application skills to succeed.

Consistent with this framework (see positional strategy at www.groupe-esa.com), the academic content is strategically centred on the terroir concept, which can be defined as a well-defined bounded area where natural and constructed local resources give place to a product with an embedded identity. Throughout the courses, this concept will be expanded and discussed as a productive and localized cultural system, creating economic, ecological and social value within its territorial setting. Terroir as a concept develops therefore a sense of place, where winegrowers establish a wine displaying the embedded identity of the bounded area, by exploiting natural resources and sharing a common heritage and socially constructed skills

The objective of this course guide is to outline the four semesters to be completed. The academic content of each semester is divided into several modules and submodules.

**Etienne Neethling**

Head of the International Vintage Master
*Ecole Supérieure des Agricultures*
*Angers, France*

## PROGRAM STRUCTURE

| **MSc Vintage** | | | | ***ECTS Credits*** |
|---|---|---|---|---|
| **Semester 1** | **Wine Quality** | | | **30** |
| | Module 1.1 | | Berry development and ripening | 3 |
| | Module 1.2 | | Wine science | 12 |
| | | Sub-module 1.2.1 | Winery placement internship | 3 |
| | | Sub-module 1.2.2 | Wine making processes | 4 |
| | | Sub-module 1.2.3 | Wine microbiology | 3 |
| | | Sub-module 1.2.4 | Wine analysis | 2 |
| | Module 1.3 | | Wine conservation and stabilization | 5 |
| | Module 1.4 | | Wine sensory analysis | 5 |
| | Module 1.5 | | Wine marketing | 5 |
| **Semester 2** | **Sustainable Viticulture** | | | **30** |
| | Module 2.1 | | Vineyard establishment | 3 |
| | Module 2.2 | | Precision viticultural farming | 2 |
| | Module 2.3 | | Viticultural environmental assessments | 3 |
| | Module 2.4 | | Grape pest and disease management | 6 |
| | Module 2.5 | | Grapevine eco-physiology | 7 |
| | Module 2.6 | | Grape varieties and wine geography | 9 |
| **Semester 3** | **Wine Identity** | | | **30** |
| | Module 3.1 | | Managing the territorial identity of terroir wines | 5 |
| | Module 3.2 | | Assessing the terroir system of wine regions | 5 |
| | Module 3.3 | | WSET Level 3 Award Wines | 5 |
| | Module 3.4 | | Applied wine marketing | 5 |
| | Module 3.5 | | Wine economics and business management | 5 |
| | Module 3.6 | | Applied research project | 5 |
| **Semester 4** | **Master Thesis** | | | **30** |
| | Module 4.1 | | Professional applied research project | 30 |

# SEMESTER 1

## WINE QUALITY

## FIRST SEMESTER OVERVIEW

# WINE QUALITY

Wine quality is the outcome of a complex interaction between natural, biological and human factors, varying strongly over time and geographical areas. It is therefore the result of countless components, ranging from the role of soil or variety to cellar management practices and techniques, all taking place within a specific social and economic background. With increasing global competition, wine quality has become central in retaining and gaining consumers, creating a reliable image in the market. Indeed, while wine consumption is growing, especially among non-producing countries, wine production still continues to outpace consumption, resulting in an oversupply of wine and therefore a demand for winegrowers to be committed to quality. Wine quality remains neither easy to define nor measure as it is strongly subjective in nature. In general, a quality wine product refers to the absence of perceptible flaws in colour or flavour. Yet, it is likewise assessed with its positives, for example, the presence of desirable characteristics for a particular style, the duration and complexity of aromas, the conformity to a specific place, etc. The first semester focusses on this concept of wine quality, from berry formation to wine conservation, including sensory analysis and wine marketing. The first module is founded on the fundamentals of berry development and ripening. From here, the second module will cover managing wine production and quality, as well as wine microbiology and analysis. The courses of these modules are based on the fundamentals of the science and technology of winemaking. The modules three and four are based on wine conservation and sensory analysis, including wine statistics to identify, measure and interpret wine quality. The final module relates to wine marketing.

| **MSc Vintage** | *Universidade de Trás-os-Montes e Alto Douro* in Vila Real, Portugal. | | ***ECTS Credits*** |
|---|---|---|---|
| **Semester 1** | **Wine Quality** | | **30** |
| | Module 1.1 | Berry development and ripening | 3 |
| | Module 1.2 | Wine science | 12 |
| | Sub-module 1.2.1 | Winery placement internship | 3 |
| | Sub-module 1.2.2 | Wine making processes | 4 |
| | Sub-module 1.2.3 | Wine microbiology | 3 |
| | Sub-module 1.2.4 | Wine analysis | 2 |
| | Module 1.3 | Wine conservation and stabilization | 5 |
| | Module 1.4 | Wine sensory analysis | 5 |
| | Module 1.5 | Wine marketing | 5 |

# MODULE 1.1 BERRY DEVELOPMENT & RIPENING

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

This module comprises the principles on berry development stages, from insights in grapevine structure and functions to fruit formation and composition. It underpins the importance of closely following the berry ripening process as final wine quality and style are much dependent on grape quality at harvest. Practical classes will allow for performing field and laboratory assessments.

## LEARNING OUTCOMES

1) Describe the anatomy of the grapevine and its growing cycle with knowledge in ampelography.
2) Report the physiological processes and environmental needs underlying vine performance for wine production.
3) Explain the berry development stages and compositional changes during fruit ripening.
4) Execute the principal berry composition analysis and identify potential wine quality and style.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Grapevine structure and functions**: Vine anatomy, principals of ampelography and annual growing cycle; Vine physiological processes and environmental factors that affect grapevine physiology; Introduction to different approaches to vine growing, from conventional to biodynamic farming. | Péter Bodor-Pesti (MATE); Lia Dinis (UTAD); Cátia Brito (UTAD). | 9 hours |
| **Fruit formation and composition**: Flowering mechanisms; Berry growth and development; Berry composition and parts, principal compounds and changes during ripening; Grey mould and noble rot. | Lia Dinis (UTAD); Sara Bernardo (UTAD); Isabel Cortez (UTAD). | 3 hours |
| **Practical training**: Field techniques in bio productivity and photosynthesis under field conditions; Performing laboratory berry composition analysis and berry sensory assessments. | Moutinho Pereira (UTAD); Carlos Manuel Correia (UTAD); Virgilio Falco (UTAD). | 9 hours |
| **Field visits:** Experimental vineyards of Symington Family Estates at Quinta do Bomfim in the Douro Valley**.** | Fernando Alves (Symington Family Estates). | 3 hours |
| **Invited masterclasses**: Douro Demarcated region, a heritage to preserve, innovate and enhance; Importance of harvest date and finding a balance between different levels of ripeness for wine quality and style; Major challenges for mountain and steep slope viticulture in a changing environment; Terroir: how do soils and climate shape wines? | Helena Pina (UPorto); Antonio Graça (Sogrape); Cátia Brito (UTAD); Jamie Goode. | 6 hours |

## PREREQUISITES

None

## CREDITS

3 ECTS with 30 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2,3,4 |

The module consists of classroom lectures and discussions completed by practical field and laboratory work. The teaching and evaluation language is English.

## COURSE COORDINATOR

Virgilio Falco (UTAD): vfalco@utad.pt

## SUGGESTED READINGS


- Ribéreau-Gayon P, Dubourdieu D, Donèche B, Lonvaud A (2000) Handbook of Enology, The Microbiology of Wine and Vinifications, Vol. I, Wiley, West Sussex, England
- Creasy GL, Creasy LL (2009) Grapes, CABI, Wallingford, Oxfordshire, UK.
- Keller M (2010) The science of grapevines: Anatomy and physiology, Academic Press, New York, US.
- Iland P, Dry P, Proffitt T, Tyerman S (2012). The grapevine: from the science to the practice of growing vines for wine. Campbelltown: Patrick Iland Wine Promotions.
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.
- Goode J (2021) Wine science: The Application of Science in Wine, from Vine to Glass, 3rd ed., University of California Press, US.


Additional scientific and technical reading references will be set during the course.

# SUB-MODULE 1.2.1 WINERY PLACEMENT INTERNSHIP

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

This module provides the opportunity to gain first-hand experience in winemaking from harvest reception to post fermentation processes. This is a deeply engaging course, placing students in commercial wineries to work closely with the winemaker. Through these placements, students are also exposed to the traditional methods shaping Portuguese wine quality and identity.

## LEARNING OUTCOMES

1) Describe the overall wine making operations and organisational management of a commercial winery.
2) Implement berry ripening assessments and execute wine analysis during fermentation and post-fermentation operations.
3) Operate with a basic level of competence the wine making equipment and recognise which type of equipment is most appropriate for a given purpose.
4) Identify and question the decision-making factors affecting wine quality and style and how they may be controlled and managed.

## COURSE CONTENT

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Defining wine quality and style with a focus on the concept of terroir; Overview of winemaking steps from harvest reception to post fermentation practices. | Etienne Neethling (ESA); João Pissarra (Vinha Comprida) | 3 Hours |
| **Work based training:** Berry sampling, grape harvest, harvest reception and procession grapes, preparing and cleaning cellar equipment, making wine (adding yeast, pressing, pumping over, density readings, etc.) and wine analysis. | Portuguese winemakers | 2-3 weeks |

Portuguese Winemakers

- ✓ Vinho Verdes: José Diogo Teixeira Coelho (Quinta da Raza); Lourenço Charters (Quinta do Ameal); Manuel Soares (Quinta da Aveleda).
- ✓ Douro: Tiago Alves de Sousa (Quinta da Gaivosa); Lourenço Charters (Quinta dos Murcas); Álvaro Roseira and João Roseira (Quinta do Infantado); Paulo Schreck (Palato do Côa); Pedro Coelho (Pormenor Vinhos); Jose Brites (Quinta do Casal da Granja); Sandra Tavares (Wine and Soul); Maria Serpa Pimentel (Quinta da pacheca).
- ✓ Dão: Peter Eckert and Luis Lopes (Quinta das Marias); João Tavares de Pina (Quinta da Boavista); Antonio Madeira (Antonio Madeira) Luis Lopes (Domínio do Açor); João Cabral (Joao Cabral Almeida); Alvaro Castro (Quinta da Pellada).

## PREREQUISITES

None

## CREDITS

3 ECTS with 3 teaching hours and 2 to 3 weeks of work-based learning.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Company feedback | 20% | 2,3 |
| Written assignment | 80% | 1,4 |

The module consists of initial classroom lectures and cellar visits, followed then by a 2 to 3-week practical working experience in a Portuguese winery. The teaching and evaluation language is English. Nevertheless, while the winemaker is English proficient, Portuguese will be spoken by team members at the winery where students are placed.

## COURSE COORDINATOR

Etienne Neethling (ESA): e.neethling@groupe-esa.com

## SUGGESTED READINGS


- Ribéreau-Gayon P, Dubourdieu D, Donèche B, Lonvaud A (2006) Handbook of Enology, The Microbiology of Wine and Vinifications, Vol. 1, 2nd ed., Wiley, West Sussex, England.
- Ribéreau-Gayon P, Glories Y, Maujean A, Dubourdieu D (2006) Handbook of Enology, The chemistry of wine stabilization and treatments volume, Vol. 2, 2nd ed., Wiley, West Sussex, England.
- Bird D (2007) Understanding Wine Technology, DBQ Publishing, Great Britain.
- Iland P, Grbin P, Grinbergs M, Schmidtke L, Soden A (2007) Microbiological analysis of grape and wine: techniques and concepts. Campbelltown: Patrick Iland Wine Promotions.
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.
- Goode J (2021) Wine science: The Application of Science in Wine, from Vine to Glass, 3rd ed., University of California Press, US.


Additional scientific and technical reading references will be set during the course.

# SUB-MODULE 1.2.2 WINE MAKING PROCESS

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

This module covers the scientific and technical wine making aspects for still and special wines. It explores the pre- to post fermentation wine making process, carefully considering the various management operations and critical decisions of making commercial wine. The courses will place emphasis on alcoholic and malolactic fermentation, phenolic and flavour compounds including sulphur dioxide management and the effects of oxidation. This module will also consist of a series of short online courses with Jamie Goode, who holds a PhD in plant biology, and is today an international renowned wine writer, book author and wine judge. Drawing on his extensive travels and experience around the world, students will gain access to the latest scientific developments relating to key issues in wine making.

## LEARNING OUTCOMES

1) List the winery operations involved in making white, rosé and red wine that occur before, during and after fermentation.
2) State the steps involved in making sweet, fortified and sparkling wines.
3) Discuss how the different winemaking practices and techniques, from harvest reception to bottling, influence final product quality and style.
4) Explain the influence of different wine components on wine quality and style.
5) Understand and describe faults in wine.
6) Report how different styles of white, rosé and red wines can be produced.
7) Hold a broad and up-to-date understanding of complex issues in winemaking around the world.

## COURSE CONTENT

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Winemaking options and decision making for still wines:** Basic principles of white, rosé and red winemaking; Wine stabilization and clarification processes; Wine chemistry, pH and acidity; Alcoholic and malolactic fermentation; Sulphur dioxide management and effects of oxidation; Phenolic compounds, maceration and extraction; Art of blending. | Tiago Alves de Sousa (Quinta da Gaivosa); João Pissarra (Vinha Comprida) | 20 Hours |
| **Winemaking options and decision making for special wines:** Sparkling wines, the examples of Champagne, Cava and Prosecco; Fortified wines, the example of Port; Sweet wines, the examples of Tokaji and Sauternes. | Daniela Fracassetti (UNIMI); Tiago Alves de Sousa (Quinta da Gaivosa); Annamária Sólyom-Leskó (MATE); László Mészaros (Disznókő). | 10 Hours |
| **Invited masterclasses:** Flor wines, the example of Sherry with Bodega Tradicion; Effect of French, American, Eastern | Eduardo Davis (Bodegas Tradicion); | 15 Hours |

| | |
|---|---|
| Europe and Portuguese Oak on red wine with Seguin Moreau; Phenolics; Extraction and maceration; Whole cluster and carbonic maceration; Evolution of élevage. | Tiago Alves de Sousa (Quinta da Gaivosa); Benoît Verdier (Seguin Moreau); Jamie Goode; José Luis Aleixandre-Tudo (UPV) |

## PREREQUISITES

None

## CREDITS

4 ECTS with 45 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2,3,4,5,6,7 |

The module consists of classroom lectures and discussions in addition to winery visits. The teaching and evaluation language is English.

## COURSE COORDINATORS

Virgilio Falco (UTAD): vfalco@utad.pt
Tiago Alves de Sousa (Quinta da Gaivosa): tiago@alvesdesousa.com
Joao Pissarra (Vinha Comprida): vinhacomprida@hotmail.com

## SUGGESTED READINGS


- Ribéreau-Gayon P, Dubourdieu D, Donèche B, Lonvaud A (2006) Handbook of Enology, The Microbiology of Wine and Vinifications, Vol. 1, 2nd ed., Wiley, West Sussex, England.
- Ribéreau-Gayon P, Glories Y, Maujean A, Dubourdieu D (2006) Handbook of Enology, The chemistry of wine stabilization and treatments volume, Vol. 2, 2nd ed., Wiley, West Sussex, England.
- Bird D (2007) Understanding Wine Technology, DBQ Publishing, Great Britain.
- Iland P, Grbin P, Grinbergs M, Schmidtke L, Soden A (2007) Microbiological analysis of grape and wine: techniques and concepts. Campbelltown: Patrick Iland Wine Promotions.
- Moreno-Arribas MV and Polo MC (2008). Wine chemistry and biochemistry. New York, NY: Springer.
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.
- Goode J (2021) Wine science: The Application of Science in Wine, from Vine to Glass, 3rd ed., University of California Press, US


Additional scientific and technical reading references will be set during the course.

# SUB-MODULE 1.2.3 WINE MICROBIOLOGY

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

This course is designed to introduce students to the fundamental knowledge of microorganisms of oenological importance, their biodiversity, physiology, and metabolism in order to understand, control and optimize their activity according to the raw material, the desired wine characteristics and the winemaking procedures. Furthermore, it is intended that students acquire scientific knowledge and practical skills that will enable them to identify and solve problems under real winery conditions.

## LEARNING OUTCOMES

1) List the important microorganisms encountered during wine production and their main characteristics
2) Understand the factors controlling microbial growth during winemaking - fungi (yeast and moulds) and bacteria (LAB and AAB)
3) Understand the use of different strategies (spontaneous vs inoculated) for conducting wine fermentation
4) Explain the role (positive and negative) of groups of Yeast and LAB in the various stages of the process of wine production.

## COURSE CONTENT

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Microbial groups of interest in oenology (Fungi and Bacteria). | Alexandra Mendes Ferreira (UTAD) | 4 Hours |
| **Wine Yeasts:** General characteristics of wine yeasts; Ecology and dynamics along fermentation; Spontaneous vs inoculated fermentations; Yeasts traits for use in winemaking industry. | Alexandra Mendes Ferreira (UTAD) | 4 Hours |
| **Wine Fermentation:** Sugars and nitrogenous compounds metabolism; Factors affecting growth and metabolism and impact on wine quality; Problematic fermentations; Yeast as spoilage agents; Evolution of organic acids during winemaking: the role of yeasts and lactic acid bacteria; Malolactic fermentation: control and management; Spoilage due to bacterial metabolism. | Alexandra Mendes Ferreira (UTAD) | 12 Hours |
| **Invited masterclasses:** Application of immobilized yeast cells in the winemaking industry; Biological strategies to reduce chemical inputs during winemaking; Wine microbiology in the XXI century: challenges old and new. | Filipe Centeno (Proenol); Marion Bastien (Lallemand); Antonio Graça (Sogrape) | 12 Hours |

## PREREQUISITES

None

## CREDITS

3 ECTS with 32 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Written assignment | 50% | 1,2,3,4 |
| Individual examination | 50% | 1,2,3,4 |

The module consists of face-to-face classroom lectures and discussions. The teaching and evaluation language is English.

## COURSE COORDINATOR

Alexandra Mendes Ferreira (UTAD): anamf@utad.pt

## SUGGESTED READINGS


- Boulton RB, Singleton VL, Bisson LF, Kunkee RE (1996) Principles and practices of winemaking, Springer, New York.
- Ribéreau-Gayon P, Dubourdieu D, Donèche B, Lonvaud A (2006) Handbook of Enology, The Microbiology of Wine and Vinifications, Vol. 1, 2nd ed., Wiley, West Sussex, England.
- Fugelsang KC and Edwards CG (2007). Wine microbiology, practical applications and procedures, 2nd Edition, Springer, New York.
- Iland P, Grbin P, Grinbergs M, Schmidtke L, Soden A (2007) Microbiological analysis of grape and wine: techniques and concepts. Campbelltown: Patrick Iland Wine Promotions.
- Moreno-Arribas MV and Polo MC (2008). Wine chemistry and biochemistry. New York, NY: Springer.
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.
- Compendium of international methods of analysis - OIV. Microbiological analysis of wines and musts. Detection, differentiation and counting of micro-organisms (resolution OIV-OENO 206/2010).


Additional scientific and technical reading references will be set during the course.

# SUB-MODULE 1.2.4 WINE ANALYSIS

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

This course introduces the methods of wine analysis essential for quality wine production and used routinely in wineries or oenology laboratories. It consists of practical laboratory lessons where the student applies different methods of analysis of wines. Focus will be on equipment and procedures suitable for wineries, but also include specific spectrophotometric techniques of wine analysis.

## LEARNING OUTCOMES

1) Understand and apply the main methods of wine analysis.
2) Become familiar with the proper laboratory techniques.

## COURSE CONTENT

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Wine Analysis:** Wine density and specific gravity at 20°C; Alcoholic strength by volume - direct measurement by ebulliometry; Alcoholic strength by volume - distillation and measurement of the alcoholic strength of the distillate by pycnometry; Total dry extract; Titrable acidity, volatile acidity, fixed acidity, and pH; Total phenolics by means of the Folin-Ciocalteau reagent; Total phenolics by spectral analysis; Calcium by atomic absorption spectrophotometry. | Virgilio Falco (UTAD) | 20 Hours |

## PREREQUISITES

None

## CREDITS

2 ECTS with 20 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2 |

The module consists of practical laboratory lessons where the student applies different methods of wine analysis. The teaching and evaluation language is English.

## COURSE COORDINATOR

Virgilio Falco (UTAD): vfalco@utad.pt

## SUGGESTED READINGS


- Zoecklein BW, KC Fugelsang, BH Gump, FS Nury (1995) Wine analysis and production. Chapman and Hall, New York.
- Iland P, Grbin P, Grinbergs M, Schmidtke L, Soden A (2007) Microbiological analysis of grape and wine: techniques and concepts. Campbelltown: Patrick Iland Wine Promotions.
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.
- Harvey D (2016) Analytical Chemistry 2.1. (freely downloadable from dpuadweb.depauw.edu/harvey_web/eTextProject/version_2.1.html)


Additional scientific and technical reading references will be set during the course.

# MODULE 1.3 WINE SENSORY ANALYSIS

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

This module first explores the sensory evaluation of wines, from introducing the common wine aromas and flavours to the subject of wine scoring and description, including the recognition of the major wine faults. The courses then focus on the science of sensory analysis, developing students' skills to select appropriate sensory evaluation methods and train a tasting panel, in addition to the understanding of statistical methods and analysis.

## LEARNING OUTCOMES

1) Able to distinguish wine aromas and key wine components through a blind wine tasting.
2) Understand the viticultural and oenology practices defining the final wine quality and style.
3) Develop the skills necessary for the application and interpretation of sensory methodologies presented.
4) Understand and apply the theoretical and practical knowledge of multivariate statistics.
5) Develop skills in the use of statistical software to illustrate the application of the methods studied, and interpret the outputs obtained.

## COURSE CONTENT

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Sensory analysis fundamentals; Physiology of the senses and threshold limits; Wine aromas and correlation between sensorial analysis and instrumental analysis; Influence of technology during processing of the grapes, wine and wine-aging on wine sensory characteristics. | Alice Vilela (UTAD) | 4 Hours |
| **Sensory Analysis:** Selection and training of a tasting panel; Sensorial evaluation methods (triangular, duo-trio, differentiation tests, ranking tests, scoring tests, descriptive analysis, sensory profile); Hedonic tests (descriptive hedonic scales, facial scales and projective mapping). Correlation between sensorial analysis and instrumental analysis. Compounds responsible for defects and their detection. | Alice Vilela (UTAD) | 8 Hours |
| **Multivariate statistical analysis:** Factorial analysis (PCA and CATPCA), MANOVA and Multiple Linear Regression using the SPSS software. | Elisete Correia Mourão (UTAD) | 18 Hours |
| **Invited masterclasses:** Portugal's indigenous varieties; Understand the principles of wine tasting and evaluation of wine quality and style; Varieties and wines of Portugal; Distinctive characteristics of the Douro region and the uniqueness of Port style wines; Role of the Port and Douro Wines Institute to guarantee the quality; Wine faults and wine flavour chemistry; Spanish wine terroirs. | Tiago Alves de Sousa (Quinta da Gaivosa); Christine Marsiglio (Master of Wine); Sofia Salvador (ViniPortugal); Manuel Lima (IVDP); Jamie | 19 Hours |

| | |
|---|---|
| | Goode; José Luis Aleixandre-Tudo (UPV). |

## PREREQUISITES

None

## CREDITS

5 ECTS with 49 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual tasting examination | 10% | 1 |
| Individual sensory examination | 45% | 2,3 |
| Individual statistic examination | 45% | 4,5 |

The module consists of practical sensory lessons where the student applies different methods of wine tasting and sensory analysis. The teaching and evaluation language is English.

## COURSE COORDINATORS

Alice Vilela (UTAD): avimoura@utad.pt
Elisete Correia (UTAD): ecorreia@utad.pt

## SUGGESTED READINGS

- Lawless HT and Heymann H (2010) Sensory Evaluation of Food: Principles and Practices. Aspen Publishing, New York, NY.
- Jackson R (2002) Wine Tasting: A Professional Handbook (A Volume in the Food Science and Technology International Series). Academic Press. 291 p.
- Wine & Spirit Education Trust (WSET) Level 3 Award in Wine. Understanding Wines: Explaining Style and Quality. 200p.
- Goode J (2021) Wine science: The Application of Science in Wine, from Vine to Glass, 3rd ed., University of California Press, US

Additional scientific and technical reading references will be set during the course.

# MODULE 1.4 WINE CONSERVATION AND STABILIZATION

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

This module is intended to illustrate the processes occurring during wine stabilization and storage. It focuses on risk assessment to ensure wine conservation, while also allowing students to acquire knowledge and skills for the implementation and control of stabilization methods and processes used for wine clarification and stabilization.

## LEARNING OUTCOMES

1) Report the phenomena occurring during wine stabilization and storage.
2) Explain the methods used to assess the risks in stabilization for preventing and ensuring wine conservation.
3) Describe the implementation and control of unit operations and processes for wine clarification and stabilization.

## COURSE CONTENT

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Wine clarification and stabilization; Phenolic composition of wines and changes during ageing; Oxygen management. | Fernanda Cosme (UTAD); Fernando Nunes (UTAD) | 15 Hours |
| **Wine clarification and stabilization:** Wine Fining; Wine clarification unit operations and processes; Wine stabilization processes and stability tests; New oenological practices recently approved for wine stabilization. | Fernanda Cosme (UTAD); Fernando Nunes (UTAD) | 18 Hours |
| **Wine instabilities:** Metallic, protein, pinking, colour and tartaric precipitations; Main colloidal instabilities in wines. | Fernanda Cosme (UTAD); Fernando Nunes (UTAD) | 12 Hours |
| **Practical laboratory experiment:** Determination of phenolic composition of wines by HPLC-DAD) | Fernanda Cosme (UTAD); Fernando Nunes (UTAD) | 5 Hours |

## PREREQUISITES

None

## CREDITS

5 ECTS with 50 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Group assignment | 30% | 1,2,3 |
| Written assignment | 70% | 1,2,3 |

The evaluation is performed by conducting one written test. There will also be a group work evaluation to be presented with power point. The teaching and evaluation language is English.

## COURSE COORDINATORS

Fernanda Cosme (UTAD): fcosme@utad.pt
Fernando Nunes (UTAD): fnunes@utad.pt

## SUGGESTED READINGS

- Boulton RB, Singleton VL, Bisson LF and Kunkee RE (1996) Principles and practices of winemaking.
- Zoecklein W, Fugeslang K, Gump B and Nury F (1999). Wine analysis and production. Nueva York, USA: Aspen Publishers
- Ribéreau-Gayon P, Dubourdieu D, Donèche B, Lonvaud A (2006) Handbook of Enology, The Microbiology of Wine and Vinifications, Vol. 1, 2nd ed., Wiley, West Sussex, England.
- Ribéreau-Gayon P, Glories Y, Maujean A, Dubourdieu D (2006) Handbook of Enology, The chemistry of wine stabilization and treatments volume, Vol. 2, 2nd ed., Wiley, West Sussex, England.
- Cosme F, Ricardo-da-Silva JM and Laureano O (2007) Protein fining agents: characterization and red wine fining assay. Italian Journal of Food Science, 19, 39-56.
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.
- Goode J (2021) Wine science: The Application of Science in Wine, from Vine to Glass, 3rd ed., University of California Press, US

Additional scientific and technical reading references will be set during the course.

# MODULE 1.5 WINE MARKETING

## SCHEDULE & LOCATION

First academic year, first semester at the *Universidade de Trás-os-Montes e Alto Douro* (UTAD) in Vila Real, Portugal.

## DESCRIPTION

The course will set the theoretical base for the applied marketing module of the second academic year. Key marketing principles, concepts and terms will be fully addressed in this module to emphasize the importance of market research, brand building and storytelling. The theory will be accompanied by a practical work assignment.

## LEARNING OUTCOMES

1) List the key considerations in wine marketing with a focus on the production and complexity of wine.
2) Identify wine marketing strategies and the most important concepts of branding and consumer trends.
3) Analyse a market considering the internal and external factors.
4) Propose a marketing strategy for a commercial winery.

## COURSE CONTENT

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Understanding the marketplace and consumer segmentation; Product differentiation and creating competitive advantage. | Marcela Dibildox-Huot | 6 Hours |
| **Principles and concepts of marketing mix:** Defining product attributes and exploring major pricing strategies; Marketing channel design and management; Major promotion tools and communication strategies; Emerging trends in marketing mix and packaging. | Marcela Dibildox-Huot | 12 Hours |
| **Wine brand case studies**: General presentation of case studies; Strategy, benchmarking, positioning and storytelling; Product design and product innovation; Distribution channels; Cost of good vs Consumer value approach; Building a communication plan | Baptiste Fabre (ESA) | 20 Hours |
| **Innovation:** Marketing innovations in the wine sector. | Mickaël Rouyer | 8 Hours |
| **Field visits:** Private winery visit and tasting at Quinta do Noval in the Douro Valley. | Patricia Bastos (Quinta do Noval) | 3 Hours |
| **Invited masterclass:** Focus on applying marketing mix and wine brand management: The case of Axa Millesimes. | Ana Carvalho (Axa Millesimes) | 3 Hours |

## PREREQUISITES

None

## CREDITS

5 ECTS with 52 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Written assignment | 50% | 1,2 |
| Group assignment | 50% | 3,4 |

The module consists of online and in person classroom lectures and discussions. The teaching and evaluation language is English.

## COURSE COORDINATORS

Baptiste Fabre: b.fabre@groupe-esa.com
Marcela Dibildox-Huot: marcela@maison-dibildox.fr

## SUGGESTED READINGS

- Lapsley J and Moulton K (2001) Successful Wine Marketing. New York: Springer Science, 297pp.
- Anderson K and Golin G (2004) The World's Wine Markets. Globalization at Work. Edward Elgar, Cheltenham, UK; Northampton, MA, USA.
- Hall CM and Mitchell R (2008) Wine Marketing. A practical guide. Oxford: Elsevier, 344pp.

Additional scientific and technical reading references will be set during the course.

# SEMESTER 2

## SUSTAINABLE VITICULTURE

## SECOND SEMESTER OVERVIEW

# SUSTAINABLE VITICULTURE

The grapevine is cultivated over a wide range of environmental conditions. As a perennial specie, it requires a few years to reach reproductive maturity, remaining then economically productive for many years. Prior to planting, choices in terms of perennial practices are very important. At this level, natural conditions inevitably play an important role, yet decision-making is also strongly driven by other factors, such as market trends. Indeed, quality-orientated wine production is achieved by considering both environmental and socio-economic conditions. From here, annual practices, e.g. soil and canopy management, are constantly required to manage, among other factors, seasonal climate variability. Today, vine growers are facing many environmental issues (e.g. climate change), requiring them to reconsider their farming practices and management strategies to promote sustainable viticulture. Hence, vineyard practices and strategies should focus on producing grapes with high quality and correct yields, while having minimal effects on the environment for future generations. The second semester seeks to promote the principles of sustainable viticulture. The first module will present the knowledge on vineyard establishment, while the second addresses precision farming. The third module provides students guidance relevant to environmental assessments in viticultural systems. The fourth and fifth modules are focused on the issues of pest and disease management and vine eco-physiology. These courses teach students the advanced understanding of managing grapevines. Including technical visits and a study trip in Italy and Switzerland, the last module is based on wine geography, allowing students to gain exposure and knowledge to the industry and activities of local actors from different regions.

| **MSc Vintage** | *Università Cattolica del Sacro Cuore (UCSC) in Piacenza, Italy* | ***ECTS Credits*** |
|---|---|---|
| **Semester 2** | **Sustainable Viticulture** | **30** |
| Module 2.1 | Vineyard establishment | 3 |
| Module 2.2 | Precision viticultural farming | 2 |
| Module 2.3 | Viticultural environmental assessments | 3 |
| Module 2.4 | Grape pest and disease management | 6 |
| Module 2.5 | Grapevine eco-physiology | 7 |
| Module 2.6 | Grape varieties and wine geography | 9 |

# MODULE 2.1 VINEYARD ESTABLISHMENT

## SCHEDULE & LOCATION

First academic year, second semester at the *Università Cattolica del Sacro Cuore* (UCSC) in Piacenza, Italy.

## DESCRIPTION

In adopting a terroir zoning approach to viticulture, this module teaches students how to establish a sustainable vineyard by selecting appropriate planting material in different local environmental situations and making informed decisions about the perennial management and operations of a commercial vineyard.

## LEARNING OUTCOMES

1) Report the agroclimatic characteristics of a specific region and identify the viticultural and enology potential of different vineyard planting sites.
2) Recognize suitable grapevine planting material (including varieties, clones and rootstocks).
3) Define a fitted vineyard layout plan in terms of perennial practices such as row orientation, planting density and training systems.
4) Discuss the potential production constraints of different vineyard sites in relation with the zonal and local environment.
5) Report the overall costs of a vineyard establishment project.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Plant materiel:** Vine improvement and vine nurseries, grafting and propagation techniques, Grapevine varieties and heat requirements, Rootstock varieties and characteristics. | Luigi Bavaresco (UCSC); Etienne Neethling (ESA) | 5 Hours |
| **Site selection:** Climate variations and limits, understanding soil physical characteristics and water balance, understanding soil chemical properties including pH and nutrient levels, identifying suitable environmental conditions for vineyard establishment. | Etienne Neethling (ESA); Gyorgy Lukácsy (MATE) | 10 Hours |
| **Vineyard layout:** Clearing roots and rock removal, weed control and fertilization, levelling and terracing, drainage and irrigation, selecting the structural parts of vineyard and shelter belts; Understanding row spacing and direction, training systems, pruning and cover cropping techniques | Gyorgy Lukácsy (MATE); Matteo Mota (Changins); Matteo Gatti (UCSC) | 10 Hours |
| **Vine planting:** Timing and cost of plantation, landscape design techniques and spatial organization, training young vines (year 1, 2 and 3) | Gyorgy Lukácsy (MATE) | 5 Hours |
| **Invited masterclasses:** Vine immunity and breeding, Pruning, trellis systems and canopy management, Regenerative viticulture, Geology as basis of terroir wines. | Jamie Goode; Charles Frankel | 12 Hours |
| **Field visits:** Visit to a vine nursery. | Luigi Bavaresco (UCSC) | 3 Hours |

## PREREQUISITES

None

## CREDITS

3 ECTS with 45 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Group assignment | 40% | 1,2,3,4,5 |
| Individual examination | 60% | 1,2,3,4,5 |

The module consists of classroom lectures and discussions completed by practical work. The teaching and evaluation language is English.

## COURSE COORDINATORS

Etienne Neethling (ESA): e.neethling@groupe-esa.com
Luigi Bavaresco (UCSC): luigi.bavaresco@unicatt.it

## SUGGESTED READINGS


- Van Leeuwen C, Seguin G (2006) The concept of terroir in viticulture. J. Wine Res, 17, 1–10.
- White RE (2009) Understanding Vineyard Soil, Oxford University Press, New York, USA.
- Coulon-Leroy C, Morlat R, Barbeau G, Gary C, Thiollet-Scholtus M (2012) The vine functioning pathway, a new conceptual representation. Sustain. Agric. Rev., 11, 241-264.
- Parker AK, Garcia de Cortázar I, Chuine I, Barbeau G, Bois B, Boursiquot JM, Cahurel JY, Claverie M, Dufourcq T, Gény L, et al. (2013) Classification of varieties for their timing of flowering and veraison using a modelling approach. A case study for the grapevine species Vitis vinifera L. Agric. For. Meteorol., 180, 249–264
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.
- Vaudour E, Costantini E, Jones GV, Mocali S (2015) An overview of the recent approaches to terroir functional modelling, footprinting and zoning. Soil, 1, 287–312.
- Hunter JJ, Volschenk CG, Zorer R (2016) Vineyard row orientation of Vitis vinifera L. Cv. Shiraz/101-14 Mgt, climatic profiles and vine physiological status. Agric. For. Meteorol., 228, 104-119
- Neethling E, Barbeau G, Coulon-Leroy C, Quénol H (2019). Spatial complexity and temporal dynamics in viticulture: a review of climate-driven scales. Agric. For. Meteorol., 276-277.
- Parker AK, García de Cortázar-Atauri I, Gény L, Spring JL, Destrac A, et al. (2020) Temperature-based grapevine sugar ripeness modelling for a wide range of Vitis vinifera L. cultivars. Agric. For. Meteorol., 285–286.
- Goode J (2021) Wine science: The Application of Science in Wine, from Vine to Glass, 3rd ed., University of California Press, US.


Additional scientific and technical reading references will be set during the course.

# MODULE 2.2 PRECISION VITICULTURAL FARMING

## SCHEDULE & LOCATION

First academic year, second semester at the *Università Cattolica del Sacro Cuore* (UCSC) in Piacenza, Italy.

## DESCRIPTION

This module introduces students to the development and adoption of precision farming, applied to viticulture. Precision farming is a data-driven approach that enables winegrowers the ability to target site specific management strategies within their vineyards. Using precision farming tools and technologies to map and monitor local variability, winegrowers can improve and maximize vine performance and production.

## LEARNING OUTCOMES

1) Report the traditional approaches of vineyard variability.
2) Explain precision viticulture and the drivers of vineyard variation.
3) Describe the tools and technologies available to map and monitor vineyard variability.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Origin of vineyard variability; Traditional approaches to vineyard variability: site selection and zoning. | Matteo Gatti (UCSC) | 3 Hours |
| **Precision farming:** Definition of precision viticulture. Drivers of vineyard variation; Spatial variation in vine vigour, grape yield and fruit composition. | Matteo Gatti (UCSC) | 7 Hours |
| **Monitoring variability:** Remote sensing platforms and different resolutions. Proximal sensing tools for monitoring of soil, canopy, yield and fruit composition. Vegetation indices and vigour maps. | Matteo Gatti (UCSC) | 7 Hours |
| **Prescription maps:** Variable-rate applications in the vineyard: fertilization, leaf-removal, selective harvesting. How robotics can assist vineyard management. | Matteo Gatti (UCSC) | 3 Hours |

## PREREQUISITES

None

## CREDITS

2 ECTS with 20 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2,3 |

The module consists of classroom lectures and discussions. The teaching and evaluation language is English.

## COURSE COORDINATOR

Matteo Gatti (UCSC): matteo.gatti@unicatt.it

## SUGGESTED READINGS


- Bramley RGV, Hamilton RP (2004) Understanding variability in winegrape production systems. 1. Within vineyard variation in yield over several vintages. Australian Journal of Grape and Wine Research 10, 32–45.
- Bramley RGV (2005) Understanding variability in wine grape production systems. 2. Within vineyard variation in quality over several vintages. Australian Journal of Grape and Wine Research 11, 33–42.
- Bramley RGV (2010) Precision viticulture: Managing vineyard variability for improved quality outcomes. Chapter 12. In: Managing wine quality. Volume 1. Viticulture and wine quality. Ed. A.G. Reynolds (Woodhead Publishing: Cambridge, UK) pp. 445–480.
- Vaudour E, Costantini E, Jones GV, Mocali S (2015) An overview of the recent approaches to terroir functional modelling, footprinting and zoning. Soil, 1, 287–312.
- Gatti M, Garavani A, Squeri C, et al. (2022) Effects of intra-vineyard variability and soil heterogeneity on vine performance, dry matter and nutrient partitioning. Precision Agric 23, 150–177
- OIV definition and general principles on Precision Viticulture https://www.oiv.int/public/medias/2074/cst-1-2004-en.pdf


Additional scientific and technical reading references will be set during the course.

# MODULE 2.3 VITICULTURAL ENVIRONMENTAL ASSESSMENTS

## SCHEDULE & LOCATION

First academic year, second semester at the *Università Cattolica del Sacro Cuore* (UCSC) in Piacenza, Italy.

## DESCRIPTION

This module teaches students sustainable grapevine production in terms of purpose, principles and applied techniques. The courses will allow students to discuss the strengths and weaknesses of vineyard management practices and techniques with an outlook at different sustainable programs and farming strategies worldwide.

## LEARNING OUTCOMES

1) List the environmental issues affecting the wine sector.
2) Explain Life Cycle Analyses including the differences between emissions and impacts.
3) Report what is an ecodesign and make a first interpretation of LCA results in viticulture.
4) Discuss the sustainable development in vitiviniculture (SDVV).
5) Address the legal and social responsibility of a winery and vineyard management.
6) Highlight the main international programs and indicators to achieve objectives of SDVV.
7) Practice with the reporting system of the SDVV in real scenario.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction to life cycle analysis:** Impacts of viticulture on environment, Social pressure on viticulture inducing evolution of laws and practices, Environmental labelling, Consumers perception of environmental impacts of viticulture. | Christel Renaud-Gentié (ESA) | 4 Hours |
| **Life cycle analysis:** LCA principles and customisation for viticulture at different scales, Participative eco-design method and results, Associating LCA to other indicators. | Christel Renaud-Gentié (ESA) | 4 Hours |
| **Introduction to sustainability:** Preliminary glossary and terminology used in the field of the sustainability science; From the Burtland Commission to Agenda 21; Millenium Development goals; PAC, Green Deal and Farm to Fork strategies; Circular economy and Bioeconomy. | Ettore Capri (UCSC) | 3 Hours |
| **Sustainable development goals:** Agenda 2030; Key factors for the integration; Role in the SDVV; SDVV and ecosystem service; Ecosystem service and sustainable practices in viticulture. | Ettore Capri (UCSC) | 5 Hours |
| **Sustainability programs:** OIV principles, Classification by protocol and structural elements, Inside the VIVA program, Reporting data and continues improvement. | Ettore Capri (UCSC) | 4 Hours |
| **Field visits:** CAVIRO for the circular economy applied in the winery and its by-products; Cooperative Settecani for the improvement in winery and vineyards with VIVA certification program | Rosa Prati (CAVIRO); Stefano Stefanucci (Equalitas); Stefano Mattioli (Cooperative | 10 Hours |

| | |
|---|---|
| | Settecani) Ettore Capri (UCSC) |

## PREREQUISITES

None

## CREDITS

3 ECTS with 30 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Group assignment | 50% | 1,2,3,4,5,6,7 |
| Individual examination | 50% | 1,2,3,4,5,6,7 |

The module consists of classroom lectures, discussions and field experience with companies and experts. The teaching and evaluation language is English.

## COURSE COORDINATOR

Ettore Capri (UCSC): ettore.capri@unicatt.it

## SUGGESTED READINGS


- Fragoulis G, Trevisan M, Di Guardo A, Sorce A, Van Der Meer M, Capri E (2009) Development of a management tool to indicate the environmental impact of organic viticulture J. Environ. Qual., 38, 826-835.
- Capri E, Jordan A, Lewis SE, Pretorius I, Scienza A, Marchis A, Stefanucci S, Walker N, Camilleri C (2013) Vision on the Sustainable Future of Our Wine and Vineyards. Milano
- Corbo C, Lamastra L, Capri E (2014) From environmental to sustainability programs: a review of sustainability initiatives in the Italian wine sector Sustainability, 6, 2133-2159.
- Rouault A, Perrin A, Renaud-Gentié C, Julien S, Jourjon F (2020) Using LCA in a participatory eco-design approach in agriculture: the example of vineyard management. Int J Life Cycle Ass 25 (7):1368-1383.
- Renaud-Gentié, C., Dieu, V., Thiollet-Scholtus M, Mérot A (2020) Addressing organic viticulture environmental burdens by better understanding interannual impact variations. The International Journal of Life Cycle Assessment 25(7): 1307-1322.
- Luzzani G, Lamastra L, Valentino F, Capri E (2021) Development and implementation of a qualitative framework for the sustainable management of wine companies. Sci. Total Environ. 759, 143462.
- D'Ammaro D, Capri E, Valentino F, Grillo S, Fiorini E, Lamastra L (2021) Benchmarking of carbon footprint data from the Italian wine sector: a comprehensive and extended analysis. Sci. Total Environ. 779, 146416
- D'Ammaro D, Capri E, Valentino F, Grillo S, Fiorini E, Lamastra L (2021) A multi-criteria approach to evaluate the sustainability performances of wines: the Italian red wine case study. Sci. Total Environ, 799, 149446
- Costa JM, Catarino S, Escalona JM, Comuzzo P (2022) Improving Sustainable Viticulture and Winemaking Practices. Oxford, United Kingdom, pp 536.


Additional scientific and technical reading references will be set during the course.

# MODULE 2.4 GRAPE PEST AND DISEASE MANAGEMENT

## SCHEDULE & LOCATION

First academic year, second semester at the *Università Cattolica del Sacro Cuore* (UCSC) in Piacenza, Italy.

## DESCRIPTION

Students will acquire the necessary elements to understand the development of grapevine plant diseases and for applying this knowledge in the sustainable vineyard management. Different aspects will be addressed: i) epidemiological aspects of diseases; ii) interaction between plant disease epidemics, the environment, and crop management; iii) mathematical models and decision support system for crop protection; iv) crop protection in integrated and organic viticulture.

## LEARNING OUTCOMES

1) List the epidemiological aspects of diseases in grapevines.
2) Explain the interaction between disease epidemics, the environment, and vine management.
3) Report the mathematical models and decision support system for grapevine protection.
4) Discuss grapevine protection in integrated and organic viticulture.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Plant-pathogen-environment interactions:** Life cycle of pathogens; infection chains and epidemiological parameters; influence of the host plant on epidemiological parameters of plant diseases; the vineyard's environment (biotic and abiotic components and their measurement). | Vittorio Rossi (UCSC) | 5 Hours |
| **Biology and epidemiology of grape pathogens:** Overview of the recent findings on biology, epidemiology and population dynamics of the main pathogens, including oomycetes, fungi, phytoplasmas, fastidious bacteria and viruses. | Vittorio Rossi (UCSC) | 7 Hours |
| **Sustainable grape protection:** concepts in sustainable grape protection; principles of Integrated Pest Management according to Directive 128/2009 EC; a framework for IPM implementation; new tools and methods for IPM, including resistant varieties, sanitation, vineyard monitoring and scouting, modelling, monitoring of resistant populations and anti-resistance strategies, biocontrol agents and other non-chemical methods for disease control; precision crop-protection. | Vittorio Rossi (UCSC) | 10 Hours |
| **Mathematical models for grape disease and protection:** Insights on plant disease modelling; empirical versus mechanistic models; principles of model validation and use in scheduling fungicide applications; strengths and weaknesses of model's use. Practical examples of models for downy and powdery mildews, Botrytis bunch rot and Black rot. | Vittorio Rossi (UCSC) | 15 Hours |

| | | |
|---|---|---|
| **Decision support tools for sustainable grape protection:** Tools for supporting grape growers in practical implementation of IPM; on-site devices, warning systems, and decision support systems (DSSs); strengths and weaknesses of the different tools; the DSS vite.net as a successful case-study. | Vittorio Rossi (UCSC) | 10 Hours |

## PREREQUISITES

None

## CREDITS

6 ECTS with 47 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2,3,4 |

The module consists of classroom lectures and discussions completed by practical field work. The teaching and evaluation language is English.

## COURSE COORDINATOR

Vittorio Rossi (UCSC): vittorio.rossi@unicatt.it

## SUGGESTED READINGS


- Rossi V, Caffi T, Giosuè S, Bugiani R 2008) A mechanistic model simulating primary infections of downy mildew in grapevine. Ecol. Modell. 212, 480–491.
- Caffi T, Rossi V, Legler SE, Bugiani R (2011) A mechanistic model simulating ascosporic infections by Erysiphe necator, the powdery mildew fungus of grapevine. Plant Pathol. 60, 522–531.
- Rossi V, Caffi T, Salinari F (2012) Helping farmers face the increasing complexity of decision-making for crop protection. Phytopathol. Mediterr, 51, 457–479.
- Bettiga LJ (2013) Grape Pest Management. 3rd Edition. University of California, 609 pp.
- Caffi T, Legler SE, Bugiani R, Rossi V (2013) Combining sanitation and disease modelling for control of grapevine powdery mildew. Eur. J. Plant Pathol. 135, 817–829
- Rossi, V, Salinari F, Poni S, Caffi T, Bettati T (2014) Addressing the implementation problem in agricultural decision support systems: The example of vite.net®. Comput. Electron. Agric. 100, 88–99
- Rossi V, Onesti G, Legler SE, Caffi T (2015) Use of systems analysis to develop plant disease models based on literature data: Grape black-rot as a case-study. Eur. J. Plant Pathol. 141, 427–444
- Caffi T, Rossi V (2018) Fungicide models are key components of multiple modelling approaches for decision-making in crop protection. Phytopathol. Mediterr. 57, 153–169.


Additional scientific and technical reading references will be set during the course.

# MODULE 2.5 GRAPEVINE ECO-PHYSIOLOGY

## SCHEDULE & LOCATION

First academic year, second semester at the *Università Cattolica del Sacro Cuore* (UCSC) in Piacenza, Italy.

## DESCRIPTION

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.

## LEARNING OUTCOMES

1) Report the physiological processes and environmental constrains underlying vine performance.
2) Explain the issues of a global changing climate and its effects on viticulture.
3) List the main climate change adaptation and mitigation techniques.
4) Describe the physiology of winter pruning and canopy management.
5) Discuss the water relations and water use efficiency of grapevines.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Bases of environmental physiology:** yield formation, yield potential and its realization. Grape composition and fruit quality: water, sugar, acids, nitrogen compounds and mineral nutrients, phenolics, lipids and volatiles. Xylem and phloem function.). | Stefano Poni (UCSC) | 4 Hours |
| **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? | Stefano Poni (UCSC) | 6 Hours |
| **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 and for prevention of climate extremes. | Stefano Poni (UCSC) | 12 Hours |
| **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. Methods for assessing efficiency of different training systems. | Stefano Poni (UCSC) | 12 Hours |
| **Water relations and water use efficiency:** Stomatal action and transpiration. Isohydric and anisohydric adaptation to water stress. Definition and ways of assessment of water use efficiency (WUE) Water relations and nutrient uptake. Invited seminars on specific topics. Audio-video listening of lectures and working groups. Discussion of case studies. | Stefano Poni (UCSC) | 14 Hours |

## PREREQUISITES

None

## CREDITS

7 ECTS with 48 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2,3,4,5 |

The module consists of classroom lectures and discussions completed by practical field work. The teaching and evaluation language is English.

## COURSE COORDINATOR

Stefano Poni (UCSC): stefano.poni@unicatt.it

## SUGGESTED READINGS

- Keller M (2010) The science of grapevines: Anatomy and physiology, Academic Press, New York, US.
- Iland P, Dry P, Proffitt T, Tyerman S (2012). The grapevine: from the science to the practice of growing vines for wine. Campbelltown: Patrick Iland Wine Promotions.
- Jackson RS (2014) Wine science: principles and applications, Academic Press, New York, US.

Additional scientific and technical reading references will be set during the course.

# MODULE 2.6 GRAPE VARIETIES & WINE GEOGRAPHY

## SCHEDULE & LOCATION

First academic year, second semester at the *Università Cattolica del Sacro Cuore* (UCSC) in Piacenza, Italy.

## DESCRIPTION

To teach the student the viticultural, oenological and cultural characteristics of the main wine grape varieties grown worldwide and to describe the main growing areas. The module also includes a 6-day study trip in Italy.

## LEARNING OUTCOMES

1) Report the main traits of the global wine industry.
2) Explain the terroir concept and the role of the different on the wine quality.
3) List the origin and the viticultural and enology attributes of the main wine grape varieties.
4) Discuss the relationships between the grape varieties and the terroir in which they are grown.
5) Correlate the sensory profiles of the wines with the different terroirs.
6) Discuss which terroir is more suitable for growing a certain grape variety according to specific wine style.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Wine statistics.** Terroir definition and role of the different factors. World viticultural terroirs: history and structure of national wine industries; description of producing areas, emphasizing the role of the grape variety, soil, climate and human being on grape and wine quality traits. Wine as a cultural produce. | Luigi Bavaresco (UCSC) | 30 Hours |
| **Grape varieties:** Para-domestication and domestication of the grapevine. Origin of the grape varieties grown nowadays. Classification and distribution in the world of the most grown varieties. | Luigi Bavaresco (UCSC) | 10 Hours |
| **Grape varieties:** Description of the most cultivated varieties: history, ampelographic characterization, phenology, agronomical attitudes, technological traits, wine sensory profiles. | Luigi Bavaresco (UCSC) | 20 Hours |
| **Tutorials:** Wine sensory analyses. | Luigi Bavaresco (UCSC) | 10 Hours |
| **Study Trips:** 10 daily visits to representative wine estates and 6-days in Italy | Luigi Bavaresco (UCSC) | 100 Hours |

## PREREQUISITES

None

## CREDITS

9 ECTS with 170 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2,3,4,5,6 |

The module consists of classroom lectures and discussions completed by various study visits in Italy and Switzerland. The teaching and evaluation language is English.

## COURSE COORDINATOR

Luigi Bavaresco (UCSC): luigi.bavaresco@unicatt.it

## SUGGESTED READINGS


- Anderson K (2013) Which Winegrapes Varieties are Grown where? University of Adelaide Press, e-book.
- Anderson K, Nelgen S (2020) Which Winegrapes Varieties are Grown where? A global empirical pictures. Revised Edition. University of Adelaide Press, e-book.
- Christensen LP, Dokoozlian NK, Walker MA, Wolpert JA (2003) Wine Grape Varieties in California. University of California ANR, Publ. 3419
- Gerrat J, Posluzeny U, Melville L (2015) Taming the Wild Grape., Springer, International Publishing Switzerland.
- MAGHRADZE D., RUSTIONI L., TUKOR J., SCIENZA A., FAILLA O., 2012. Caucasus and Northern Black Sea Region Ampelography. Vitis, Siebeldingen, Germany.
- Robinson J (2006) The Oxford Companion to Wine, Oxford University Press
- Robinson J, Harding SJ, Vouillam OZ (2012) Wine grapes, Allen La.ne.
- Szabo J (2016) Volcanic Wines – Salt, Grit and Power. Jacqui Small LLP London.
- Tomasi D, Gaiotti F, Jones GV (2013) The Power of the Terroir: the Case Study of Prosecco Wine. Springer
- Wilson JE (1998) Terroir. The role of geology, climate and culture in the making of French Wines. Mitchell Beazley, London.


Additional scientific and technical reading references will be set during the course.


# SEMESTER 3

## WINE IDENTITY

## THIRD SEMESTER OVERVIEW

# WINE IDENTITY

The wine sector is growing every day with emerging wine producing regions or new markets. In response to an increasingly competitive global industry, winemakers are seeking to increase their sales and attract more consumers by distinguishing themselves and their products from competitors. These targets can be achieved either by volume (at low prices) or by a strong identity, oriented towards maintaining a premium in the market by ensuring high quality products and more recently, meeting the demands of the discerning consumer for environmental sustainability. As a competitive marketing advantage for fine wines, wine identity can either be defined at the territorial level or at the level of a wine company. The former specifically focus on collective features such as a distinctive landscape, well-defined wine style, cultural heritage and local expertise. While traditionally a European practice, regional branding strategies have strongly increased over recent years in new wine producing countries. Still, alone a territorial identity is not sufficient as a means for quality differentiation and each company requires to create its own identity. The latter represents a defined set of expectations and values, which implies trust and consistency for the consumer. A well-positioned identity can generate loyalty in a wine market where the consumer can be overwhelmed by many choices. The first three modules are centred on the terroir concept, as a productive and localized cultural system, creating economic, ecological and social value within its territorial setting, including the WSET level 3 award in wines providing a strong international perspective. The fourth and fifth modules will teach students the techniques of strategic and operational wine management, economics as well as marketing and branding. During the final module, students will be introduced to the areas of research.

| **Wine Identity** | | ***ECTS Credits*** |
|---|---|---|
| Module 3.1 | Managing the territorial identity of terroir wines | 5 |
| Module 3.2 | Assessing the terroir system of wine regions | 5[1] |
| Module 3.3 | WSET Level 3 Award Wines | 5 |
| Module 3.4 | Applied wine marketing | 5 |
| Module 3.5 | Wine economics and business management | 5 |
| Module 3.6 | Applied research project | 5 |

[1] This module is centered on a wine study trip in France.

# MODULE 3.1 MANAGING THE TERRITORIAL IDENTITY OF TERROIR WINES

## SCHEDULE & LOCATION

Second academic year, third semester at the *Ecole Supérieure des Agricultures* (ESA) in Angers, France.

## DESCRIPTION

This module is centred on the terroir concept as a productive and localized cultural system, creating economic, ecological and social value within its territorial setting. The courses will build on the teaching curriculum of the first academic year, which focused on the various components and their interactions that shape a terroir wine. Students will gain understanding about the sustainable management and branding strategies of terroir wines, serving as a competitive advantage in a global wine market.

## LEARNING OUTCOMES

1) List the definition of and explain the concept of terroir in the wine sector.
2) Identify how the terroir concept creates economic, ecological and social value within its territorial setting.
3) Discuss the complex relationship between place and taste.
4) Explain the various dimensions of authenticity in terroir products.
5) Analyse a responsible and sustainable way of producing terroir wine.
6) Report the spatial and temporal issues of local terroir driven wines in a global changing climate.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction and concepts**: Terroir concept as a local, productive and cultural system; Sensory typicity of wines and defining the specific quality product. | Etienne Neethling (ESA); Cécile Coulon-Leroy (ESA). | 4.5 Hours |
| **Terroir wines as collective and territorial development processes**: Historical and cultural development of territorial wines; At the intersection of place, heritage and identity; Geographical indications as tools for local development; Territorial approach for rural development, the concept of basket of goods and services. | Daniel Henderson; Marion Demoissier (University of Southampton); Claire Durand (ESA). | 15.5 Hours |
| **Collective marketing and strategies for terroir wines**: Defining terroir brands and branding terroir wines; Collective marketing and strategic use of resources; Applied collective marketing and developing a territorial differentiating strategy; Environmental marketing. | Nathalie Spielmann (NEOMA); Mickaël Rouyer. | 19.5 Hours |
| **Socio-ecological sustainability of terroir wines:** Conservation of biodiversity within sustainable viticulture; Eco-quali-design for a sustainable wine production; Regional dynamics of terroir wines under climate change. | Joséphine Python-Rivallain (ESA); Christel Renaud-Gentié (ESA); Etienne Neethling (ESA). | 9 Hours |
| **Field visits**: Characterisation and description of natural terroir components and their interactions – Case of Saumur Champigny. | Etienne Neethling (ESA); Sam Schrock (IFV) | 6 Hours |
| **Invited masterclasses:** Lodi rules and sustainable viticulture**;** Agroecological transition in geographical indications | Stephanie Bolton (LODI); Faustine | 6 Hours |

| | |
|---|---|
| vineyards in France; An overview of the recent approaches to terroir zoning. | Ruggieri (ESA); Emmanuelle Vaudour (INRAE) |

## PREREQUISITES

A strong academic background in viticulture and enology, with knowledge in wine marketing.

## CREDITS

5 ECTS with 60.5 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual examination | 100% | 1,2,3,4,5,6 |

The module consists of classroom lectures and discussions completed by practical field work. The teaching and evaluation language is English.

## COURSE COORDINATOR

Etienne Neethling (ESA): e.neethling@groupe-esa.com

## SUGGESTED READINGS


- Van Leeuwen C, Seguin G (2006) The concept of terroir in viticulture. J. Wine Res, 17, 1–10.
- Demossier M (2011) Beyond terroir: Territorial construction, hegemonic discourses, and French wine culture. Journal of the Royal Anthropological Institute, 17(4), 685–705.
- Frankel C (2014) Land and wine: the French terroir. The University of Chicago Press.
- Charters S, Spielmann N (2014) Characteristics of strong territorial brands: The case of champagne. Journal of Business Research, 67(7), 1461-1467.
- Charters S, Spielmann N, Babin BJ (2017) The nature and value of terroir products. European Journal of Marketing, 51(4), 748-771.
- Coulon-Leroy C, Poulzagues N, Cayla L, Symoneaux R, Masson G (2018) Is the typicality of Provence Rosé wines only a matter of color? Oeno One, 52(4), pp. 1-15
- Demossier M (2018) Burgundy: A Global Anthropology of Place and Taste. New York: Berghahn.
- Leriche C, Molinier C, Caillé S, Razungles A, Symoneaux R, Coulon-Leroy C (2020) Development of a methodology to study typicity of PDO wines with professionals of the wine sector. Journal of the Science of Food and Agriculture, 100(10).
- Rouault A, Perrin A, Renaud-Gentié C, Julien S, Jourjon F (2020) Using LCA in a participatory eco-design approach in agriculture: the example of vineyard management. Int J Life Cycle Ass 25 (7):1368-1383.
- Spielmann N (2014) Brand equity for origin-bounded brands. Journal of Brand Management, 21(3), 189-201.
- Spielmann N, Williams C (2016) It goes with the territory: Communal leverage as a marketing resource. Journal of Business Research, 69(12), 5636-5643.


Additional scientific and technical reading references will be set during the course.

# MODULE 3.2 ASSESSING THE TERROIR SYSTEM OF WINE REGIONS

## SCHEDULE & LOCATION

Second academic year, third semester at the *Ecole Supérieure des Agricultures* (ESA) in Angers, France.

## DESCRIPTION

The module involves a study trip to a wine region in France where students will explore the various terroir components and values of that given region. The study trip can be either Champagne or Bordeaux.

## LEARNING OUTCOMES

1) Outline the terroir management system of a wine producing area, from its natural, biological and human factors to the economic, ecological and social values.
2) Knowledge of research methodologies to conduct research and identity problems.
3) Ability to plan and execute a research project appropriate to the problem under investigation and collect and analyze data to make practical recommendations.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Presentation of the study region; Development and validation of research topics. | Etienne Neethling (ESA); Daniel Henderson. | 3 Hours |
| **Study trip case studies**: Daily visits with different local stakeholders of a wine region (grape growers, wine producers, trade houses, syndicates, etc.). | Clément Miramont (ESA) | 40 Hours |

## PREREQUISITES

A strong academic background in viticulture and enology, with knowledge in wine marketing.

## CREDITS

5 ECTS with 43 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Group assignment | 100% | 1, 2, 3 |

The module consists of field visits. The teaching and evaluation language is English.

## COURSE COORDINATOR

Etienne Neethling (ESA): e.neethling@groupe-esa.com

## SUGGESTED READINGS

Scientific and technical reading references will be set during the course.

# MODULE 3.3 WSET LEVEL 3 AWARD WINES

## SCHEDULE & LOCATION

Second academic year, third semester at the *Ecole Supérieure des Agricultures* (ESA) in Angers, France.

## DESCRIPTION

This module is designed to give students a thorough and advanced understanding of the terroir factors that account for the style and quality of the principal still, sparkling and fortified wines of the world. The courses are based on the principles of the Wine and Spirit Education Trust (WSET) level 3 award in wines.

## LEARNING OUTCOMES

1) Identify and describe the characteristics of the principal still wines produced in the wine producing regions of the world and explain how the natural and human factors in the vineyard, winery and commerce can influence the style, quality and price of these wines.
2) Identify and describe the characteristics of the principal sparkling wines of the world and explain how the natural and human factors in the vineyard, winery and commerce can influence the style, quality and price of these wines.
3) Identify and describe the characteristics of the principal fortified wines of the world and explain how the natural and human factors in the vineyard, winery and commerce can influence the style, quality and price of these wines.
4) Ability to make an assessment of wine quality and readiness for drinking.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Exploring wine identity and diversity**: The WSET level 3 award in wines. The Theory of Wines of the World; Natural factors in the vineyard that influence style, quality and price; Human factors in the vineyard that influence style, quality and price; Human factors in the winery that influence style, quality and price; The principal still wine producing regions of the world; Key factors that influence style, quality and price of the principal still wines of the world; Principal sparkling wines of the world; Key factors that influence style, quality and price of sparkling wines; Principal fortified wines of the world; Key factors that influence style, quality and price of fortified wines; The Analytical Tasting of Wine. | Daniel Henderson; Baptiste Fabre (ESA) | 30 Hours |
| **E-learning Wine:** Video lessons on major study topics of WSET level 3, Online flashcards; multiple choice questions and revision exercises; Library of short written mock exam questions. | Etienne Neethling (ESA); Jimmy Smith | 30 Hours |

## PREREQUISITES

A strong academic background in viticulture and enology, with knowledge in wine marketing.

## CREDITS

5 ECTS with 60 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Individual WSET examination | 100% | 1,2,3,4 |

The module consists of classroom lectures and discussions completed with various tasting sessions. The teaching and evaluation language is English.

## COURSE COORDINATOR

Etienne Neethling (ESA): e.neethling@groupe-esa.com

## SUGGESTED READINGS

- Wine & Spirit Education Trust (WSET) Level 3 Award in Wine. Understanding Wines: Explaining Style and Quality. 200p.

Additional scientific and technical reading references will be set during the course.

# MODULE 3.4 APPLIED WINE MARKETING

## SCHEDULE & LOCATION

Second academic year, third semester at the *Ecole Supérieure d'Agricultures* (ESA) in Angers, France.

## DESCRIPTION

Students will engage with a real-world marketing challenge presented by a sponsoring winery. Through a combination of lectures, masterclasses, meetings with professionals, students will deepen their understanding of the unique challenges and opportunities within the wine sector related to marketing and branding. Students will compete against each other to develop innovative solutions according to the winery's marketing case study, with the company participating in the evaluation process.

## LEARNING OUTCOMES

5) Develop skills in creating and managing wine brand value propositions.
6) Analyse and evaluate real-world wine branding and marketing campaigns.
7) Apply marketing concepts to develop effective branding, packaging, and distribution plans for a winery.
8) Explore the dynamics of working with a sponsoring wine company.
9) Gain insights into sales and distribution strategies, with a focus on international markets.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction**: Specificity of wine marketing. | Mickaël Rouyer | 6 Hours |
| **Applied wine brand case study**: General presentation of case studies; Strategy, benchmarking, positioning and storytelling; Product design and product innovation; Distribution channels; Cost of good vs consumer value approach; Building a communication plan. | Baptiste Fabre (ESA) | 20 Hours |
| **Marketing wine in a global world**: Consumer behaviour and insights**;** Global brand strategy; Premium wine marketing and gatekeeper strategy. | Amélie Boucherit (Pernod Ricard) | 9 Hours |
| **Specific international considerations:** Understanding the US market | Marcela Dibildox | 3 Hours |
| **Invited masterclasses**: The principles of growth, mental availability, and category entry points applied to wine industry; Develop a communication strategy for a winery or wine region. | Justin Cohen (Erhenberg Bass Institute); Eléonore Deloison (Divino Conseils) | 6 Hours |

## PREREQUISITES

A strong academic background in viticulture and enology, with knowledge in wine marketing.

## CREDITS

5 ECTS with 44 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Group assignment | 100% | 1,2,3,4,5 |

The module consists of classroom lectures and discussions. The teaching and evaluation language is English.

## COURSE COORDINATOR

Baptiste Fabre (ESA): b.fabre@groupe-esa.com

## SUGGESTED READINGS


- Lapsley J and Moulton K (2001) Successful Wine Marketing. New York: Springer Science, 297pp.
- Anderson K and Golin G (2004) The World's Wine Markets. Globalization at Work. Edward Elgar, Cheltenham, UK; Northampton, MA, USA.
- Hall CM and Mitchell R (2008) Wine Marketing. A practical guide. Oxford: Elsevier, 344pp.


Additional scientific and technical reading references will be set during the course.

# MODULE 3.5 WINE ECONOMICS AND BUSINESS MANAGEMENT

## SCHEDULE & LOCATION

Second academic year, third semester at the *Ecole Supérieure des Agricultures* (ESA) in Angers, France.

## DESCRIPTION

This module covers fundamental economics, finance and management principles as applied to the management of vineyards and other wine-related business practices. Through a combination of a course textbook, extra-curricular readings, and independent case studies, students are led to develop critical thinking and problem-solving skills, while acquiring basic economics and management theory.

## LEARNING OUTCOMES

1) Understand the global wine structures, producer vs consumer economies and attitudes to wine consumption.
2) Explain industry organisation structures including appellations, clusters, cooperatives and individual producers. Discuss advantages and drawbacks of each.
3) Describe and explain different approaches to wine production management. Explain internal and external factors and forces impacting winery profitability.
4) Identify fundamental financial and economic concepts as applied to the wine industry. Discuss management organisation options in the wine industry.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Context of international wine business:** World's wine economy, the internationalization of wine; production and consumption statistics by country; Fundamental economics of wine across international markets, aspects of regulation and world wine laws. | Daniel Henderson | 6 Hours |
| **Wine industry organisation:** Clusters, leadership, innovation and change; Strategic decision making, cooperation and competition; Vertical industry integration; Economies of scale. | Daniel Henderson | 9 Hours |
| **Market forces and influences on decision making:** Policy, social externalities, taxes, regulation; Négociants, winegrowers and wholesale structures; Individual vs collective reputations; Terroir and appellations. | Daniel Henderson | 9 Hours |
| **Basic financial concepts applied to the wine industry:** Profitability, value and efficiency ratios; growth, debt and debt financing, balance sheets; Staffing and leadership. | Daniel Henderson | 6 Hours |
| **Field visits:** Daily visits with different local stakeholders of Anjou (Chenin) and Saumur (Cabernet franc). | Daniel Henderson | 40 Hours |
| **Invited masterclasses:** Large-scale management in the wine sector. | Antonio Graca (SOGRAPE) | 3 Hours |

## PREREQUISITES

A strong academic background in viticulture and enology, with knowledge in wine marketing.

## CREDITS

5 ECTS with 73 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Class participation, case preparation and discussions | 50% | 1,2,3,4 |
| Individual examination | 50% | 1,2,3,4 |

The module consists of classroom lectures and discussions, supplemented by outside-of-class readings and case preparation. The teaching and evaluation language is English.

## COURSE COORDINATOR

Etienne Neethling (ESA): e.neethling@groupe-esa.com

Daniel Henderson

## SUGGESTED READINGS

- Wine Business Management, Steve Charters and Jérome Gallo. 2014 Pearson France. ISBN 978-2-3260-0052-0
- Wine Economics, Stefan Castriota. 2020 Massachusetts Institute of Technology Press. ISBN 9780262044677
- The Palgrave Handbook of Wine Industry Economics, 2019 Palgrave/Macmillan. ISBN 978-3-319-98632-6
- The Globalization of wine, Inglis & Amila, 2020 Bloomsbury Academic Press. ISBN 978-1-4742-6499-0.

Additional scientific and technical reading references will be set during the course.

# MODULE 3.6 APPLIED RESEARCH PROJECT

## SCHEDULE & LOCATION

Second academic year, third semester at the *Ecole Supérieure des Agricultures* (ESA) in Angers, France.

## DESCRIPTION

The aim of this module is to provide students the opportunity to manage an applied research or entrepreneurship project, under the guidance of an academic supervisor. The content of this module (which can range from production to sales) will be defined by the study focus of the applied project. For each project, the students will need to address a scientific question with an appropriate study framework, allowing to analyse the results and propose an adequate answer with arguments.

## LEARNING OUTCOMES

1) Develop methodological skills in the contextualisation and design of a project.
2) Apply scientific knowledge in the management and implementation of the project.
3) Demonstrate in-depth understanding in the study area.
4) Ability to propose informed recommendations based on study findings.

## COURSE CONTENTS

| *TOPICS* | *TEACHERS* | *TEACHING* |
|---|---|---|
| **Introduction:** Presentation of case studies; Defining a study problematic; Bibliographic synthesis. | Etienne Neethling; Annie Sigwalt (ESA); Chantal Maury (ESA); | 5 Hours |
| **Teacher meetings** | Academic Supervisor (ESA) | 20 Hours |

## PREREQUISITES

A strong academic background in viticulture and enology, with knowledge in wine marketing.

## CREDITS

5 ECTS with 25 teaching hours.

## EVALUATION & TEACHING METHODS

| *ASSESSMENT* | *WEIGHTING* | *LEARNING OUTCOME* |
|---|---|---|
| Report examination | 100% | 1,2,3,4 |

The teaching and evaluation language is English.

## COURSE COORDINATOR

Etienne Neethling (ESA): e.neethling@groupe-esa.com

## SUGGESTED READINGS

Scientific and technical reading references will be set during the module depending on the study focus.

# SEMESTER 4

## MASTER THESIS

## FOURTH SEMESTER OVERVIEW

# MASTER THESIS

According to the International Organisation of Vine and Wine (OIV), global wine exports totalled 107.9 million hectolitres in 2017, representing around 30.4 billion euros in value. Given the significant economic impact, the wine sector generates an overwhelming number of wine-related jobs. They range from positions in grape growing or wine production to, for example, careers in vine nurseries, tank or barrel producing facilities, sales and marketing teams, restaurateurs, wine tourism, education or training. With many opportunities offered in the wine sector, the working environment remains nevertheless competitive where every role is unique, requiring a specific set of skills and attributes to be successful. In this context, the MSc Vintage programme has a double purpose. Firstly, to educate and form students with a comprehensive overview of the wine industry, from soil to consumer. Indeed, the economic growth and sustainable development of the wine sector will benefit from new leaders and actors with a broad technical and strategic background of grape and wine production, with expertise and knowledge in wine identity and diversity. And secondly, to grant students the opportunity to gain specific competencies by conducting a fundamental scientific research in any company or country of choice. This exposure and experience gained in real life situations will empower students to address the various challenges and issues that await them after graduation. They will learn to be more autonomous and responsible, develop skills and gain knowledge in the field of interest and obtain a specialisation for specific tasks or professions. The fourth semester is devoted to the Master's thesis. It takes place for a duration of six months in a professional environment and answer a scientific question, which was approved by the academic committee. The aim is to apply the concepts, tools and methodologies taught in the first three semesters of the MSc Vintage programme. After writing a scientific report, the thesis is orally defended in front of a jury committee.

| **MSc Vintage** | | | ***ECTS Credits*** |
|---|---|---|---|
| **Semester 4** | **Master Thesis** | | **30** |
| | Module 4.1 | Professional applied research project | 30 |