“*VINIFERA EUROMASTER*“

MODULE HANDBOOK
Second Academic Year (M2)

Modules offered by
Hochschule Geisenheim University

Students of the Vinifera EuroMaster degree program have to attend the following modules in the second academic year (M2):

- 4 core modules — 30 ECTS Credits
- Master Thesis — 30 ECTS Credits

Core Modules

Module	ECTS Credits
Advanced Enology	6
Advanced Viticulture	6
Product- and Project Management in Wine Business (Advanced Wine Business)	6
Research Project	12
Thesis	30
Total:	**60**

The ECTS user's guide indicates that one credit corresponds to 25 to 30 hours of work. In this module manual, 30 hours of work are assumed per credit.

Module Name	**Advanced Enology** **(Technology and Microbiology in Enology)**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year in Geisenheim
Semester:	3rd semester
Module coordinator:	Prof. Dr. Monika Christmann (Hochschule Geisenheim)
Lecturer:	Monika Christmann, Prof. Dr. (Hochschule Geisenheim); Jürgen Wendland, Prof. Dr. (Hochschule Geisenheim); Doris Rauhut, Prof. Dr. (Hochschule Geisenheim); Rainer Jung, Prof. Dr. (Hochschule Geisenheim); von Wallbrunn, Christian Dr. (Hochschule Geisenheim), Ludwig Pasch, M.Sc. (Hochschule Geisenheim); Matthias Schmitt, Dr. (Hochschule Geisenheim); Andrii Tarasov Dr. (Hochschule Geisenheim).
Language:	English
Classification within the curriculum:	Module of specialization
Teaching format:	Regular lectures and seminar during the semester
Workload:	Face to face lectures and seminar: 60 h; Student's personal study time in the module: 120
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students know about the ongoing research activities in winemaking, enology and microbiology and their implementation in small, medium and large scale wine production
Content:	Current research topics in Enology; Wine making technology; Microbiology
Assessment methods and criteria:	Presentation and written examination
Forms of media:	Power point presentations, hand-outs
Required reading:	a) General background literature as prerequisite to follow the course:

	REYNOLDS, A.: Managing Wine Quality., Vol. I + II, Woodhead Publishing, 2011. KÖNIG, H.; UNDEN, G.; FRÖHLICH, J.: Biology of Microorganisms on Grapes, in Must and in Wine. Springer-Verlag, Berlin, 2017. b) course specific references and relevant publications will be given at start of course
Optional reading	Scientific papers (make use of literature databases searching for keywords of the content of the lectures)
Other learning resources/tools (specific to the module) if applicable	Papers immediately linked to the lectures will be uploaded to the StudIP system of Hochschule Geisenheim University
Last updated in:	October 2023

Module name	**Advanced Viticulture**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Geisenheim
Semester:	3rd semester
Module coordinator:	Prof. Dr. Manfred Stoll (Hochschule Geisenheim)
Lecturer:	Johanna Döring, Dr. (Hochschule Geisenheim); Dimitrios Paraforos, Prof. Dr. (Hochschule Geisenheim); Elvira Bleser, Dr. (Hochschule Geisenheim); Timo Strack, Dr. (Hochschule Geisenheim); Johanna Frotscher, Dr. (Hochschule Geisenheim); Annette Reineke, Prof. Dr. (Hochschule Geisenheim); Moustafa Selim, Dr. PhD (Hochschule Geisenheim); Susanne Tittmann, Dr. (Hochschule Geisenheim); Matthias Friedel, Dr. (Hochschule Geisenheim)
Language:	English
Classification within the curriculum:	Module of specialization
Teaching format:	Regular lectures during the semester
Workload:	Face to face lectures and seminar: 60 h; Student's personal study time in the module: 120
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students know about current research topics in organic, biodynamic and conventional viticulture, molecular biology, breeding, pest control and precision viticulture and get an insight into current field trials, mitigation and adaptation strategies.
Content:	Hot topics in organic, biodynamic and conventional viticulture, physiology and pest control of grape production, including aspects of sustainability, mitigation, climate change, modern tools of precession viticulture, irrigation scheduling under different climatic scenarios, rootstock selection and best canopy management practice to achieve high quality fruit using limited resources.
Assessment methods and criteria:	Written examination
Forms of media:	Power point, laboratory and field work
Required reading:	a) General background literature as prerequisite to follow the course:

	GLADSTONES, J.: Wine, Terroir and Climate Change, Adelaide, Hyde Park Press, 2011. ILAND, P.; DRY, P.R.; PROFFITT, T.; TYEMAN, S.: The Grapevine - from science to the practice of growing vines for wine., Patrick Iland wine Promotions Pty Ltd, 2011. KELLER, M.: The Science of grapevines: anatomy and physiology. Amsterdam, Elsevier, 2010.b) course specific references and relevant publications will be given at begin of the course.
Optional reading	Scientific papers (make use of literature databases searching for keywords of the content of the lectures)
Other learning resources/tools (specific to the module) if applicable	Papers immediately linked to the lectures will be uploaded to the StudIP system of Hochschule Geisenheim University
Last updated in:	October 2023

Module name	**Advanced Wine Business** (Product- and Project Management in Wine Business)
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Geisenheim
Semester:	3rd semester
Module coordinator:	Jon H. Hanf, Prof. Dr.habil (Hochschule Geisenheim)
Lecturer:	Jon H. Hanf, Prof. Dr.habil (Hochschule Geisenheim) Katharina Mybes; M.Sc (Hochschule Geisenheim University) & guest lecturers
Language:	English
Classification within the curriculum:	Module of specialization
Teaching format:	Regular lectures and seminar during the semester
Workload:	Face to face lectures: 60 h Student's personal study time in the module: 120 h
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students know methods of strategic management and internationalization They are able to analyze firm and environmental conditions They are able to understand and analyze the wine market behavior They learn to develop marketing concepts
Content:	Theoretical Basis: Methods of strategic management (particularly Market based View and Resource based View), analysis of firm and environment, methods of marketing management, marketing and communication concepts, consumer behavior and target group analysis, wine cooperatives, methods of internationalization
Assessment methods and criteria:	Seminar thesis or written exam; accompanying presentations, to show stages of development
Forms of media:	Power point; black and white board; printed concepts
Required reading:	a) General background literature as prerequisite to follow the course: KOTLER, P.; ARMSTRONG, G.: Principles of Marketing. 2009. WIT, DE B.; MEYER, R.: Strategy - Process, Content, Context. 2010.

	b) course specific references and relevant publications will be given at begin of the course
Optional reading	Scientific papers (make use of literature databases searching for keywords of the content of the lectures)
Other learning resources/tools (specific to the module) if applicable	Papers immediately linked to the lectures will be uploaded to the StudIP system of Hochschule Geisenheim
Last updated in:	October 2023

Module name:	**Research Project**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Geisenheim
Semester:	3rd semester
Module coordinator:	Prof. Dr. Manfred Stoll (Hochschule Geisenheim)
Lecturer:	Academic staff of Hochschule Geisenheim
Language:	English
Classification within the curriculum:	Module of specialization
Teaching format:	Face to face presentations and discussion of the project *en bloc* at the beginning and end of the project. Research under continuous supervision
Workload:	Face to face: 8 h; oral presentations of interim and final results of the projects within a written report: 12 h, Student's research under supervision and independent study: 300 h; preparation of interim und final reports: 40 h
Credit points:	12 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	scientific writing
Targeted learning outcomes:	Students know about research strategies and methods and are able to apply them to practical research
Content:	Introduction to the library and literature research, research hypotheses and strategies; research methods; processing research data; statistics (involvement in laboratory)
Assessment methods and criteria:	Presentation and written report
Forms of media:	Power point and laboratory equipment (depending on the project), field visits
Required reading:	Basic required reading: MALMFORS, B.; GAMSWORTHY, P.; Gr, M.: Writing and Presenting Scientific Papers. Nottingham, Nottingham University Press., 2006. In the field of chemometrics: LEARDI, R.: Experimental design in chemistry: A tutorial. In: Analytica Chimica Acta, **652,** 2009, 161-172.

	The project specific literature research is part of the research project
Optional reading	The students will be introduced to current publication within their project environment
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Master Thesis** **at Hochschule Geisenheim University**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Geisenheim
Semester	4th semester
Module coordinator:	General coordination by Prof. Dr. Manfred Stoll (Hochschule Geisenheim) and student office of HGU
Supervisors:	Academic staff of Hochschule Geisenheim University and academic staff members of the EMaVE Consortium and associated partners.
Language:	English
Classification within the curriculum:	Core module
Teaching format:	The thesis consists of the elaboration of a written report about an independent scientific work of the student and a defense.
Workload:	24 weeks for the elaboration of the thesis; plus adequate time (at least 2 weeks) for personal preparation for the defence.
Credit points:	30 ECTS credits
Requirements under the examination regulations:	Admission to the thesis is granted if the student has - successfully completed the modules of the first academic year; - attended an internship of at least 8 weeks, proved by a respective certificate. Admission to the defence is granted under the condition that: - the written report was evaluated at least with the grade "E - pass"; - the student has completed all other compulsory modules of the second academic year successfully and obtained at least 120 ECTS (including the ECTS allocated to the Master Thesis)
Recommended prerequisites:	Scientific writing, data management and data analysis
Targeted learning outcomes:	The student is able to carry out scientific research independently in a given time implementing adequate scientific methods. In addition the student is able to present his/her results to a jury and answers questions related to the field of research.
Content:	Thesis document

Assessment methods and criteria:	Delivery of a written thesis report at the submission date. The written report has to be prepared under consideration of the formal requirements of the Hochschule Geisenheim University. Thesis defence in front of an examination jury of at least 3 academic members according to no 13.2 of the Study and Examination Regulations of the Vinifera EuroMaster degree program.
Forms of media:	Research methods depending on the topic of the thesis. Written report; presentation media for the defence
Required reading:	Books and scientific papers related to the topic of the thesis. The literature research is part of the Master Thesis
Optional reading	Scientific papers in related fields
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Additional Language Module offer

The credit points are not counted for the completion of the Master degree program.

Module	ECTS Credits
German as a Foreign Language	6

Module name:	**German as a Foreign Language**
Module code	
Type of module (compulsory/optional)	Additional to the curriculum
Higher education cycle	For beginners
Mode of delivery	Face-to-face
Academic Year:	2nd academic year in Geisenheim
Semester:	3rd semester
Module coordinator:	Katharina Betker-Zawisko (Language Center, Hochschule Geisenheim)
Lecturer:	Katharina Betker-Zawisko and freelance lecturers
Language:	German
Classification within the curriculum:	Additional module
Teaching format:	Lectures (interactive teaching): 4-6 hours / per week during the semester depending on entrance level
Workload:	Total study hours: 180 Course attendance: 60-90 hours; self-study: 90-120 hours
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Online placement test if prior knowledge of German
Targeted learning outcomes:	The level of the course will be defined at the beginning of the course depending on students' previous knowledge
Content:	Depending on the entrance level, relevant points of grammar and syntax will be covered and expanded. Everyday situations will be practiced, to enhance the experience of living in Germany.
Assessment methods and criteria:	Examinations and active participation Further details will be given at the beginning of the course
Forms of media:	Course organization in Stud.IP. Handouts, podcasts, videos
Required reading:	----------
Optional reading	
Other learning resources/tools (specific to the module) if applicable	German newspaper, literature, movies, etc.
Last updated in:	October 2023

Modules offered by
Universidade de Lisboa
&
Universidade do Porto

Students of the Vinifera EuroMaster degree programme have to attend the following modules in the second academic year (M2):

• 3 Core modules of 6 credits each	18 ECTS credits
• 3 Core modules of 3 credits each	9 ECTS credits
• 1 Core modules of 3 credits (Professional Training and Study Visit)	3 ECTS credits
• Master Thesis	30 ECTS credits
TOTAL	60 ECTS credits

The ECTS user's guide indicates that one credit corresponds to 25 to 30 hours of work. In this module manual, 28 hours of total work are assumed per credit.

Modules

Module	ECTS credits
Advanced Viticulture	6
Stabilisation and Wine Aging	6
Professional (Winery) Training and Study Visit	3
Mountain and Semi-Arid Tropical Viticulture	3
Grape and Wine Derived Products and By-products	3
Fortified Wines	3
Master Seminar (in Viticulture and Enology Engineering – Vinifera EuroMaster)	6
Dissertations (in Viticulture and Enology Engineering – Vinifera EuroMaster)	30
Total	60

Module name:	**Advanced Viticulture**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Instituto Superior de Agronomia-Universidade de Lisboa
Semester:	3rd semester
Module coordinator:	Carlos Lopes (Instituto Superior de Agronomia (ISA)-Universidade de Lisboa
Lecturer:	Carlos Lopes, Miguel Costa, Luisa Carvalho, Ricardo B. Ferreira, Erika Santos. (all from the Instituto Superior de Agronomia-Universidade de Lisboa); Jorge Cunha (INIAV-Pólo de Dois Portos) *Additional lecturer*: Ricardo Braga (ISA-Universidade de Lisboa)
Language:	English
Classification within the curriculum:	Module of Specialization (compulsory module)
Teaching format:	Regular lectures and workshops with seminars given by invited external researchers, technicians and other experts. Study trip at several Portuguese winegrowing regions
Workload:	Face to face lectures and seminars: 70 h Student's personal study time in the module: 98 h
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Viticulture courses
Targeted learning outcomes:	To complete the students background in the Viticulture area by improving their knowledge in specialized areas like vineyard mechanization and yield estimation and control. In addition, a perspective of the state of the art in current relevant topics such as Sustainable Viticulture, Impacts of Climate Change on Viticulture, Precision Viticulture and Applications of Biotechnology in the grape and wine sector, will be given through talks presented by several invited experts. Overall, it is intended that the students will learn how to critically evaluate and integrate the knowledge obtained from previous Viticulture courses and from recent scientific literature in order to be able to deal with the main current and future challenges of the Viticulture and to promote the sustainability of the grape and wine production chain.
Content:	Vineyard mechanization. Yield forecast, estimation and control. Implications of climate change for Viticulture and wine production; mitigation and adaptation measures. Precision Viticulture. Grapevine Biotechnology: main applications in

	viticulture; Sustainable Viticulture management systems; strategies to promote sustainability in Viticulture.
Assessment methods and criteria:	Evaluation by a written report based on a literature review of a given topic (1/3) and by a final examination (2/3).
Forms of media:	Power point, black board, scientific and technological articles, data bases, videos
Required reading:	Below some books and other recommended general literature. Specific papers and other literature will be provided to the students for each chapter. Costa J.M., Catarino S., Escalona J.M., Comuzzo P., (2022). Improving sustainable viticulture and winemaking practices. Academic Press, Elsevier. ISBN: 9780323851503. Forbes, S. L., De Silva, T., & Gilinsky Jr. A (2020). Social Sustainability in the Global Wine Industry. Springer Books, Springer. Gerling C. (2015). Environmentally Sustainable Viticulture, Practices and Practicality. Apple Academic Press 2015, ISBN: 978-1-77188-112-8, CRS Press, 399 p. Gerós, H. et al. 2015. Grapevine in a Changing Environment. A Molecular and Ecophysiological Perspective. Wiley & Sons Ltd. Gladstones, J. 2011. Wine, Terroir and Climate Change. Wakefield Press, Adelaide, South Austrália. Hayes P, Graça A, de la Fuente M, Bois B, Andrag A, Savage C, Corbett-Milward J, Koundouras S (2021). Sustainable use of water in winegrape vineyards. OIV - International Organisation of Vine and Wine, Paris, France, ISBN 978-2-85038-023-5 Jones, G. (2012). Climate Assessment for the Douro Wine Region: An Examination for the Past, Present and Future Conditions for Wine Production. ADVID, Régua, Portugal. OIV. (2016). OIV general principles of sustainable vitiviniculture-environmental-social-economic and cultural aspects. International Organisation of Vine and Wine, Paris, France. OIV (2021). Digital trends applied to the vine and wine sector. International Organisation of Vine and Wine, Paris, France. OIV (2021). The World Organic Vineyard. International Organisation of Vine and Wine, Paris, France. Poni, S. (2013). Proceedings 1st International Workshop on Vineyard Mechanization & Grape & Wine Quality. Acta Horticulturae, 978, ISHS. Poni, S. (2023). Designing and managing a sustainable vineyard in a climate change scenario. Amazon.com. ISBN 979-8370585326. Profit, T., Bramley, Rob, Lamb, D and winter, E. (2006). Precision Viticulture. A new era in vineyard management and wine production. Winetitles, Ashford, South Australia Stefanucci S, Graça A, Novello V, Belda I, Carlos C and Gautier J. (2018). Functional biodiversity in the vineyard, OIV - International Organisation of Vine and Wine publications, 1**st** Edition: November 2018 (Paris, France). ISBN 979-10-91799-93-5 Victorino, G (2022). Development of a new non-invasive vineyard yield estimation method based on image analysis.

	PhD dissertation, Instituto Superior de Agronomia, Universidade de Lisboa, Lisboa.
Optional reading	Costa, J.M.**;** Catarino, S.**;** Escalona, J.M.; Comuzzo, P. (2022) Achieving a More Sustainable Wine Supply Chain – Environmental and Socioeconomic Issues of the Industry. In *Improving sustainable viticulture and winemaking practices.*; Costa, J.M., Catarino, S., Escalona, J.M., Comuzzo, P., Eds.; Academic Press, Elsevier, 2022; pp. 1–24 ISBN 9780323851503. [Link] Costa JM, Egipto R, Aguiar FC, Marques P, Nogales A and Madeira M (2023) The role of soil temperature in mediterranean vineyards in a climate change context. *Front. Plant Sci.* 14:1145137. doi: 10.3389/fpls.2023.1145137 Nogales A, Rottier E, Campos C, Victorino G, **Costa JM**, Coito JL., Pereira S., Viegas W, **Lopes C (2021**). The effects of field inoculation of arbuscular mycorrhizal fungi through rye donor plants on grapevine performance and soil properties Agriculture, Ecosystems and Environment, 313, https://doi.org/10.1016/j.agee.2021.107369; Costa J. M. Oliveira M, Egipto R. Cid F, Fragoso R.,**Lopes CM**, Duarte E (2020).. Water and wastewater management for sustainable viticulture and oenology in south Portugal – a review, Ciência Téc. Vitiv., Vol. 35, 1:1 – 15. DOI https://doi.org/10.1051/ctv/2020350100 Carvalho LC, Gonçalves EF, Marques da Silva J and Costa JM (2021) Potential Phenotyping Methodologies to Assess Inter- and Intravarietal Variability and to Select Grapevine Genotypes Tolerant to Abiotic Stress. Front. Plant Sci. 12:718202. doi: 10.3389/fpls.2021.718202.
Other learning resources/tools (specific to the module) if applicable	Videos and power point presentations used on the workshops
Last updated in	October 2023

Module name:	**Stabilization and Wine Aging**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Instituto Superior de Agronomia-Universidade de Lisboa
Semester:	3rd semester
Module coordinator:	Sofia Catarino, (Instituto Superior de Agronomia, Universidade de Lisboa)
Lecturer:	Lecturer in charge: Sofia Catarino, (Instituto Superior de Agronomia, Universidade de Lisboa) *Additional lecturers*: M. Norberta de Pinho, Prof. PhD (Instituto Superior Técnico, Universidade de Lisboa) and Paulo Lopes, PhD (Private company)
Language:	English
Classification within the curriculum:	Core module of the second academic year
Teaching format:	Face to face lectures, laboratory and winery exercises, and tutorial during the semester
Workload:	Face to face lectures and seminars: 40 h; laboratory exercises: 30 h; tutorial: 14 h Student's personal study time in the module: 84 h
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Knowledge on grape and wine chemical composition, winemaking, wine chemical and sensory analysis
Targeted learning outcomes:	Understanding of the different physicochemical phenomena which take place during the conservation, aging, and stabilization of wines. Development of judgement abilities on wine treatments, according to the type of wine intended. Knowledge on the tests to assess the main risks, and on the stabilization methods available to prevent them. Capacity for team work and critical thinking skills.
Content:	Wine quality and quality control. Overview on Portuguese wine sector and wines. Physicochemical characterization of wines. Evolution, physicochemical and sensory modifications of wines overtime: main mechanisms involved and affecting factors. Evolution of phenolic compounds overtime. Influence of pH, oxygen, sulphur dioxide and temperature.

	Wine maturation in different containers (wood barrel, stainless steel, concrete, clay, others). Wooden barrel maturation. Micro-oxygenation. Oak alternatives. Colloidal phenomena and main physicochemical instabilities. Wines stabilization: protein, coloring matter, pinking, metallic and tartaric precipitations; stabilization processes; other treatments; stability tests. Clarification of wines. Fining operation: mechanisms involved; fining agents. Filtration, mechanisms of filtration; products used in filtration, types of filters. Membrane processes for the management of wine quality. Bottle closures and wine evolution in bottle. Cork. Other oenological practices: OIV International Code of Oenological Practices.
Assessment methods and criteria:	Written exam and (group) Report of laboratory and winery activities
Forms of media:	Power point, whiteboard, scientific and technical articles data base, industry films, study visits to wineries
Required reading:	<u>Main Bibliography:</u> Boulton et al., 1996. Principles and Practices of Winemaking. Chapman and Hall, New York. Costa M.; Catarino S., Escalona J., Comuzzo P. (Eds), 2022. Improving Sustainable Viticulture and Enology Practices. Academic Press, Elsevier. Curvelo-Garcia AS, 1989. Controlo de Qualidade dos Vinhos. Instituto da Vinha e do Vinho, Lisboa. Curvelo-Garcia AS, Barros P (Eds), 2015. Química Enológica – métodos analíticos. Avanços recentes no controlo da qualidade de vinho e de outros produtos vitivinícolas. Publindústria, Porto. Flanzy C, 1998. Oenologie. Fondements scientifiques et technologiques. Tec & Doc. Lavoisier, Paris. Morata A. (Ed), 2019. Red Wine Technology. Academic Press, Elsevier. Morata A. (Ed), 2021. White Wine Technology. Academic Press, Elsevier. OIV, 2023. International Code of Oenological Practices. OIV, Paris. OIV, 2023. International Oenological Codex. OIV, Paris. OIV, 2023. Compendium of International Methods of Wine and Must Analysis. Vol. 1 and 2. OIV, Paris. Ribéreau-Gayon et al. (Eds.), 2006. Handbook of Enology. Vol. 2. The chemistry of wine. Stabilization and treatments. 2nd edition. Wiley, England. Reynolds AG (Ed.), 2010. Managing wine quality. Vol. 2: Oenology and wine quality. Woodhead Publishing Ltd., Cambridge. Waterhouse et al., 2016. Understanding Wine Chemistry. John Wiley & Sons, Chichester, UK. Zoecklein, B., Fugelsang, K.C.; Gump, B.H.; Nury, F.S., 1999. Wine analysis and Production. Springer.
Optional reading	Cabrita MJ, Garcia R, Catarino S, 2016. Recent developments in wine tartaric stabilization. In *Recent advances in wine*

	stabilization and conservation technologies, 49-63. Nova Science Publishers, New York. Catarino S, Madeira M, Monteiro F, Rocha F, Curvelo-Garcia AS, Bruno de Sousa R, 2008. Effect of bentonite characteristics on the elemental composition of wine. J. Agric. Food Chem., 56, 158-165. Cosme F, Ricardo-da-Silva JM, Laureano O, 2008. Interactions between protein fining agents and proanthocyanidins in white wine. Food Chem., 106 (2), 2008, 536-544. Kaya A, Bruno de Sousa R, Curvelo-Garcia AS, Ricardo-da-Silva J, Catarino S, 2017**.** Effect of wood aging on mineral composition and wine $^{87}Sr/^{86}Sr$ isotopic ratio. J. Agric. Food Chem., 65, 4766-4776. Mira H, Leite P, Catarino S, Ricardo-da-Silva JM, Curvelo-Garcia AS, 2007. Use of PVI-PVP copolymer for wine metal reduction effects on wine characteristics. Vitis, 46 (3), 138-147. Pfahl, L; Catarino, S.; Fontes, N.; Graça, A.; Ricardo-da-Silva, J., 2021. Effect of barrel-to-barrel variation on color and phenolic composition of a red wine. Foods, 10(7), 1669. https://doi.org/10.3390/foods10071669 Pittari E., Catarino S., Andrade M.C., Ricardo-da-Silva J.M., 2018. Tartaric stabilization of red wine by adding different carboxymethylcelluloses. *Ciência e Técnica Vitivinícola,* 33 (1), 47-57. Teissedre P.-L., Catarino S., Comuzzo P., 2022. Wine quality production and sustainability. In: Improving sustainable viticulture and winemaking practices. 187-196. Costa J.M., Catarino S., Escalona J.M., Comuzzo P. (Ed.). Academic Press, Elsevier. White W., Catarino S., 2023. How does maturation vessel influence wine quality? A critical literature review. Ciência e Técnica Vitivinícola, 38 (2), 128-151. <u>SCI Journals for complementary references</u>: Am. J. Enol. Vitic.; Aust. J. Grape Wine Res.; Ciência Téc. Vitiv.; Food Chem.; J. Agric. Food Chem.; J. Sci. Food Agric.; OENOOne S. Afr. J. Enol. Vitic.; Vitis
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Professional (Winery) Training and Study Visit**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Winery training/Internship activities
Academic Year:	2nd academic year at Instituto Superior de Agronomia-Universidade de Lisboa
Semester:	3rd semester
Module coordinator:	Jorge M. Ricardo da Silva (Instituto Superior de Agronomia, Universidade de Lisboa)
Lecturer:	Jorge M. Ricardo-da-Silva, (Instituto Superior de Agronomia, Universidade de Lisboa), Manuel Malfeito-Ferreira, (Instituto Superior de Agronomia, Universidade de Lisboa); Jorge Queiroz, Prof. Ph.D (Facudade de Ciências-Universidade de Porto)
Language:	English
Classification within the curriculum:	Core module of the second year (M2)
Teaching format:	Period: from the end of July to the beginning of October (Compulsory module). The students should spend at least one month in a winery during harvest time and winemaking.
Workload:	minimum of 200 hours of internship in a wine company, of which 84 hours study related
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Vinification, Viticulture, Wine Microbiology modules
Targeted learning outcomes:	Students have practical experience concerning the operational procedures in a winery during the harvest and vinification period. They are able to combine the theoretical knowledge with the constraints of practical implementation. Students have an impression of the special characteristics of the main Portuguese vine growing regions and their wines.
Content:	Contact of the students with the practical of wine company, during harvest and vinification Participation of the students during grape maturation controls until the end of the fermentations/1st racking of the wines. (Grape maturation survey; Harvest decision; Definition of a concept related to the production of a certain wine style; Hygiene of the winery and equipment preparation; Corrections and pre-fermentative operations; Choice of the grapes, crushing, destemming; draining, pressing, Clarification of white and rose musts; Fermentative process; yeast application;

	maceration/remontage, Fermentation temperature control; Decision about malolactic fermentation; draining and pomace out from the tanks. Wine survey until the end of fermentations; racking. Yields, costs and by-products. Integrated study visit to vineyards and wineries of the main Portuguese wine regions.
Assessment methods and criteria:	Report on the training period in a winery with an oral presentation and discussion during the evaluation period.
Forms of media:	Machinery and equipment of the winery, power point
Required reading:	All Enology literature references recommended in the other Enology modules
Optional reading	idem
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Mountain and Semi-Arid and Tropical Viticulture**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher Education Cycle:	2º Cycle / Master level
Mode of Delivery	Face-to-face
Academic Year	2nd academic year at Instituto Superior de Agronomia-Universidade de Lisboa
Semester:	3rd semester
Module coordinator:	Carlos Lopes (Instituto Superior de Agronomia-Universidade de Lisboa)
Lecturer:	Jorge Queiroz (Faculdade de Ciências-Universidade de Porto) & Luis Goulão, Ph.D (Instituto Superior de Agronomia-Universidade de Lisboa);
Language:	English
Classification within the curriculum:	Core Module of Specialisation
Teaching format:	Regular and tutorial lectures; study trip to the Douro Valley in Portugal and Seminars given by Brazilian researchers
Workload:	Face to face lectures and practical exercises: 35 h; tutorial: 7 h Student's personal study time in the module: 42 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Upon completion of the course it is expect that the students will be able to: - Find out the geographical locations of the main current worldwide regions for Mountain and Semi-Arid and Tropical grape production - learn about the specificities of Mountain Viticulture regarding soil preparation, leveling, training systems, soil management and mechanization; - understand the effects of Semi-Arid and Tropical Climate on grapevine biology, vigor and berry health and composition and learn how to use management tools and practices to overcome those problems.
Content:	1-Mountain Viticulture Main regions of Mountain Viticulture in the winegrowing world. Hillside systematization for grapevine planting in Mountain Viticulture. Specific training systems for Mountain Viticulture. Control of erosion and soil management. Vineyard mechanization for steep slope Viticulture 2- Semi-Arid and Tropical Viticulture

	Worldwide Semi-Arid and Tropical Viticulture regions; Climate constraints and Bioclimatic indices. Grapevine Biology in tropical semi-arid climate: bud dormancy, shoot development, apical dominance, carbon reserves and fruitfulness; Vineyard management in Semi-Arid and Tropical Viticulture: The training and pruning systems: From pergolas to vertical shoot positioning canopies. Vigor control, canopy microclimate and berry health and composition, water management and pruning opportunity. From seasonal harvest to continuous harvest. Influence of the tropical and semi-arid conditions in grape and wine composition. Seminar: The Brazilian winegrowing regions and the tropical wines produced.
Study / exam achievements:	Evaluation by a written report based on a literature review of a given topic (1/3) and by a final examination (2/3).
Forms of media:	Power point, black board, videos and scientific and technological articles
Literature:	Albuquerque J. A. S., Vieira S. M. (1987). Efeitos da cianamida hidrogenada na brotação da videira cv. Itália na região Semi-árida do Vale do São Francisco. In: *Congresso Brasileiro de Fruticultura*, **9**, 739-744. Campinas-SP. Sociedade Brasileira de Fruticultura (ed). Campinas. Bois B., Pérard, J. (2009). Climat et viticulture au Vietnam : évaluation et perspectives. Climatologie, 6, 75-88. Camargo U.A. (2007). Técnicas de produção vitícola com ciclos sucessivos em condições tropicais. In: Workshop Internacional de Pesquisa, Anais, 1, 2004. Petrolina: Embrapa Uva e Vinho, 85-95. Camargo U.A., Mandelli F., Conceição M.A., Tonietto, J. (2012). Grapevine performance and production strategies in tropical climates. As. J. Food Ag-Ind. 5(04), 257-269. Camargo U.A., Protas J.F.S., Mello L.M.R. (2008). Grape growing and processing in Brazil. Acta Horticulturae, 785, 51-57. Carbonneau, A. (2010). La viticulture tropicale mondiale. Le point de son évolution au IIème Symposium International des Vins Tropicaux, Petrolina, Brésil. *Progrès Agricole et Viticole*, 127(13-14), 281-283. Carbonneau, A. (2011). Tropical Viticulture: Specificities and Challenges for a Quality Viticulture. Acta Hort. 910, 15-34. Cargnello, G., Carbonneau, A., Murisier, F., Queiroz, J., (2012). Recherches sur des modèles de systèmes de culture traditionnels et nouveaux pour le développement de la viticulture de montagne ou en forte pente". CERVIM, Proceedings Quatrième Congrès International sur la Viticulture de Montagne et en Forte Pente, 11 – 12. Lyon, França. Cargnello, G., Queiroz, J., Carbonneau, A., Castro, R. and Murisier, F., (2013). Viticultures difficiles et héroïques : recherches sur des modèles de viticulture « vieux-nouveaux » et convenables au niveau économiques, socio-environnemental, existentiel, éthique de façon « metaéthique. Ciência e Técnica Vitivinícola **28**, 1078-1086. ISSN 0254-0223.

Carvalho JN, Pereira LS, Carvalho PA, Neto AD (2016). Application of natural garlic extract to overcome bud dormancy of grapevines 'BRS Rúbea' and 'BRS Cora'. Australian J. Crop Science 10(2):216-219.

Chadha, K.L. (2008). Indian viticulture scenario. Acta Horticulturae, 785, 59-68. Conference on Viticultural Zoning, 15 a 19 Nov. 2004. Cape Town, South Africa, 193–201.

Cruz, A.; Santos, J.; Gomes, C.; Castro, R. (2008). Tempranillo in semi-arid tropical climate (Pernambuco – Brazil). Adaptation of some clones and their affinity to different rootstoks. VIIth International Terroir Congress 2008, Nyon, Suisse.

Cruz, A.; Santos, J.; Gomes, C.; Castro, R. (2008). Tempranillo in semi-arid tropical climate (Pernambuco – Brazil). Adaptation of some clones and their affinity to different rootstoks. VIIth International Terroir Congress 2008, Nyon, Suisse.

Kok D. (2014). A Review on Grape Growing in Tropical Regions. Turkish Journal of Agricultural and Natural Sciences, Special Issue: 1, 1236-1241.

Marin FR, Lopes AML, Pacheco LRF, Pilau FG, Silveira PH, Conceição MAF, Tonietto J, Mandelli F. (2008). Soil and climate potential for grape crop in the São Paulo state, Brazil. Revista Brasileira de Agrometeorologia, 16(2), 163-174.

OIV (2019). Alternatives of dormancy breaking and other production agents for table grapes. International Organisation of Vine and Wine, Paris, France.

Oliveira, J., Faria D., Duarte D., Egipto, R., Laureano, O., Castro R., Pereira J- and Ricardo-da-Silva, J. (2018). Effect of the harvest season on phenolic composition and oenological parameters of grapes and wines cv. 'Touriga Nacional' (V*itis vinifera* l.) produced under tropical semi-arid climate, in the state of Pernambuco, Brazil. *Ciência Téc. Vitiv*. 33(2) 145-166.

Pereira GE, Santos JO, Guerra CC, Alves LA, (2008). Évaluation de la qualité des raisins et des vins selon la période de vendage, dans une région tropicale au Nord-Est du Brésil. In: Congrés International des Terroirs Viticoles, Nyon, Suisse. *Comptes rendus*. Pully, Suisse: Agroscope Changins Wädenswill, p. 536-539.

Possingham J.V.)2008). Developments in the production of tablegrapes, wine and raisins in tropical regions of the world. *Acta Horticulturae*, , 785, 45-50.

Queiroz J, Cunha M; Fonseca A; Machado M, Sousa M, Borges L, Castro R, Magalhaes A; Guimaraens D. (2010). Vine Spacing in steep slope viticulture: narrow terraces, Douro region. Viticulture en fort pente et densité de plantation: banquettes, étroites, région de Douro. CERVIM, Troisième Congrès International Viticulture de Montagne et/ou En Forte Pente, Castiglione di Sicilia, Catania, Itália.

Queiroz, J; Cunha, M; Magalhaes, A; Guimaraens, D ; Sousa, M; Borges, L; Castro, R., (2009). Mountain viticulture and new training systems in narrow terraces - Douro region". 16th International GESCO Symposium, University of Califórnia, Davis, USA, 487-492.

Quijano–Rico, M. (2008). Great highlands wine growing terroir: conditions and expressions. VIIth International Terroir Congress 2008, Nyon, Suisse.

Schaefer W W. (2008). Hot climate/Tropical wine making. *Acta Horticulturae*, 785, 477-481.

	Schaefer W.W. (2016). New developments in tropical viticulture under monsoon climate. Acta Hortic. 1115, 195-202. Tonietto J, Teixeira AHC, (2004). Zonage climatique des periodes viticoles de production dans l'année en zone Tonietto J., Teixeira AHC, (2004). Zonage climatique des periodes viticoles de production dans l'année en zone tropicale: application de la méthodologie du Sistème CCM Géoviticole.p.193–201. In: *Proceedings* Joint International Conference on Viticultural Zoning, 15 a 19 Nov. 2004. Cape Town, South Africa. Tonietto, J. and Mandelli, F. (2007). Study of the inter-annual variability of the viticultural climate in Brazilian regions by the Geoviticulture MCC system. CR GESCO, 15(1):285-293. Tonietto, J., and Carbonneau, A. (2004). A multicriteria climatic classification system for grape-growing regions worldwide. Agric. For. Meteorol. *124* (*1-2*). Tonietto, J., Mandelli, F.; Weber, E.; Hasenack, H. (2006). Viticultural Climatic Zoning and Digital Mapping of Rio Grande do Sul - Brazil, using Indices of the Géoviticulture MCC System. VIth Int. Terroir Congress 2006, Bordeaux, France, 21-26. Zheng C, Halaly T, Acheampong AK, Takebayashi Y, Jikumaru Y, Kamiya Y, Or E. (2015). Abscisic Acid (ABA) regulates grape bud dormancy, and dormancy release stimuli may act through modification of ABA metabolism.Journal of Experimental Botany, 66(5):1527-42. Wurz DA, Bem BP, Allebrandt R., Bonin B., Dalmolin LG, Tamiris, A., Rufato, CL, Kretzschmar AA (2017). New wine-growing regions of Brazil and their importance in the evolution of Brazilian wine. BIO Web of Conferences 9, 1-4.
Update	October, 2023

Module name:	**Grape and Wine Derived Products and By-Products**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Instituto Superior de Agronomia-Universidade de Lisboa
Semester:	3rd semester
Module coordinator:	Jorge M. Ricardo-da-Silva, (Instituto Superior de Agronomia-Universidade de Lisboa)
Lecturer:	Jorge M. Ricardo-da-Silva, (Instituto Superior de Agronomia-Universidade de Lisboa), Ilda Caldeira (INIAV-Pólo de Dois Portos), Sara Canas, (INIAV-Pólo de Dois Portos)
Language:	English
Classification within the curriculum:	Core Module
Teaching format:	Regular lectures, laboratory exercises and tutorial during the semester
Workload:	Face to face lectures: 21 h; laboratory exercises: 14 h; tutorial: 7 h Student's personal study time in the module: 42 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Vinification, Grape and Wine Composition and Sensory Analysis
Targeted learning outcomes:	Students know the grape and wine alternative products and by-products. They are able to characterize these products in order to obtain a valorization, in comparison to the main products of the sector: Grapes and wines.
Content:	Short historical description of the grape and wine alternative products and by-products. Actual interest. Grape alternative products: juices, production diagram and equipment. Raisins, production diagram and equipment. Polysaccharides gelification: processes and products. Jams, production diagram and equipment, particular case of *"uvada".* Jellies, production diagram and equipment, particular case of hypocaloric jellies. Liquors, production diagram and equipment. Concentrated must: economic importance and production, equipment and rectification. Other grape alternative products. Wine derived products: brandies, types, distillation and alembics, aging technology, the barrels- chemical composition, botanical and geographical origin of the wood, cooperage.

	Vinegars: types, production technology, fermentation systems, fining. Other wine derived (alternative) products. By-products valorization: stems, marcs, seeds, lees, tartar, distillation residues. Biological, nutriceutical, and pharmacological aspects of the vine products: nutriceutical products, main target constituents.
Assessment methods and criteria:	Written examination
Forms of media:	Power point, black board, scientific and technological articles data base
Required reading:	CANAS, S. et al.: Effect of heat treatment on the thermal and chemical modifications of oak and chestnut wood used in brandy ageing. In: Ciência Téc Vitiv., **22** (1), 2007, 5-14. LÉAUTÉ, R.: Distillation in alambic. In: Am. J. Enol. Vit., **41,** 1990, 90-103. GASPAR, C. ; SOUSA, I. ; LAUREANO, O.: Production of reduced – calorie grape juice jelly with gellan, xanthan and locust bean gums: sensory analysis and objective texture. In: Z. Lebensm. Unters. Forsch., **207**, 1998, 91-96 LARANJEIRA, C.: Introdução monográfica à indústria vinagreira. Aproveitamento de vinhaços de aguardentes vínicas em acetificação: um valor de opção para a indústria vinagreira. Tese de Mestrado em Ciência e Tecnologia de Alimentos, Instituto Superior de Agronomia, UTL, 1998. CALDEIRA, I.: Uvada – recuperação de um doce tradicional de uva e maçã. Tese de Mestrado em Viticultura e Enologia, Instituto Superior de Agronomia, UTL, 1995. CALDEIRA, I.: O aroma de aguardentes vínicas envelhecidas em madeira. Tese de Doutoramento em Engenharia Agro-Industrial, Instituto Superior de Agronomia, UTL, 2004. CANAS, S.: Estudo dos compostos extraíveis de madeira (Carvalho e Castanheiro) e dos processos de extracção na perspectiva do envelhecimento em Enologia. Tese de Doutoramento em Engenharia Agro-Industrial, Instituto Superior de Agronomia, UTL., 2003. CANTAGREL, R.: Elaboration et Connaissance des Spiritueux (1º Simpósio Científico International do Congresso). Tec. & Doc. Lavoisier, Paris, 1993. CHATONNET, P.: Influence des procédés de tonnellerie et des conditions d'élevage sur la composition et la qualité des vins élevés en fûts de chêne. Thèse Doctorat, Université de Bordeaux II, 1995.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Fortified Wines**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Instituto Superior de Agronomia-Universidade de Lisboa
Semester:	3rd semester
Module coordinator:	Jorge M. Ricardo-da-Silva, (Instituto Superior de Agronomia-Universidade de Lisboa)
Lecturer:	Jorge M. Ricardo-da-Silva, (Instituto Superior de Agronomia-Universidade de Lisboa), Jorge Queiroz (Faculdade de Ciências-Universidade de Porto). *Additional lectures*: Invited persons from the various Wine Regions producing fortified wines.
Language:	English
Classification within the curriculum:	Core Module (*compulsory module*)
Teaching format:	Regular lectures, practical exercises and tutorial during the semester, sensory analysis of fortified wines
Workload:	Face to face lectures and practical exercises: 35 h; tutorial: 7 h Student's personal study time in the module: 42 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Vinification, Wine Microbiology, Basic Viticulture
Targeted learning outcomes:	The students understand the distinct steps from grape maturation to the ageing of the wine under fortified winemaking conditions. They know about fortified wines of the world.
Content:	The Vineyards and wines in the Douro and the classification system of awarding points and letters (Engº Moreira da Fonseca) Control of grape maturation and decision time for harvesting in order to produce a fortified wine. Fortified wines in the context of special Vinifications. Diagrams of production: Must extraction. Decision of the corrections and pre-fermentation operations; Fermentation process; Application of yeasts, fermentation temperature control. Maceration. Remontage. Addition of wine / brandy alcohol. Sangria and pressing. Monitoring the wine conservation, stage, maturation and aging

	Fortified *("Licorosos")* wines and *"Generosos":* general approach. Port wine: wine categories: Generics and Special (Premium) ones. Maturation and aging of Port. Other Portuguese fortified wines :Moscatel de Setúbal, Madeira, Carcavelos, others. Fortified Wines of the World: Marsala, Muscat of Frontignan, Lunel, Riversaltes, Fortified wines of the "new World". Flor Wines technology and ageing. "Abafados and Jeropigas (Mistelles): particularities. Tasting of the different fortified wines along the semester and in the study visits. Study visit at fortified wine companies.
Assessment methods and criteria:	Written examination
Forms of media:	Power point, black board, scientific and technological articles data base
Required reading:	BOULTON, R. B. ; SINGLETON, V. L. ; BISSON, L. F. ; KUNKEE, R.: Principles and Practices of Winemaking. Chapman & Hall, 1995. JACKSON, R.: Wine Science. Principles and Applications. Academic Press, New York, 2008. RIBEREAU-GAYON, P. ; DUBOURDIEU, D. ; DONÉCHE, B. ; LONVAUD, A.: Handbook of Enology. Vol. 1. The Microbiology of wine and vinifications. Wiley, London, 2000. MENCARELLI F., TONUTTI, P.: Sweet, Reinforced and Fortified Wines: Grape Biochemistry, Technology and Vinification. Ed. Wiley-Blackwell, London, pp372, 2013.
Optional reading	RIBEREAU-GAYON, P.; GLORIES, Y. ; MAUJEAN, A. ; DUBOURDIEU, D. (1998). *Traite d'œnologie. Vol. 2. Chimie du vin. Stabilisation et traitements*, Dunod, Paris. VINE, R,P,; HARKNESS, E,M,; BROWNING, T,; WAGNER, C (1997) – *Winemaking. From grape growing to marketplace.* Chapman & Hall. ZOECKLEIN, B.W.; FUGELSANG, K.C.; GUMP, B.H.; NURY, F.S (1994). – *Wine analysis and production,* Chapman & Hall.
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Master Seminar (in Viticulture and Enology Engineering – Vinifera EuroMaster)**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Instituto Superior de Agronomia-University of Lisbon
Semester:	3rd semester
Module coordinator:	Carlos Lopes (Instituto Superior de Agronomia (ISA)-University of Lisbon)
Lecturer:	Carlos Lopes (coordinator), other ISA staff.
Language:	English
Classification within the curriculum:	Core Module (compulsory module)
Teaching format:	Theoretical-Practical, Seminars and Tutorial Lectures
Workload:	Lectures, seminars and tutorial: 84 h Student's personal study time: 84 h
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Support students in the preparation of the master's thesis by guiding them through the main steps from the selection of the topic to the structuring, organization, timing and writing of the dissertation. The aim is to inform the students about the different possibilities in terms of topics and places to carry out the dissertation, promoting contacts with researchers and other potential supervisors in Viticulture and Oenology areas, both in ISA and in other institutions. In addition, knowledge will be provided to enable students to improve their competencies either in the use of computer tools to research scientific literature and to manage bibliographic references, and in the critical review, analysis and synthesis of scientific knowledge. With the completion of this module it is intended that the students have acquired competences that allow them to organize and conduct the master dissertation project that will be carried out in the following semester.
Content:	1. Objectives of the course. Timeline for Seminar preparation, deliver and discussion 2. Types of Master Dissertation 3. Selection of the dissertation topic 3.1. Description of the main steps

	3.2. Offer of dissertation topics: list and description of the topics in Viticulture and Enology made available by ISA researchers and other national and international institutions. 4. Rules and regulations for the organization, writing and presentation of the master's dissertation 4.1. Scientific dissertation 4.1.1. General structure of scientific articles and dissertations; 4.1.2. The research Proposal: title, introduction and definition of the aims; state of the art: bibliographic sources and computer tools to search, manage and create the list of references; rules for bibliographic citation. Research methodologies, data organization, analysis and presentation 4.2. Specificities of the reports of the other types of dissertation; 5. Workshops and Seminars. 6. Tutorial sessions with the supervisors
Assessment methods and criteria:	The evaluation is composed of two components: an oral presentation (40%) and a written report (60%) synthetizing the state of the art of the Master thesis subject.
Forms of media:	Power point and other software to manage references, scientific papers and technical articles.
Required reading:	Bui, YN (2019). How to Write a Master's Thesis. 3rd edition. SAGE Publications, Inc, CA, USA. ISBN: 9781506336107 Doumont, J, (2010). English Communication for Scientists. Cambridge, MA. NPG Education. Madeira AC, Abreu MM, (2004). Comunicar em Ciência: como Redigir e Apresentar Trabalhos Científicos. Lisboa: Escolar Editora. Malmfors B, Garnsworthy P, Grossman M (2004). Writing and presenting scientific papers. 2nd Edition. Notthingham University Press. Notthingham, UK. Murray, Rowena (2011). How to Write a Thesis, 3rd ed. Maidenhead: Open University Press. Nygaard Lynn P. (2017). Writing Your Master's Thesis: From A to Zen. SAGE Publications Ltd London, UK. Ruxton GD, Colegrave N (2006). Experimental design for the life sciences. 2nd edition, Oxford University Press, Oxford, UK. Schimel J (2012). Writing Science. Oxford University Press. Oxford, UK. Turabian, Kate L (2018). A Manual for Writers of Research Papers, Theses, and Dissertations. The University of Chicago Press, Ltd., London. DOI: https:// doi.org/ 10.7208/ chicago/ 9780226430607.001.0001
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Master thesis ("Dissertation" in Viticulture and Enology Engineering – Vinifera EuroMaster)**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year
Semester:	4th semester
Module coordinator:	General coordination by the Master Course Committee
Lecturer:	Supervisors of the master's thesis are: Academic staff of the Instituto Superior de Agronomia-University of Lisbon and Faculdade de Ciências-University of Porto and INIAV-Pólo de Dois Portos, and academic staff members of the EMaVE Consortium and associated partners.
Language:	English
Classification within the curriculum:	Core module
Teaching format	The Dissertation consists of the elaboration of a written report about an independent scientific work, a professional training or a Project of the student and a defense.
Workload:	840 h
Credit points:	30 ECTS credits
Requirements under the examination regulations:	Admission to the Dissertation is granted if the student has - completed at least 48 ECTS of the Master degree programme. Requirements for the submission of the written report: The student has to have successfully completed: - the first academic year (M1) - all the core modules of the second academic year (M2) of the Vinifera degree programme in Lisbon. - The written report has to be submitted within 3 months following the last examination of the course in which the student is enrolled. Admission to the defence is granted under the condition that - the written report was evaluated at least with the grade "E - pass" - the student has completed all other compulsory modules of the second academic year successfully and obtained at least 120 ECTS (including the ECTS allocated to the Dissertation).
Recommended prerequisites:	Not applicable

Targeted learning outcomes:	The student will be able to carry out scientific research or a project or a professional stage independently in a given time implementing adequate scientific methods. In addition the student is able to present his/her results to a jury and answers questions related to the dissertation contents.
Content:	Dissertation document
Assessment methods and criteria:	Delivery of a written dissertation report at the submission date. The written report has to be prepared under consideration of the formal requirements of the University of Lisbon/University of Porto. Dissertation defense in front of an examination jury of at least 3 academic members according to no 13.2 of the Study and Examination Regulations of the Vinifera EuroMaster degree programme.
Forms of media:	Research methods depending on the topic of the thesis. Written report; presentation media for the defense
Required reading:	Literature research is based on books and scientific papers related to the topic of the thesis.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

MODULES offered by
Universidad Politécnica de Madrid

UNIVERSIDAD
POLITÉCNICA
DE MADRID

Students of the Vinifera EuroMaster degree programme have to attend the following modules in the second academic year (M2):

- 7 Core modules — 30 ECTS Credits
- Master' Thesis — 30 ECTS Credits

The ECTS user's guide indicates that one credit corresponds to 25 to 30 hours of work. In this module manual, 27 hours of work are assumed per credit.

Core Modules

Module	ECTS credit points
Microbiological and Physicochemical Stabilization of Wines from Dry Regions	6
Viticulture. Practices	5
Wine Technology in Wines from Dry Mediterranean Regions	4
Plant Material	4
Marketing and Diffusion in Spanish Wine Sector	6
Vine pests and diseases in dry regions	3
Study Trip – Spanish Wines	2
Total	**30**

Module name:	**Microbiological and Physicochemical Stabilization of Wines from Dry Regions**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Universidad Politécnica de Madrid
Semester:	3rd semester
Module coordinator:	José Antonio Suárez Lepe, Prof. Ph.D (Universidad Politécnica de Madrid)
Lecturer:	Suárez Lepe, José Antonio, Prof. Ph.D; González Chamorro, Carmen, Prof. Ph.D; Morata Barrado, Antonio Prof. Ph.D; Palomero Rodríguez, Felipe Prof. Ph.D; Loira Calvar, Iris Prof. Ph.D; Bañuelos Bernabé, María Antonia Prof. Ph.D; López Díaz, Carmen Prof. Ph.D; del Fresno Florez, Juan Manuel Prof. Ph.D; Escott Pérez, Carlos Ph.D; García de Blas, Blanca Ph.D; (Universidad Politécnica de Madrid)
Language:	Spanish
Classification within the curriculum:	Module of Specialisation at Universidad Politécnica de Madrid
Teaching format:	Regular lectures, laboratory exercises during the semester
Workload:	Face to face lectures: 30 h; laboratory exercises: 45 h; Student's personal study time in the module: 105 h
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Wine microbiology, grape and wine composition, wine chemical analysis.
Targeted learning outcomes:	Students are familiar with microbiological strategies and biotechnologies to improve wine fermentation in dry regions. They possess an advanced knowledge to manage typical disequilibria in musts and wines of dry Mediterranean regions concerning acidity, alcohol content, colour, metabolic profile etc. They know the microbiological and analytical techniques to check the quality and evolution of fermentation and aging processes. The students are skilled to manage alcoholic and malolactic fermentations in dry regions. They are able to apply special maceration and extraction processes to increase quality and they possess the skills for the management of the alterations during stabilization and aging. Students are competent to evaluate biotechnological process in wineries.

	They have the capacity to take technical decisions according to analytical -results in dry regions. They are able to evaluate and to control microbiological and physicochemical alterations in Mediterranean regions
Content:	Microbiology: Yeast selection and fermentation biotechnologies to improve technical and sensorial parameters in dry regions. Non-*Saccharomyces*. Colour stabilization, pyranoanthocyanin formation, malic acid production, increase of glycerine and polysaccharides. Microbiological alterations in Mediterranean regions and strategies to manage these problems. LAB alterations, TCAs, Dekkera/Brettanomyces and ethylphenols. Advanced management of biological ageing. Over lees ageing in red and white wines, film aging. New perspectives in fermentation. New biotechnologies, use of no Saccharomyces. Microbiological analysis: Analytical management of malolactic fermentation. Techniques for yeast characterization (molecular and conventional). Analytical determination of spoilage molecules from microbial activity. Physicochemistry: Advanced physicochemical techniques to improve/control acidity/ph. Techniques to reduce alcoholic degree. Techniques to reduce sulphites addition in dry regions. Management of wines to increase self life with good aromatic profile. Instrumental analysis: Spectrophotometric determinations of phenols PDA-Spectrophotometry Enzymatic analysis Atomic Absorption Spectrophotometry GC-FID (liquid injection and purge and trap injection) GC-MS (liquid injection and SPME) LC-DAD-RI LC-ESI/MS NIRS-FT
Assessment methods and criteria	Written examination and laboratory reports
Forms of media:	Multimedia presentations and demonstrations, conventional media, videos, laboratory presentations.

Required reading:	Morata, A. Ed. Red Wine Technology. ISBN 978-0-12-814399-5, 2019 Elsevier Inc. Academic Press. https://doi.org/10.1016/C2017-0-01326-5 Morata, A. Ed. White Wine Technology. ISBN 978-0-12-823497-6, 2021 Elsevier Inc. Academic Press. https://doi.org/10.1016/C2020-0-00376-2 Morata, A., Loira, I. Eds. (2016). Grape and wine biotechnology. Intech pp: 458 ISBN 978-953-51-2693-5; Print ISBN 978-953-51-2692-8 Open Access http://dx.doi.org/10.5772/61694 Suárez Lepe, J. A., Morata, A. 2015. Levaduras para vinificación en tinto. pp 350 Ed. Antonio Madrid Vicente Ediciones, Madrid, España ISBN: 978-84-943451-9-7 SUAREZ LEPE, J. A. ; ÍNIGO LEAL, B.: Microbiología Enológica. Fundamentos de vinificación. Ed. Mundiprensa, Madrid, 2004. RIBEREAU-GAYON, P. ; GLORIES, Y. ; MAUJEAN, A. ; DUBORDIEU, D.: Handbook of Enology. Vol. 2. The Chemistry of Wine Stabilization and Treatments. Wiley, New York, 2001. RIBEREAU-GAYON, P. ; GLORIES, Y. ; MAUJEAN, A. ; DUBORDIEU, D.: Handbook of Enology. Vol. 2. The Chemistry of Wine Stabilization and Treatments. Wiley, New York, 2001. FLANZY, C.: Fundamentos Científicos y Tecnológicos. Ed AMV y Mundiprensa, Madrid, 2000. SUAREZ LEPE, J. A. ; LEVADURAS, V.:Funcionalidad y Uso en Bodega. Ed. Mundiprensa, Madrid, 1997. BOULTON, R. B. ; SINGLETON, V. L. ; BISSON, L. F. ; KUNKEE, R. E.: Principles and Practices of Winemaking. Chapman and Hall, New York, 1996.
Optional reading	SCI Journals American Journal of Enology and Viticulture. Australian J. of Grape and Wine Research. South African Journal of Enology and Viticulture. Journal International des Sciences de la Vigne et du Vin. Journal of Agricultural and Food Chemistry. Food Chemistry. International Journal of Food Microbiology. Journal of Applied Microbiology.
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name	**Viticulture: Practices**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year	2nd academic year at the Universidad Politécnica de Madrid
Semester	3rd semester
Module coordinator	Pilar Baeza, Prof. Ph.D; (Universidad Politécnica de Madrid)
Lecturer	Vicente Sotés Ruiz, Prof. Ph.D; José Ramón Lissarrague García-Gutiérrez, Prof. Ph.D; Pilar Baeza, Hernández, Natalia, Ph.D; (Universidad Politécnica de Madrid) Junquera González, Pedro, PhD (GIVITI), de la Fuente Lloreda, Mario (PTV),
Language	Spanish
Classification within the curriculum	Module of Specialization at Universidad Politécnica de Madrid
Teaching format:	Master lectures, study of cases and field practices
Work load	Face to face lectures: 60 h; Student's personal study time in the module: 120 h
Credits points	6 ECTS credits
Requirements under the examination regulations	
Recommended prerequisites	Vine anatomy, Vine morphology and biology; Vine ecology; Basis on soil science; Basis on vine pests and diseases.
Targeted learning outcomes	Students can plan irrigation management for a particular yield and must composition objective and given scarce resources. They can control plant response to water availability with decisions based on plant & soil water content measurements and atmosphere demand and weather forecast. The students are familiar with the different canopy management systems suitable for different environments, cultivars and objectives. They know how to adapt and optimize the resources – climate, soil water content, soil fertility, etc.- to the objectives fixed by the winemaker or the company and they know how to establish a soil management program adapted to vineyard conditions: soil, climate, variety, rootstock and the winemaker's requirements. The students are able to find out new solutions for new situations, concerning training design and viticulture adapted to upcoming challenges: new laws, new machinery , or current demanded

	products. They are skilled to improve the efficiency of the viticulture practices. They are capable for conducting education programmes for workers and research within the industry
Content	Viticultural Practices: Quantifying vine water needs. Irrigation strategies and control/ Evaluation of the vineyard potential productivity. Pruning and trellising. Training system assessment. Canopy management Soil management.
Assessment methods	Written examination and reports on practical exercises
Forms of media	Multimedia presentations, field practices.
Required reading	COOMBE, B: G. ; DRY, P. R.:Viticulture Vol 2. Practices. Winetitles, Adelaide, 2006. INGELS, C. A. ; BUGG, R. L. ; MCGOURTY, G. T. ; CHRISTENSEN, L. P.: Cover Cropping in Vineyards: A Grower's Handbook. Winetitles, Adelaide, 1998. GLADSTONES, J.: Viticulture and Environment. Winetitles, Adelaide, 2002. JACKSON, D.: Monographs in Cool Climate Viticulture - 2. Climate. Adelaide, 2001. MULLINS, M. G. ; BOUQUET, A. ; WILLIAMS, L. E.: Biology of the grapevine. Cambridge University Press, 1992. WHITE, R. E.: Soils for Fine Wines. Oxford University Press, New York, 2003. SMART, R. ; ROBINSON, M.: Sunlight into Wine: A Handbook for Winegrape Canopy Management. Winetitles, Adelaide, 2006. BAEZA, P. ; LISSARRAGUE, P. ; SANCHEZ, P.: Fundamento y aplicación del riego en la vid. Ed. Agrícola Española, Madrid. 2007. HUGLIN, P. ; SCHNEIDER, C.: Biology and écologie de la Vigne. Payot-Lausanne, Rustica, 1998. MARTINEZ DE TODA, F.: Biologia de la vid. Mundi-Prensa, Madrid, 1991.
Optional reading	Acta Horticulture. GESCO and GiESCO Acta. American Journal of Enology and Viticulture. Australian Journal of Grape and Wine Research. HortTechnology. Irrigation Science OenoOne - IVES Rev. Suisse de Vitic. Arboric. Hortic. Spanish Journal of Agricultural Research. Scientia Horticulturae. South African Journal of Enology and Viticulture. Viticultura y Enología Profesional. Vitis

Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Wine Technology in Wines from Dry Mediterranean Regions**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Universidad Politécnica de Madrid
Semester:	3rd semester
Module coordinator:	Antonio Morata Barrado, Prof. Ph.D (Universidad Politécnica de Madrid)
Lecturer:	Antonio Morata Barrado, Prof. Ph.D; González Chamorro, Carmen, Prof. Ph.D; Palomero Rodríguez, Felipe Prof. Ph.D; Loira Calvar, Iris Prof. Ph.D; López Díaz, Carmen Prof. Ph.D; del Fresno Florez, Juan Manuel Prof. Ph.D; Escott Pérez, Carlos Ph.D; Fernando Calderón Fernández, Prof. Ph.D; (Universidad Politécnica de Madrid)
Language:	Spanish
Classification within the curriculum:	Module of Specialisation at Universidad Politécnica de Madrid
Teaching format:	Regular lectures during the semester
Workload:	Face to face lectures: 45 h Student's personal study time in the module: 75 h
Credit points:	4 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Conventional red and white wine making
Targeted learning outcomes:	Students understand the processes of wine stabilization in dry regions. They know the technology for making wines with a high alcoholic degree and low acidity and are familiar with special wines like Sherry wines, Porto and Madeira wines, Noble rot wines. The students have advanced skills in winemaking in dry regions. They are able to manage wine stabilization in dry regions. They can apply and develop strategies for quality management. The students have the capacity to improve wine quality with unbalanced grapes from dry regions. They are able to develop strategies to increase shelf life of products in warm regions.

Content:	Refrigeration engineer in warm regions: Refrigeration necessities during elaboration, stabilization and conservation; Climatization of wineries and aging cellars Special strategies for winemaking in warm regions Wine conservation: Inert gases in wine making Wine stabilization Bottling and other package systems Special wines: Sherry wines: wine technology and microbiology and biochemistry of aging; Porto wines: wine technology and aging.; Madeira wines: wine technology and ageing; Liquor wines; Spirits.
Assessment methods:	Written examination
Forms of media:	Multimedia presentations and demonstrations, conventional media, videos
Required reading:	Morata, A. Ed. Red Wine Technology. ISBN 978-0-12-814399-5, 2019 Elsevier Inc. Academic Press. https://doi.org/10.1016/C2017-0-01326-5 Morata, A. Ed. White Wine Technology. ISBN 978-0-12-823497-6, 2021 Elsevier Inc. Academic Press. https://doi.org/10.1016/C2020-0-00376-2 Morata, A., Loira, I. Eds. (2016). Grape and wine biotechnology. Intech pp: 458 ISBN 978-953-51-2693-5; Print ISBN 978-953-51-2692-8 Open Access http://dx.doi.org/10.5772/61694 BOULTOB, R. B. ; SINGLETON, V. L. ; BISON, L. ; KUNKEE, R. E.: Teoría y práctica de la elaboración del vino. Editorial Acribia, Zaragoza, 2002. FLANZY, G. M.: Enología. Fundamentos científicos y tecnológicos. Ed. AMV- Mundi-Prensa, Madrid, 2000. HIDALGO, J.: Tratado de Enología. Tomo I y II. Ed. Mundi-Prensa, Madrid, 2003. RIBEREAU-GAYON, P. ; GLORIES, Y. ; MAUJEAN, A. ; DUBOURDIEU, D.: Tratado de Enología. 1. Microbiología del vino. Vinificaciones. Editorial Hemisferio Sur- Mundi-Prensa, Buenos Aires, Madrid, 2002. RIBEREAU-GAYON, P. ; GLORIES, Y. ; MAUJEAN, A. ; DUBOURDIEU, D.: Tratado de Enología. 2. Química del vino. Estabilización y Tratamientos. Editorial Hemisferio Sur- Mundi-Prensa, Buenos Aires, Madrid, 2002. SUAREZ, J. A. ; IÑIGO, B.: Microbiología enológica. Fundamentos de vinificación. Ed. Mundi-Prensa, Madrid, 2004. ZAMORA, F.: Elaboración y crianza del vino tinto. Aspectos científicos y prácticos. AMV Ediciones, Madrid, 2003.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name	**PLANT MATERIAL**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year	2nd academic year at the Universidad Politécnica de Madrid
Semester	3rd semester
Module coordinator	Pilar Baeza PhD (Universidad Politécnica de Madrid
Lecturer	Sotés Ruiz, Vicente, Prof. Ph.D; Lissarrague García-Gutiérrez, José Ramón, Prof. Ph.D; Baeza, Pilar, Prof. Ph.D; Pedro Junquera González, PhD.; (Universidad Politécnica de Madrid), de la Fuente Lloreda, Mario (PTV),
Language	Spanish
Classification within the curriculum	Module of Specialisation at Universidad Politécnica de Madrid
Teaching format:	Master lectures, study of cases and field practices
Work load	Face to face lectures and field exercises: 40 h; Student's personal study time in the module: 100 h
Credits points	4 ECTS credits
Requirements under the examination regulations	
Recommended prerequisites	Vine anatomy, Vine morphology and biology,Vine ecology, Basis on soil science and Terroir, Basis on vine pests and diseases .
Targeted learning outcomes	Students know the methodology for the evaluation of the environmental potential on a given area for vine growing. They are able to decide on the best rootstock and cultivar performance for any potential vine growing area. They are able to evaluate the potential of new varieties in an area. Students know how to determine the soil factors affecting rootstock and vine performance, how to identify possible problems and to find out the techniques to solve them. Students know the challenges to overcome the actual problems with the new breeding cultivars
Content	Environmental characteristics of the Spanish vineyards: Vine-growing regions; cultivars and rootstocks. Legal framework in Spain and UE

	Vineyard establishment: plant material selection and how to take care and training of the young vines
Assessment methods	Written examination, reports on practical exercises
Forms of media	Multimedia presentations
Required reading	BETTIGA, L.: Wine grapes varieties in California. ANR publications, 2003. COOMBE, B. G. ; DRY, P. R.: Viticulture Vol 1.Resources. Winetitles, Adelaide, Australia, 2004. COOMBE, B. G. ; DRY, P. R.: Viticulture Vol 2. Practices. Winetitles, Adelaide, Australia, 2006. GLADSTONES. J.: Viticulture and Environment. Winetitles, Adelaide, Australia, 2002. JACKSON, D.: Monographs in Cool Climate Viticulture - 2. Climate. Adelaide, 2001. WHITE, R. E.: Soils for Fine Wines. Oxford University Press, New York, 2003. ROBINSON, J.: The Oxford Companion to wine. Oxford University Press, 2006. ROBINSON, J.: Vines, grapes and wines. Mitchell Beazley, 1986 JOHNSON, H. ; ROBINSON, J.: The world atlas of wine. Mitchell Beazley, 2007. ALBURQUERQUE, M. V. ; YUSTE, R. ; RUBIO, J. A. ; YUSTE, J.: Descripción y caracterización agronómica de 28 variedades tintas de vid en Castilla y León. ITACyL, 2006. CENTRO DE INVESTIGACIÓN Y DESARROLLO AGRARIO DE LA RIOJA: Aspectos vitícolas y enológicos de la variedad Graciano. La Rioja. Consejería de Agricultura y Alimentación de La Rioja, 1994. HUGLIN, P. ; SCHNEIDER, C.: Biology and écologie de la Vigne. Payot-Lausanne, Rustica, 1998. RUBIO, J. A. ; YUSTE, J. ; ALBURQUERQUE, M. V. ; ARRANZ, C. ; BARAJAS, E.: Clones certificados de las principales variedades tradicionales de vid en Castilla y León, ITACyL, 2008. JOHNSON, H.; ROBINSON, J.: The world atlas of wine. Mitchell Beazley, 2019.
Optional reading	Acta Horticulture. GESCO and GiESCO Acta. American Journal of Enology and Viticulture. Australian Journal of Grape and Wine Research. HortTechnology. Irrigation Science OenoOne - IVES Rev. Suisse de Vitic. Arboric. Hortic. Spanish Journal of Agricultural Research. Scientia Horticulturae.

	South African Journal of Enology and Viticulture. Viticultura y Enología Profesional. Vitis
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Marketing and Diffusion in Spanish Wine Sector**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Universidad Politécnica de Madrid
Semester:	3rd semester
Module coordinator:	Bardají Azcárate, Isabel, Prof. Ph.D;
Lecturer:	Alarcón Lorenzo, Silverio, Prof. Ph.D; Lopez-Cozar Navarro, Cristina, Prof. Ph.D; Chaya Romero, Carolina, Prof. Ph.D; Soriano, Bárbara, Prof. Ph.D; Ferrer, Juan, Prof. Ph.D; Benito, Santiago, Prof. Ph.D (Universidad Politécnica de Madrid) Reinares, Pedro, Prof. Ph.D. (Universidad Rey Juan Carlos), Del Rey, Rafael (OEMV); Muñoz, Mónica (Mercados del Vino); Vázquez, Juan (Martín Codax)
Language:	Spanish
Classification within the curriculum:	Module of Specialisation at Universidad Politécnica de Madrid
Teaching format:	Regular lectures during the semester
Workload:	Face to face lectures: 60 h Student's personal study time in the module: 120 h
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	European legislation in Wine Sector Basic Wine Economy
Targeted learning outcomes:	Students possess an advanced knowledge in wine business management. They understand the marketing strategies in wine sector. They are familiar with the markets for Spanish wines and the Wine export. Students have skills in marketing strategies of the wine sector. They are able to develop strategies for quality management. Students have the capacity to improve wine sales using suitable strategies for Spanish wines. They have the competences to participate in the management of Spanish wine business.
Content:	Wine business management: economical and financial analysis of wine business; evaluation of wine investments

	Wine marketing: commercial strategies of marketing applied to wine sector; price and promotion strategies on wine sector; Spanish wine market regulation in the frame of EU; government management of wine sector; quality management in wine sector International commercialization of Spanish wine: introduction; markets of France, Italy and Benelux; Markets of Germany, Great Britain and Nordic countries; other European markets, USA, Oceania, Asia and Africa; marketing programme to increase Spanish wines sales.
Assessment methods:	Written examination
Forms of media:	Multimedia presentations and demonstrations; conventional media; videos
Required reading:	ALONSO, R. ; IRURETAGOYENA, T.: Economía de la empresa agroalimentaria. MAPA,. Madrid, 2004. CALDENTEY, A.: El marketing agroalimentario. Mundi-Prensa, Madrid,. 1999.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Vine pests and diseases**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd Academic year at Universidad Politécnica de Madrid
Semester:	3rd semester
Module coordinator:	Agustín Garzón Hidalgo, Prof PhD. (Universidad Politécnica de Madrid)
Lecturer:	María Ángeles Ayllón Talavera, Prof. Dr; María Soledad Sacristán Benayas, Prof. Dr.; Garzón Hidalgo, Agustín, Prof. Dr.; Pilar Medina Vélez, Prof Dr (Universidad Politécnica de Madrid)
Language:	Spanish
Classification within the curriculum:	Module of Specialisation at Universidad Politécnica de Madrid
Teaching format:	Regular lectures and laboratory exercises during the semester
Workload:	Face to face lectures: 20 h; personal work: 40 h
Credit points:	2 ECTS credits
Requirements under the examination regulations:	
Recommended prerequisites:	
Targeted learning outcomes:	Students understand the biology of the major pest and diseases. They are familiar with the methods for diagnosis and identification and are skilled in identifying these pests and diseases. They know the specific management practices and possess the theoretical background of integrated pest management and they are able to apply such strategies.
Content:	Control: pest management; insects as pest; thresholds; factors regulating populations; sampling and monitoring; mechanical, physical and cultural control, chemical control, biological control, genetic manipulation of insect pests, pheromones and other insect attractants; disease management; cultural practices, disease resistant varieties, fungicides; guidelines for an integrated and organic management of major grape diseases in Spain. Pests: Orthoptera: Acrididae. Isoptera: Calotermes flavicollis and Reticulitermes spp.; Homoptera: aphids; phyloxera grape; Cicadelloidea: Empoasca spp., Scaphoideus titanus; Flatidae: Metcalfa pruinosa; Coccoidea; Thysanoptera: Frankiniella occidentalis, Drepanothris reuteri ; Coleoptera: Altica ampelophaga, Vesperus xatartii, Xylotrechus arvicola, Anobium

	punctatum, Sinoxylon sexdentatum, Byctiscus betulae, Otiorrhynchus sp.; Scarabeoidea; Elateroidea ; Lepidoptera: Sparganothis pilleriana, Lobesia botrana, Eupoecilia ambiguella Chryptoblades gnidiella; Noctuidae; Tineidae ; Diptera: Cecidomyiidae; Tephritidae; Drosophilidae; Hymenoptera: Vespidae; Acarina. Diseases**:** Major grape diseases in Spain: Powdery mildew**;** Downy mildew**;** Grey mould**;** Trunk diseases**;** Phomopsis cane and leaf spot**;** Fanleaf degeneration**;** Leafroll**;** Corky bark
Assessment methods:	Two written examinations and reports on laboratory exercises
Forms of media:	Multimedia presentations and demonstrations; conventional media; videos
Required reading:	FLAHERTY, D. L.: Grape pest management. University of California, Oakland, 1992. PEARSON, M. C.: Compendium of grape diseases. APS Press, St. Paul, Minnesota. 2009. GALET, P.: Les maladies et les parasites de la vigne. Tome II: Les parasites animaux. Paysan du Midi, Montpellier, 1982. MUNDI-PRENSA: Los parásitos de la vid. Estrategias de protección razonada. Mundi-Prensa, Madrid. 2004. DUBOS, B.: Maladies cryptogamiques de la vigne. Éditions Féret, Bordeaux, 2002. WALTER, B. ; BOUDON-PADIEU, E. ; RIDÉ, M.: Maladies à virus, bactéries et phytoplasmes de la vigne. Éditions Féret, Bordeaux, 2000.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Study Trip – Spanish Wines**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Universidad Politécnica de Madrid
Semester:	3rd semester
Module coordinator:	González Chamorro, Carmen, Prof. Ph.D;
Lecturer:	González Chamorro, Carmen, Prof. Ph.D; Lissarrague García-Gutierrez, José Ramón Prof. PhD.; Morata Barrado, Antonio, Prof. PhD.; Baeza, Pilar, Prof. PhD.; José Antonio Suárez Lepe, Prof. PhD.; Sotés Ruiz, Vicente, Prof. PhD.; del Fresno Florez, Juan Manuel, Prof. PhD.
Language:	Spanish
Classification within the curriculum:	Module of Specialisation at Universidad Politécnica de Madrid
Teaching format:	2 Study trips 1st Sherry Region (Normally 4 days) 2nd Foreign country (5days)
Workload: (Peer week)	1st Sherry Region: Normally 4 days (8 hours per day) 2nd Foreign country: 5 days (8 hours per day)
Credit points:	2 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students know the main wines of the Sherry regions and are familiar with the special characteristics of the regional oenology and viticulture. They also know the main wines of the visited regions and are familiar with the special characteristics of the oenology and viticulture of these regions.
Content:	1st Sherry Region: Visit of Vineries and Vineyards of Montilla Moriles (Córdoba). Sherry region and Puerto de Santa María (Cádiz) y SanLucar de Barrameda. The trip finishes with the visit of wineries at la Mancha. Topics are the enology, viticulture, technology, architecture and traditions of these regions. 2nd To a foreign country: Typical options are Italy (Veneto, Toscana), Portugal (Porto and Alentejo) or France (Cognac-

	Bordeaux). Topics are the enology, viticulture, technology, architecture and traditions of these regions. At least wineries= will be visited. The vineyards, the the technology and the peculiarities of the winemaking in the regions will be explained to the students
Assessment methods:	The knowledge acquired during the study trip is evaluated in the exams of the modules of related subjects.
Forms of media:	Visit of Wineries
Required reading:	----------
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in	October 2023

Module name:	**Master Thesis at the Universidad Politécnica de Madrid**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Universidad Politécnica de Madrid
Semester	4th semester
Module coordinator:	General Coordination by González Chamorro, Carmen, Prof. Ph.D; Morata Barrado, Antonio, Prof. PhD.; Baeza Trujillo, Pilar, Prof. PhD.;
Supervisors:	Academic staff of the Universidad Politécnica de Madrid, the academic staff members of the EMaVE Consortium and associated partners.
Language:	English
Classification within the curriculum:	Core module
Teaching format:	The Thesis consists of the elaboration of a written report about an independent scientific work of the student and a defense.
Workload:	24 weeks for the elaboration of the thesis; plus adequate time (at least 2 weeks) for personal preparation for the defence.
Credit points:	30 ECTS credits
Requirements under the examination regulations:	Admission to the thesis is granted if the student has - successfully completed the modules of the first academic year Admission to the defence is granted under the condition that: - the written report was evaluated at least with the grade "E - pass"; - the student has completed all other compulsory modules of the second academic year successfully and obtained at least 120 ECTS credits (including the ECTS credits allocated to the Master Thesis)
Recommended prerequisites:	----------
Targeted learning outcomes:	The student is able to carry out scientific research independently in a given time implementing adequate scientific methods. In addition the student is able to present his/her results to a jury and answers questions related to the field of research.
Content:	Thesis document

Exam achievements:	Delivery of a written thesis report at the submission date. The written report has to be prepared under consideration of the formal requirements of the Universidad Politécnica de Madrid. Thesis defence in front of an examination jury of at least 3 academic members according to no 13.2 of the Study and Examination Regulations of the Vinifera EuroMaster degree programme.
Forms of media:	Research methods depending on the topic of the thesis. Written report; presentation media for the defence
Required reading:	Books and scientific papers related to the topic of the thesis. The Required reading research is part of the Master Thesis
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Modules offered by the

Consorzio tra le Università di Torino, Milano, Palermo, Foggia e Sassari

UNIVERSITÀ
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Students of the Vinifera EuroMaster degree programme have to attend the following modules in the second academic year (M2), choosing among one or more of the 5 Universities of Consortium:

- Modules of an equivalent of — 30 ECTS credits
  - Modules within a list — 20 ECTS credits
  - Free choice modules — 10 ECTS credits
- Vineyard and / or Winery Stage — 5 ECTS credits
- Master Thesis — 25 ECTS credits

The ECTS user's guide indicates that one credit corresponds to 25 total hours of which 8 hours of lessons and 17 of personal study. In this module manual, 8 hours of lectures are assumed per credit.

Module	Location	ECTS credits
Enography	Asti	5
Fermentation microbiota and territorial characterization	Asti	5
Packaging in the wine industry: performance, safety and sustainability	Milan	5
Microbial biotechnology in oenology	Milan	5
Foods and beverages in the balanced diet	Milan	5
Oenological technologies for Mediterranean warm and arid zones	Palermo	5
Agri-food technologies	Palermo	5
Microbial biotechnology	Sassari	5
Physical and chemical analyses of foods	Sassari	5
Grapevine ecophysiology	Alba/Asti	5
Vineyard management, environment and ripening	Alba/Asti	5
Secondary metabolites in grapevine	Alba/Asti	5
Sustainable viticulture	Milan	5
Vineyard management in Mediterranean warm and arid area	Palermo	5
Studies on vineyard environments	Sassari	5
Viticultural pedology	Asti	5
Mechanic for precision viticulture	Asti	5
Advanced machinery and plant engineering in viticulture and enology	Milan	5
Sensory and consumer science for the wine industry	Milan	5
Soil management in warm-arid environments	Palermo	5
Insights into grapevine pathology	Sassari	5
Basic of remote sensing of agriculture	Asti	5
Climate change and mitigation strategies in viticulture	Asti	5
Diverse wines: Marketing threats and opportunities	Asti	5
Production of special wines	Asti	5
Wine starter microbiology	Foggia	5
Viticolture and enology policy	Foggia	5
Vineyard mite control	Foggia	5
Physiology and quality of grapevine production in warm and dry climate	Foggia	5
Sustainable management of fungal diseaqses of grapevine	Milan	5
Applied agrometeorology in a changing climate	Milan	5
Marketing strategies to improve Sicilian wines	Palermo	5

Module	Location	ECTS credits
Tablegrape protected cultivation	Foggia	5
Tablegrape processing	Foggia	5
Plant protection	Palermo	5
Tablegrape innovation	Palermo	5
Economics of food safety and nutrition	Foggia	5
Tablegrape soiless cultivation	Palermo	5
Plant growth regulator	Palermo	5
Winery/Wineyard stage		5
Master Thesis		25

Free elective Modules

Modules covering the free elective 10 ECTS have to be chosen from other programs of the Universities of Torino, Milano, Palermo, Foggia and Sassari.

Module name:	**Enography**
Module code	INT0613
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof.ssa Maria Alessandra Paissoni, University of Turin
Lecturers:	Prof.ssa Maria Alessandra Paissoni, University of Turin
Language:	English
Location	Asti
Teaching format:	Lectures will include in-class theory lessons and practical lessons in the sensory analysis lab located in Asti
Workload:	40 hours (including sensory analysis and visits to wineries) 40 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	**Knowledge and understanding**: ▪ to describe the wine diversity; ▪ to evaluate the weight of variety, geographical origin, and technology on the sensory expression of wines. **Ability to apply knowledge and understanding**: ▪ to interpret the analytical parameters of wines; ▪ to research scientific information on the geographical origin, ampelographic and agronomic characteristics of the grape varieties used and on the wine styles proposed. **Autonomy of judgment:** to propose suitable strategies for the production of wines that meet consumers demand, while respecting environmental conditions and legislative, historical, and cultural heritage of the production area. **Communication skills**: to use an international language to describe the compositional, sensory, and territorial characteristics of wines. **Learning skills:** ▪ to obtain scientific information from databases of interest to the wine and viticultural sector; ▪ to integrate them to the previous acquired knowledge; ▪ Proceed autonomously to continuous updating.
Content:	In the theorical part of each class, recalls of enology, enological chemistry, and microbiology, necessary will be made for the understanding of the subjects treated, e.g. characteristics of different

	winegrape varieties at local, national, international levels with focus on their designation specification and production technologies. The fundamental scientific contributions useful for the knowledge of the studied wines will be described. The main topics will be: ▪ White wines from international varieties: Chardonnay, Sauvignon blanc, Riesling; ▪ White wines from local and national varieties: Arneis, Cortese, Erbaluce, Timorasso; ▪ Red wines from international varieties: Cabernet sauvignon, Merlot, Pinot nero, Malbec, Syrah; ▪ Red wines from local and national varieties: Barbera, Dolcetto, Nebbiolo, Aglianico, Sangiovese, Grignolino, Freisa, Nero d'Avola. Sensory analysis of different types of wine from the same varieties will be proposed, when possible produced in different countries of the world, highlighting the characters that distinguish them and describing their composition, also with the help of bibliographic and experimental data. Group work (3-4 students) concerning a bibliographic research will be done based on keywords selected with the teacher. She will help the students in the information retrieval, and organization and interpretation of results. The group presentation will be presented at the end of teaching, and discussed in class.
Assessment methods and criteria:	The exam is divided in two parts: 1. Written exam: it consists in 30 multiple choice questions on the class program, of the value of 1 point each. The written exam will last 60 minutes. 2. After the written exam: each student will be individually evaluated on the ability of information retrieval, organization, exposition, and discussion with regards to the group work presentation (maximum 30 points). The student is admitted at the oral exam with a minimum points from written exam of 18/30. The final evaluation is done as mean of the points of oral and written exams and is expressed a grade out of 30.
Forms of media:	Slides, videos
Required reading:	The access to data base available through University of Turin subscription is recommended. These text books and sources are reccomanded for consultation: Which Winegrape Varieties are Grown Where? (2020) Kim Anderson & Signe Nelgen. University of Adelaide Press, Adelaide, Australia ISBN 978-1925261868 Available at: https://economics.adelaide.edu.au/wine-economics/ua/media/27/winegrapes-revised-ebook-0920.pdf Italian PDO/varieties database:http://catalogoviti.politicheagricole.it/catalogo.php OIV technical reports, database, and focus: https://www.oiv.int/what-we-do/statistics
Optional reading	**Titolo:** The World Atlas of Wine, 8th Edition **Anno pubblicazione:** 2019 **Editore:** Mitchell Beazley, London, UK **Autore:** Hugh Johnson & Jancis Robinson

	ISBN 978-1784726188
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Fermentation microbiota and territorial characterization**
Module code	SAF0172
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Kalliopi Rantsiou, University of Turin
Lecturers:	Prof. Kalliopi Rantsiou, University of Turin
Language:	English
Location:	Asti
Teaching format:	Lectures and practical sessions in the laboratory
Workload:	40 hours of lectures and laboratory sessions
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	Biology, Microbiology
Targeted learning outcomes:	The student will comprehend the importance of the microbial factor in the wine fermentations. More specifically the *expected learning outcomes* are: **-- Knowledge and understanding:** At the end of the class the student will be able to: - describe the role of wine related microorganisms: - explain the contribution, through metabolism and interaction with the substrate, of the main fermentative microorganisms, on the quality of the final product. **-- Applying knowledge and understanding:** At the end of the class, the student should be able to: - interpret the role of microorganisms in wine making; - use the information obtained from a microbiological analysis to guide the alcoholic and malolactic fermentations; - apply an experimental plan for the development of autoctonous starter cultures **-- Autonomy of judgment:** At the end of the class, the student should know how to: -chose the appropriate approach/method to detect/study wine related microorganism - interpret the results of a microbiological analysis - interprete the dynamics of microbial populations during wine production - Intervene to guide the fermentation(s) and obtain products with desired characteristics **- Communicative Skills:** At the end of the class, the student should: - be capable of using correct terminology as it relates to wine microbiology

	- comunicate in a detailed manner the microbial ecology of vineyard and winery environments as well as the population dynamics during wine making *Furthermore, the student should be able to conduct a microbiological analysis of a wine related sample, employing also molecular methods.*
Content:	**The class is organized in lecture sessions (24 hours) and laboratory sessions (16 hours).** The main subjects of the lectures are the following: - Introduction and main microbial groups of interest in wine production (4 hours) - Microbial dynamics and transformations during wine making (4) - Autochthonous microbiota for wine production and starter culture application in wine production: advantages and disadvantages (4 hours) - non-Saccharomyces yeasts and their application in wine (4 hours) - Molecular methods applied in wine microbiology (4 hours) - Malolactic fermentation (4 hours) The activities in the laboratory are the following: - Microbiological analysis of wine related matrices (4 hours) - Viable count and DNA extraction from isolates and must (4 hours) - Agarose gel electrophoresis (4 hours) - DGGE method (4 hours)
Assessment methods and criteria:	Discussion sections are foreseen throuthout the course in order to evaluate the students' understanding. Furthermore, during the lab classes time is dedicated for verifying students' understanding through questions (and further discussion) on subjects presented during the lectures. The final exam is oral in which the student will be asked to answer to at least 3 questions on the program of the class. The result of a positive evaluation will be expressed on a scale from 18 to 30. The number of questions can also be lower than 3 if the student does not demontrate a proper preparation on the subjects described during the classes and lab classes. The exam will be held live.
Forms of media:	
Required reading:	Class notes available on the moodle webpage of the class.
Optional reading	**Titolo:** Principles and Practices of Winemaking **Anno pubblicazione:** 1999 **Editore:** Boulton, Singleton, Bisson, Kunkee **Autore:** Boulton, Singleton, Bisson, Kunkee **ISBN** 978-083421270
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Packaging in the wine industry: performance, safety and sustainability**
Module code	SAF0042
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Stefano Farris, University of Milan
Lecturers:	Prof. Stefano Farris, University of Milan
Language:	English
Location:	Milan
Teaching format:	Frontal lectures with multimedial slides
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	To have knowledge of the basic concepts of inorganic chemistry, organic chemistry and physics
Targeted learning outcomes:	At the end of the class, students will be asked to be acquainted with most important and representative packaging materials. They should demonstrate the ability to distinguish different materials based on the most relevant functional properties. Moreover, students should exhibit full competence about fundamental concepts linked to phenomena such as permeation, migration, compostability, biodegradability, etc. Students will be encouraged to develop an adequate criticism enabling them to perform a careful assessment of the environmental, economic, and social impact of any packaging system they will deal with, based on the topics covered within the course. In detail: **Knowledge and learning skills** At the end of the course, students will be able to: - know the most important packaging materials for the wine sector; - describe the main characteristics of packaging materials for the wine sector; - describe the main analysis of characterization of packaging materials for the wine sector. **Ability to use knowledge and learning skills** At the end of the course, students will be able to: - recognize the most important packaging materials for the wine sector; - explain the different behavior of packaging materials depending on the application; - select the most suitable material for a shelf life extension goal. **Critical and interpretative skills / autonomy of judgment**

	At the end of the course, students will be able to: - provide accurate interpretation of the analyses of characterization of packaging materials; - evaluate adequately a technical data sheet of packaging materials; - manage the selection process and control of packaging materials. **Communication skills** At the end of the course, students will be able to: - use an adequate technical language within the wine packaging sector; - communicate adequately the most relevant aspects related to the characterization and selection processes of packaging materials.
Content:	Different topics will be covered within the class, such as: ▪ Food packaging functions ▪ Chemical properties ▪ Physical properties ▪ Most important materials for the packaging of wine ▪ Packaging technologies in the wine industry ▪ Food Contact Materials (FCM) ▪ "Active" and "Intelligent" packaging ▪ Packagign design - shelf life extension and sustainability ▪ Main packaging innovations in the wine world
Assessment methods and criteria:	At the end of the class, students must take an oral interview. The main goal of the exam will be to evaluate the student's ability to integrate properly the knowledge gained and to suggest potential solutions to case studies. The final grade will be expressed in /30^{ths}. Final exams will be held live, unless otherwise indicated.
Forms of media:	Multimedial slides and scientific papers (hardcopies)
Required reading:	- Robertson, G. Food Packaging - Principles and Practice. CRC Press: Boca Raton, Florida, 2013. ISBN 9781439862414 - Lee, D. S.; Yam, K. L.; Piergiovanni, L. *Food Packaging Science and Technology.* CRC Press: Boca Raton, Florida, 2008. ISBN 9780824727796 Scientific papers suggested by the lecturer and the slides of the classes will be loaded on the platform Moodle.
Optional reading	Food Packaging - Principles and Practice 2013 CRC Press G. Robertson **ISBN** 978143986241
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Microbial biotechnology in oenology**
Module code	SAF0043
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof.ssa Ileana Vigentini, Univerity of Milan
Lecturers:	Prof.ssa Ileana Vigentini, Univerity of Milan
Language:	English
Location:	Milan
Teaching format:	Teaching is provided through frontal lessons and a laboratory class.
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	Notions acquired during the course in Wine Microbiology (Yeast biodiversity/yeast metabolism/selection of starter cultures) are considered useful
Targeted learning outcomes:	At the end of the course, the student will acquire basic and advanced knowledge regarding genetics and molecular biology of wine microorganisms. In general, the expected learning outcomes will include: i) identification and typing of microbial species associated with wine environment; ii) recombinant DNA technology; iii) GMM in oenology. The student will be able to provide advice/solutions for the implementation of molecular techniques useful for the identification and typing of microorganisms. The student will improve her/his judgment thanks to the participation to practical lessons focusing on key points in wine transformation (inoculum/starter strains, monitoring of fermentation/identification and characterization of the dominant strains, wine spoilage/identification of spoilage microorganisms).
Content:	Lessons Yeast and Lactic Acid Bacteria (LABs) Systematics, Phylogenesis of the microorganisms with oenological interest, Genetics of S. cerevisiae, Genetics of O. oeni, Dynamic of Yeast and LABs Populations during must/wine fermentation, Non-Saccharomyces wine yeasts, Biomolecular Analysis of the microorganisms with oenological interest: Nucleic acids extraction from oenological substrates, DNA sequencing (Sanger, Pyrosequencing and NGS approaches), Molecular tools for the yeasts and LABs identification, Molecular tools for the typing of yeasts and LABs, Metagenomic analysis, Microbial Biotechnology, Recombinant DNA technology, Wine Biotechnology, The CRISPR/Cas9 system Laboratory classes Yeast isolation from musts, Extraction and purification of DNA, PCR of the ribosomal regions ITS and electrophoretic separation of the PCR products on agarose gel, Typing of the S. cerevisiae species, Deletion of the CAN1 gene in S. cerevisiae by the CRISPR/Cas9 approach: S. cerevisiae

	transformation and selection of recombinant strains on canavanine by replica plating.
Assessment methods and criteria:	The exam is oral and carried out through a presentation in the form of a Journal Club. In particular, the student will be asked to prepare a power point presentation based on an advanced and international scientific publication, chosen together with the teacher. At the end of the presentation, the student is asked to answer open questions on the topics presented and discussed during the course and contained within the program. Evaluation parameters: demonstration of knowledge acquisition; ability to discursively organize knowledge; correct use of the specialized vocabulary. Evaluation: the vote will be expressed out of thirty.
Forms of media:	
Required reading:	Teaching material distributed by the teacher
Optional reading	Microbiologia della vite e del vino 2022 Casa Editrice Ambrosiana Romano P., Ciani M., Cocolin L. **ISBN** 978-88-08-89978-1 Chapters 5,17,21 Biology of Microorganisms on Grape, in Must and in Wine 2009 Springer Helmut Konig, Gottfried Unden, Jurgen Frohlich **ISBN** 978-3-540-85505-7 chapters1,3,19,20, 23,24
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Foods and beverages in the balanced diet**
Module code	SAF0044
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Patrizia Riso, University of Milan
Lecturers:	Prof. Patrizia Riso, University of Milan
Language:	English
Location:	Milan
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	basic knowledge of biochemistry
Targeted learning outcomes:	The learning path will allow the acquisition of information relating to basic nutritional aspects and applied to the characterization of foods and alcoholic and non-alcoholic beverages in the context of a balanced diet. It will also allow the development of a critical analysis that takes into consideration the consumption scenarios and exposure to risk factors related to the diet in the overall population and in specific consumer groups, as addressed during the course. **Knowledge and learning skills** At the end of the teaching, the student will have acquired basic knowledge on: - body composition and physiology of the digestive system; - characteristics and functions of nutritional principles (proteins, lipids, carbohydrates, fiber, minerals and vitamins), ethanol, bioactive compounds and their role on the state of health; - energy needs and nutritional needs of healthy individuals; - composition of nutrients and substances of nutritional interest in foods and beverages and their use in different food models; - guidelines and legislative instruments regarding nutrition and health claims for food products. **Ability to use knowledge and learning skills** At the end of the teaching the student will be able to: - independently find and use the main food composition databases - identify the potential physio-metabolic impact of drinking beverages with different composition characteristics; - critically read the information on the labels and the results of scientific or popular publications **Critical and interpretative skills / autonomy of judgment**

	At the end of the teaching, the student must know: - recognize the nutrient composition of foods and drinks; - make judgments on the nutritional quality of the main beverages even in the context of a balanced diet. - use the knowledge learned in order to integrate it with that of the other teachings to develop approaches that allow to preserve and / or optimize the nutritional characteristics of drinks **Communication skills** At the end of the teaching, the student should: - express the concepts of the nutritional area with appropriate terminology; - critically discuss the nutritional characteristics of the foods and beverages analyzed and their possible impact on the consumer
Content:	The program of the teaching involves different interrelated themes such as: - Lifestyle, dietary habits and nutritional and health issues in industrialized countries -Body composition and energy metabolism (basal metabolic rate, diet induced thermogenesis and exercise associated thermogenesis) -Fundamentals of anatomy and physiology of the digestive tract (mouth, stomach, small intestine and large intestine), pancreas and liver and the mechanisms of digestion and absorption -Dietary reference intakes for energy and nutrients -Characteristics and role of macro- and micro-nutrients (proteins, lipids, carbohydrates, vitamins and minerals) -Physical and chemical characteristics of fiber and implications for its nutritional role -Absorption and metabolism of ethanol -Dietary bioactive compounds and related functional effects -Nutritional quality of foods and beverages including alcoholic beverages -Definition and characteristics of the main dietary patterns -Functional foods and novel foods in the European Union. Definitions and role in a balanced diet
Assessment methods and criteria:	Attendance is recommended but optional; the final exam will be the same for all students. The final exam will consist of a multiple choice quiz with 2 open questions that allow to verify the acquisition of knowledge and the ability to critically discuss some of the topics addressed in the lectures. The test will last a maximum of 2 hours. The final grade will be expressed out of thirty. Final exams should be taken in person unless otherwise specified. To take the exam it is necessary to be registered within the deadline to CampusNet (UNITO) and Sifa (UNIMI).
Forms of media:	Slides, internet
Required reading:	The material for the course (slides and other literature) is provided by the teacher on the ariel website.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	For any further in-depth analysis the following texts are recommended: ▪ Tortora G. J., Derrickson B. (2011) Principi di Anatomia e Fisiologia. Casa Editrice Ambrosiana, Milano. ▪ Arienti G. (2015) Le basi molecolari della nutrizione. Piccin Editore

	▪ Paolo Cabras, Aldo Martelli (2004) Chimica degli alimenti. Piccin Editore ▪ Wardlaw G, Smith A. M. (2006) Contemporary Nutrition Sixth Edition. Mc Graw Hill.
Last updated in:	October 2023

Module name:	**Oenological technologies for Mediterranean warm and arid zones**
Module code	INT0614
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	To be assigned
Lecturers:	To be assigned
Language:	Italian/English
Location:	Palermo
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	The course aims to provide scientific knowledge for planning and management wine-making process relative grapes grown in hot-arid areas. It is proposed to train expertise for the study of relationships between raw materials composition, technological process and finished product. The student will be able to evaluate how control of physical and chemical raw material and technological
Content:	Grape maturation evolution in hot and arid areas. Relationship between product specifications and raw material characteristics. Variability of chemical and physical characteristics of the grapes produced in hot climate. Factors affecting concentration of different constituents of the grapes grown in hot climate. Balance composition problems of grapes grown in warm countries. The date of grape harvest. Technological problems winemaking in hot areas. Effect of high temperatures at harvest time. Harvesting at night, the use of carbon dioxide ice. Correction of the must during winemaking in hot countries. Use of reverse osmosis technique on musts of hot countries. Sulfur dioxide in winemaking hot-arid areas. The refrigeration of the must. Plants continuous refrigeration during fermentation. Mass and energy balance. Preparation of red wines in hot countries. Prefermentantive treatments. Role of oxygen. Redox potential. Management of fermentation process and maceration in hot-arid areas. Special maceration technique. Conventional and innovative fermentation tank used in hot countries. Vinification of sweet aromatic white wine grape. Wine stabilization in hot countries by cold and electrodialysis treatment.
Assessment methods and criteria:	Oral examination
Forms of media:	Video projection

Required reading:	Ribereau-Gayon et al. 2007. Trattato di Enologia. Voll. 1 e 2. Il Sole 24 Ore Edagricole (Milano). Nardin G. et al 2006. Impiantistica enologica Edizioni Edagricole (Bologna). Articles in the scientific literature provided during the lessons. Lecture notes and materials provided by the teacher.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Agri-food technologies**
Module code	INT0734
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Diego Planeta, University of Palermo
Lecturers:	Prof. Diego Planeta, University of Palermo
Language:	Italian/English
Location:	Palermo
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	Knowledge and understanding Knowledge and ability to use the specific language of the machines and systems and production processes of the agri-food industries. Acquisition of fundamental technical-scientific knowledge on the production processes of agro-industrial products, as well as on the chemical-physical and compositional characteristics of treated foods. Autonomy of judgement Acquire the ability to find data and identify survey methodologies to define solutions to the technical problems that emerge in the agri-food sector. Acquire the ability to critically evaluate the implications and results of planned interventions. Identify the problems and related solutions for improving efficiency in the agri-food industries. Be able to evaluate the problems of choice, installation and operating costs, reliability, operational safety and layout of machines and systems in the agri-food industries. Communication skills Ability to translate one's own technical-scientific language into a popular language and, therefore, to communicate with technicians of equal and different backgrounds, to illustrate the technical-functional characteristics of the machines and their methods of use, in order to improve their efficiency and work capacity. Effectively communicate your theses and choices to a non-specialist audience, conveying the importance of the proposed planning choices. Ability to translate one's choices into project documents.

	Ability to explain the types, characteristics, main components, operation, performance and management of machines and systems in the agri-food industries, as well as the basic principles of analysis and choice of the same, even to a non-expert audience.
Content:	Presentation of teaching and objectives, unit operations. Classification and purposes of unit operations. Raw materials and preliminary operations. Cleaning, Calibration, Sorting, Size reduction Mixing, emulsifying and forming. Theory of mixing solids and liquids, The most common emulsions in the food sector Separation and concentration. Grinding, Filtration, Reverse Osmosis, Ultrafiltration Centrifugation, Distillation, Solvent Extraction. Heat transport. Processes by application of heat. Pasteurization, Sterilization, Evaporation, Drying, Blanching, Cooking, Frying, Defrosting Processes by heat removal. Freeze-drying, Refrigeration, Freezing, Freezing Agri-food sustainability: novel foods, notes on food additives. Plants and processes for the transformation of vegetable drinks; Composition of milk. Dairy production technology. Cheese classification. Fermented milk. Vegetable drinks. Plants and processes for the transformation of products of vegetal origin, wine; Qualitative characteristics of grapes, white, red, rosé transformation processes and refermentation. Vinegar: Types of vinegar; production of industrial vinegar and balsamic vinegar, ABTM&RE. Grape drying techniques and production of dessert wines. Soleras. Special wines. Mutilated wines. Role of sulfur dioxide. Refinement. Diseases, defects and alterations of wines. Transformation processes in the soft drinks supply chain: General information and classification of soft drinks. Characteristics and composition of juices and semi-finished products. Product types. Plants and processes for the transformation of products of plant origin: continuous and discontinuous distillation and main distilled products, brandy, cognac, rum, vodka, cachaca, whiskey, scotch, gin, tequila. Plants and processes for the transformation of products of plant origin: beer: Production processes in brewing, malting. EXERCISES Case studies of international scientific works TECHNICAL VISITS Technical visit OTHER Seminars regarding the agri-food panorama
Assessment methods and criteria:	Oral exam grade expressed out of thirty through verification of learning ability through participation in technical and scientific seminars and/or consultation of scientific publications specific to these specialist disciplines. Ability to follow, using the knowledge acquired in the two modules, in-depth courses and specialist seminars. Ability to understand newly acquired tools developed in research areas.
Forms of media:	
Required reading:	Lecture notes; Zanoni Bruno, 2011, Tecnologia Alimentare, Libreriauniversitaria; Pompei C., 2009, Operazioni Unitarie della tecnologia alimentare, Casa Editrice Ambrosiana; Cappelli P. e Vannucchi V., Chimica degli Alimenti. Zanichelli.
Optional reading	

Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Microbial biotechnology**
Module code	INT0618
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Ilaria Maria MANNAZZU, University of Sassari
Lecturers:	Prof. Ilaria Maria MANNAZZU, University of Sassari
Language:	Italian/English
Location:	Sassari
Teaching format:	Traditional
Workload:	125 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	The student will master the most recent developments of microbial biotechnology for the production of sustainable, low input and organic wines More specifically the *expected learning outcomes* are **Knowledge and understanding** At the end of the class the student will be able to: ▪ recognize the potential of wild and genetically modified microorganisms for the achievement of specific oenological objectives ▪ weigh the impact of microorganisms and their metabolites on the quality and sustainability of production **- Ability to apply knowledge and understanding** At the end of the class the student will be able to: ▪ utilize microorganisms for the achievement of specific oenological objectives related to wine quality and sustainability ▪ propose innovative procedures aimed at improving the management of the fermentative process **Autonomy of judgment** At the end of the class the student will be able to: ▪ individuate the correct microbiological approach to achieve specific objectives ▪ evaluate the factors on which to act for the management of sustainable and low-input fermentation processes **Communicative Skills** At the end of the class the student will be able to:

	▪ master the specialist language of microbial biotechnology ▪ correctly communicate the most recent advances in the field of production sustainability, low-impact and organic production
Content:	**Introduction.** Microorganisms as a tool to increase sustainability in the wine industry. Hybrids, genetically modified microorganisms and multistarter cultures in winemaking for the achievement of specific oenological objectives (biocontrol of spoilage microorganisms; ethanol reduction; biological acidification of wine; improvement of sensorial properties among which aroma, taste, colour; reduction of sulfur dioxide; reduction of toxic compounds among which biogenic amines and mycotoxins. Organic wines fermentation. Microbial metabolites in winemaking. Enzymes. Killer toxins. Simultaneous inoculation of yeast and lactic bacteria.
Assessment methods and criteria:	Discussion sections are foreseen throughout the course in order to evaluate the students learning. The final exam is oral. The student will be asked to answer to at least three questions on the topics treated in class. The result of the exam will be scored out of a maximum of thirty points. The exam will be held live or via webex (at distance), based on the guidilines of the University, concerning the covid emergency.
Forms of media:	The teaching consists of lectures and seminars. Lectures are based on the utilization of scientific papers and power point presentations that are available to the students. Students are encouraged to search for bibliography about the topics discussed (Peer-education).
Required reading:	The teacher will provide publications related to the topics covered and other useful material
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Yeasts in the production of wine 2019 Springer-Verlag New York. P.Romano, M. Ciani, G. Fleet **ISBN** 978-1-4939-9782-4 Microbiologia enologica 2018 Edagricole, Bologna G. Suzzi e R. Tofalo **ISBN** 978-88-506-5557-1
Last updated in:	October 2023

Module name:	**Physical and chemical analyses of foods**
Module code	INT0619
Type of module (compulsory/optional)	
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Dr. Alessandra Del Caro, University of Sassari
Lecturers:	Dr. Alessandra Del Caro, University of Sassari
Language:	Italian/English
Location:	Sassari
Teaching format:	Traditional
Workload:	lectures and laboratory
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	At the end of teaching students must have acquired the following skills: **Knowledge and understanding skills** Acquisition of the most important methodologies of physical and sensory analysis to be applied to food and in-depth knowledge of how to process the data obtained. **Ability to apply knowledge and understanding** Ability to provide companies with solutions regarding the application of techniques of physical and sensory evaluation of products; acquire autonomy of judgment by participating personally to the problems encountered by companies in relation to the processing and storage of the product. **Communication skills** Ability to communicate and transmit what has been learned obtained through the work done by the teacher in the classroom with exercises and group work. **Learning skills** Acquisition of autonomous learning skills to achieve a high degree of autonomy that will be useful in the future both in the workplace and in future studies
Content:	Course Introduction (1h). Importance of the role of physical and sensory analysis in quality control and food process. Application of physical and sensory analysis to food quality. Sensory analysis (18h). Introduction to sensory analysis. Physiology of the sense organs. Psychophysiology of perception: perception thresholds, responses to stimuli, different sensitivities, physiological and psychological errors. sensory attributes of foods. The sensory analysis laboratory. The sensory analysis judges: selection and training. Use of measurement scales. Methods of sensory analysis: discriminant ,

	descriptive and affective tests. Preference and acceptability test. Basic and advanced statistical techniques applied to sensory analysis of food. Application and solving problems of sensory analysis in companies. Color analysis of foods (5h). The perception of color. Light and interaction with food. Color spaces: C.I.E. system, Munsell, Yxy. Instrumental measurement of color and color difference, color variation causes. Colorimetric instrumentation: tristimulus colorimetry and spectrophotometry. Food and color changes during processing and storage. Correlations between physical and sensory measurements (2h). Image analysis (Image analysis) (2h): objectives, instrumentation and application on foods. Electronic nose and electronic tongue (2h): Application on food matrices. Laboratory work (10 h) Discriminant and descriptive tests on different foods, statistical analysis of the results obtained (8 h). Colorimetric analysis on foods (2h).
Assessment methods and criteria:	The verification of the learning obtained will be carried out through an oral evaluation with a grade expressed in thirtieths. The evaluation of the oral test will take into account the following parameters: mastery of the main physical and sensory analyses; ability to perform a critical reasoning on the application of the analyses on foods; expositive ability.
Forms of media:	
Required reading:	Slides and presentations of the teacher. Kemp, Hollowood, Hort. Sensory Evaluation. A practical handbook. Wiley. Blackwell. 2009. ISBN 978-1-405-16210 J. Houtchings. Food color and appearance. 2nd Edition. 1999. Aspen. ISBN 978-1-4419-5193-9 Schanda Janos. Colorimetry. Undestanding the CIE System. 2007. Wiley. ISBN: 978-0-470-04904-4 R.S. Jackson. Wine tasting: A Professional Handbook. 2016. 3rd Edition Elsevier. Academic Press. ISBN 9780128018132
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Food texture and viscosity. Concept and measurement. 2002 Academic Press M.Bourne. **ISBN** 9780080491332 Civille and Carr. Sensory Evaluation Techniques. 2016 CRC Meilgaard **ISBN** 9781482291216
Last updated in:	October 2023

Module name:	**Grapevine ecophysiology**
Module code	INT0621
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Claudio Lovisolo, University of Turin
Lecturers:	Prof. Claudio Lovisolo, University of Turin
Language:	English
Location:	Alba
Teaching format:	Traditional
Workload:	40 Hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	The students will integrate the knowledge acquired both by following the course programme and by examining scientific literature. In this part, students will manage English language in order to understand lessons and/or look for bibliography. Applying knowledge and understanding: students will be able to 1) evaluate pros and contra of physiological mechanisms applied in grapevine; 2) hypothesize plant responses to abiotic stress. Making judgments: the students will be able to make judgments on 1) interrelationships plant physiology / crop techniques; 2) the quality of available physiological information. Communication skills: at the end of the course students will have an improved capacity of 1) understanding plant-related English vocabulary; 2) using spreadsheets to evaluate relationships among variables; 3) use databases to get scientific and technical information on plant physiology; 4) effectively communicating through written reports on selected topics.
Content:	1) General overview of the grapevine ecophysiology Water metabolism: physiological role. Concept of water potential as an energy index. 2) Measurement of water potential: in the leaf, in the shoot, pre-dawn, at mid-day. The analogy of the Ohm Law to study water fluxes in plant. The *continuum* of water flow along soil-plant-atmosphere. How to modelize hydraulic resistances in grapevine organs. Implication of cell water metabolism on grapevine water balance: osmoregulation; symplasm/apoplasm water exchange; aquaporin role.

	3) Time scaling relationships between water potential and transpiration: occurrence of water stress; occurrence of rain; diel fluctuations; seasonal fluctuations; in different water-holding soils. Plant water balance: isohydric response to water stress; anisohydric response. 4) Measurement of hydraulic conductance (in the root, in the shoot, in the leaf, in the whole plant). The evaporative flux method to estimate hydraulic resistances in grapevine organs. The high-pressure-flow-meter: principles; measurements of embolism extent; estimation of aquaporin role in controlling plant hydraulics. Root water absorption and transport: symplasm, apoplasm and cell-to-cell water pathways; hormonal control at budbreak; soil temperature and seasonal control. 5) Abscisic acid biosynthesis in root: activation by pH; influence of water stress; influence of root respiration; split-root experiments and partial root drying. Abscisic acid root-to-shoot control: implications in rootstocks; auxin/ABA interaction for root deepening and later root emergence; soil properties (clay) modulate ABA response. Water transport in rootstocks: induction of tolerance to water stress (mechanisms and genotypes related); Induction of stress avoidance (mechanisms and genotypes related); hormonal control of aquaporin activation; vigor induction and water metabolism. 6) Auxin control of vascular development. Model of auxin translocation: auxin control on apex dominance in grapevine; auxin control on tropisms in grapevine. Xylem conductivity in relation to upward and downward shoot growth orientation. Water (sap) transport in the shoot: embolism formation; embolism refilling; role of aquaporins; hormonal control of aquaporin activation. 7) Transpiration: the vapor pressure deficit (VPD) as energy determinant. Atmospheric demand of transpiration. Kinetics of temperature and relative humidity. Stomatal opening and closure (physiology of guard cells). 8) Environmental control of transpiration (microclimatic influences and viticultural issues). Stomatal control (regulation during water stress and CO_2 feedbacks). VPD influence on ABA catabolism (ABA hydroxylases) Optimization of gas exchange to current environmental conditions (Speirs et al 2013 JXB, Soar et al 2006 AJGWR) VPD/ABA Involvement in controlling embolism repair (Perrone et 2012 Planta) 9) Photosynthesis; Photorespiration; Photoinhibition: measurement of chlorophyll fluorescence.

	Limitations to photosynthesis in grapevine: water stress; stomatal regulation; light deficiency; light excess; temperature. 10) Limitations to photosynthesis in grapevine: leaf ageing; in sun and shadow leaves; sink sucrose downloading (phloem); starch accumulation in leaf.
Assessment methods and criteria:	In the classroom: 3 written answers based on 3 points of the program and a oral discussion of a scientific paper.
Forms of media:	
Required reading:	All lessons and practices are recorded on MOODLE platform of 'grapevine physiology' SAF0189 Keller M. The Science of Grapevines: Anatomy and Physiology, Elsevier Academic Press, 2010. IL libro è on line https://www-sciencedirect-com.bibliopass.unito.it/book/9780128163658/the-science-of-grapevines#book-description per approfondimenti ulteriori:
Optional reading	
Other learning resources/tools (specific to the module) if applicable	for further details: Hernâni Gerós, Maria Manuela Chaves, Hipolito Medrano Gil, Serge Delrot: Grapevine in a Changing Environment: A Molecular and Ecophysiological Perspective, Wiley, 2015. Taiz, Zeiger. http://6e.plantphys.net
Last updated in:	October 2023

Module name:	**Vineyard management, environment and ripening**
Module code	SAF0045
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof.Stefania Savoi, University of Turin
Lecturers:	Prof.Stefania Savoi, University of Turin
Language:	English
Location:	Alba
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	Prior knowledge of key concepts of viticulture (Vegetative and reproductive cycles, phenological phases), vineyard management (Soil management, Canopy management), and vine physiology (Sugar distribution, Water uptake and transport, Physiological and molecular control of berry growth and development).
Targeted learning outcomes:	The course intends to integrate the student's master's education with concepts and tools useful for managing a vineyard and its fruits by deepening interactions between environment variables and crop needs. Knowledge and understanding. The student will learn the main relationships among the environmental variables, the vineyard management, and the wine grape ripening. Making judgments. The student will be able to (i) handle complex problems inherent in the management of the grape production process and the outcomes of cultivation choices; (ii) make appropriate corrections to processes once critical issues have been identified; (iii) make technical judgments even based on limited information; (iv) evaluate the authority of available sources. Communication skills. The student can communicate, with the technical language used by the scientific community, problems related to vineyard management in different environmental contexts.
Content:	The course lessons will encompass (i) introduction and grapevine terroir; (ii) the establishment of a new vineyard; (iii) the role of cover crops in vineyards; (iv) development and ripening of a berry (focus on primary metabolites); (v) molecular data on grape berry ripening; (vi) hints on organic viticulture; (vii) grapevine breeding.

Assessment methods and criteria:	The examination will consist of an oral interview to test the knowledge acquired. The interview will consist of three main questions. The mark is expressed in thirtieths.
Forms of media:	The course consists of interactive lectures with an approach to a semi-flipped classroom
Required reading:	Bibliographic texts consisting of scientific articles and reviews will be directly provided by the teacher. All the material will be available on the Moodle platform.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	The Science of Grapevines 2020 Elsevier, Academic press Markus Keller **ISBN** 9780128167021
Last updated in:	October 2023

Module name:	**Secondary metabolites in grapevine**
Module code	SAF0048
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Alessandra Ferrandino, University of Turin
Lecturers:	Prof. Alessandra Ferrandino University of Turin
Language:	English
Location:	Alba
Teaching format:	Traditional (+ visit to an organic viticulturist, if possible)
Workload:	40 hours in class
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	**Knowledge and understanding** Students will acquire knowledge about secondary metabolites in grapevine and about their interaction with the environment, studying their biological and ecological roles, beside the well-known (and already acquired) technological role in winemaking. Students will learn the grapevine biology with a specific focus on the effects exerted by secondary metabolites on berry quality and on plant defense mechanisms. **Applying knowledge and understanding** Students will be able to identify the effects exerted by climate and/or vineyard management changes on secondary metabolite accumulation in berries and in vegetative organs. Students will acquire skills in using secondary metabolites for chemiotaxonomy (cultivar classification), for pathogen prediction (studying their involvement in defense mechanisms) and for techonological (wine production) purposes.

	Making judgements Students will be able to critically review the hundreds of technical and scientific papers released about 'secondary metabolites in grapevine' every year. Students will learn the ability to add information in a puzzle which evolves continously. They will keep up with the numerous scientific discoveries that could be applied in future years in new viticultural contexts related to climate change effects and to sustainability requirements in viticulture. **Communication skills** The course will favour the development of an appropriate technical and scientific language, thanks to classroom interactions with the teacher and among students and thanks to the exam modality (a power point presentation followed by a discussion OR a text report in word followed by a discussion). **Learning skills** At the end of the class, students will be able to to find and understand links among the main biosynthetic pathways treated during the lessons. Students will be able to propose and discuss comparisons on the effects of different cultural/environmental viticultural systems on secondary metabolite accumulation in berries and in vegetative organs. They will be able to find and understand technical and scientifc information, autonomously.
Content:	The common thread of this course is the comprehension of the biological and ecological roles of grapevine main secondary metabolites in berries and in vegetative organs. Simultaneously, the teacher will focus on hormone mediation role and, consequently on the interactions among the main metabolic pathways (included some of the primary metabolism). Grapevine main secondary metabolites. General overview with a focus on hydroxycinnamates and stilbenoids, and on anthocyanins, flavonols, monomeric and dimeric flavan 3-ols, flavanonols and flavones (in berries and in vegetative organs, if known). Grapevine volatiles: focus on terpenes and sesquiterpenes, C6 and C9 volatiles, norisoprenoids; hints about benzene derivatives, pyrazines and thiols. Compositional differences among berry skins, pulps and seeds and vegetative organs (if known). Carotenoids: biosynthesis and accumulation in berries and in vegetative organs. Their relation with volatiles and ABA. Their role in tissue protection against (abiotic) stressors and consequences for berry quality. Secondary metabolites as a tool of chemiotaxonomy (for grapevine varieties, clones and Vitis species classification). Secondary metabolites and berry quality: grapevine ripening, a stressfull event that activates their accumulation.

	Secondary metabolites and biotic stressors (Flavescence dorée, viruses, fungi, etc...). Secondary metabolites and environment (abiotic stress): soil texture, water availability, light conditions and ozone. Hormonal (abscissic acid, salycilic acid and jasmonic acid) mediation on secondary metabolite accumulation: effects on berry quality and on grapevine-defense related responses. Secondary metabolite evaluation: summary review of traditional methods (spectrophotometry, HPLC-DAD, GC/MS). Recent methods for berry quality evaluation 1): the Stir Bar Sorptive Extraction (SBSE) technique to measure grapevine volatiles: advantages and disadvantages respect to traditional analysis. 2) measurements based on the chlorophyll fluorescence-screening method theory and practice. If possible, a seminar about the gene regulation and the application of molecular techniques in grapevine will be taught by an expret in the field).
Assessment methods and criteria:	Lessons will be interactive. This approach allows to evaluate the students' level of learning, *in itinere*. During each lesson, the teacher makes two summaries of the treated subjects. At half course, students, organized in groups: 1) will present a summary of the treated subjects. This lesson, prepared by students for the teacher and for the other students (=pairs) will not be evaluated for the definition of the final score <u>OR</u> 2) the teacher will organize a mid-term test evaluation with fixed and/or opened answers (no scores, no influence of the final score). At the end of the course, the teacher will organize a final-term evaluation with opened and multiple-answers (out of the final score), if there will be time. In presence: oral examination based on 1) a Power Point presentation of a subject chosen by students that is the starting point for a critical discussion of the studied subjects OR a word report (see after) to be sent to the teacher at least 24 hours before the exam. If oral exams in presence will not ne possible, the exam will be on line at https://unito.webex.com/meet/alessandra.ferrandino: in this case students <u>must</u> present a text report in Word (must be editable; the power point presentation is not allowed in the on-line exam) of 8/10 pages (2500/3500 words), the initial point for the oral examination. The report must be sent at least 24 hours before the exam. Scores are expressed in out of thirty. Minimum score eigtheen.
Forms of media:	Power Point presentations
Required reading:	The teacher could (not sure) share on the Moodle platform the recorded lessons (lessons of former years) for a limited time, if she will be allowed. The teacher will load the pdf of the slides

	proposed during the lessons and of the most relevant papers commented during the lectures.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	The science of Grapevines -2015 Elsevier Academic Press- Markus Keller **ISBN** 9780124199873 Grapevine in a changing environment-2016 Wiley- AA.VV. **ISBN** 9781118735985 Grapevine molecular physiology & biotechnology - 2009 Springer-Roubelakis-Angelakis K.A **ISBN** 9789048123056
Last updated in:	October 2023

Module name:	**Sustainable viticulture**
Module code	SAF0046
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Osvaldo Failla, University of Milan
Lecturers:	Prof. Osvaldo Failla, University of Milan
Language:	English
Location:	Milan
Teaching format:	Lessons and seminars
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	KNOWLEDGE AND UNDERSTANDING At the end of the course, the student must be able to: - Know the main problems related to sustainable viticulture. - Evaluate the sustainability of the viticultural models and cultivation techniques practiced in the vineyards according to different perspectives with reference to territorial and rural development - Know the possible choices to make for the development of sustainable viticulture. ABILITY TO APPLY KNOWLEDGE AND UNDERSTANDING At the end of this course the student will have to know: - Draw up a report on the sustainability of a specific wine-growing system. - To critically interpret the results of an experimental investigation aimed at assessing the sustainability of the cultivation choices in viticulture. AUTONOMY OF JUDGMENT At the end of this teaching the student will know: - Identify the most suitable crop choices for the sustainability of the viticultural models in specific environmental contexts. - Being able to evaluate the sustainability of the viticultural models and cultivation practices from a territorial and rural development point of view in relation to the specific environmental context. COMMUNICATION SKILLS At the end of the course the student will know: - Use technical language in the description of a viticultural model and its sustainability
Content:	The course intends to give a general picture of the concept of sustainability applied to viticulture and the procedures for evaluating and pursuing it, making reference above all to concrete case studies, also

	through the visit of leading wineries in the sector and significantly committed to improving their sustainability. Introduction to the course. Sustainable viticulture: definitions and practices The corporate organization for sustainability Territorial viticulture: soil and climatic resources. Precision viticulture Sustainability certification The estimation of the impacts of production processes Technical visits: case studies and discussions
Assessment methods and criteria:	Oral examination
Forms of media:	
Required reading:	Teaching and bibliographic materials delivered by the teacher to the Moodle platform
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Vineyard management in Mediterranean warm and arid area**
Module code	INT0503
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Antonino Pisciotta, University of Palermo
Lecturers:	Prof. Antonino Pisciotta, University of Palermo
Language:	Italian/English
Location:	Palermo
Teaching format:	The teaching includes 40 hours of activities divided into at front lectures unless otherwise specified, seminars, visit at vineyards and winery.
Workload:	40 hours of lectures
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	In order to understand the contents and learning objectives of the course, the student must have basic knowledge of arboriculture and general viticulture as well as agronomy
Targeted learning outcomes:	**Knowledge andunderstanding** Basics on the techniques of planting of vines and basic knowledge on canopy managementin in hot-arid climate. Acquisition of basic knowledge of thema in techniques of vineyard management in terms of fertilization, irrigation and soil management, on the rationality of farming operations depending on the objectives to be pursued. **Applying knowledgeandunderstanding** Ability to recognize and organize autonomously, the basic information for the formulation of the choices of the fundamental techniques for the planting of vineyards (analysis of environmental suitability, varietal choices and plantation systems and crop management). Ability to recognize the different viticultural problems and their implications on the management of the vineyards in the Mediterranean environment. **Making judgments** Being able to formulate general criteria for the management of the vineyard as a function of production targets and oenological set. Ability to apply the criteria of variety choice. **Communication skills** Skills and expertise in the dissemination of knowledge for the purpose of conducting a plant vineyard with reference to all the choices of appropriate techniques to obtaining productive results of excellence and economically sustainable. Ability to presentthe results and to give reasons for the choice of crops on the basis of production and quality goals. Being able to support the importance and highlight the

	repercussions both from the point of view of production and environmental **Learning ability** Ability to find sources of information on cropping systems in viticulture in hot arid environments. Knowledge of sources of information on plant material. Find information and analysis on the environmental variables using geographical information systems and service to viticulture. Ability to critical comparison between the physiological principles learned and applications in the field of management choices in viticulture. Ability to transfer the knowledge to the farmers.
Content:	The teaching is described as following: 1° CFU New vineyard plantation: Plant material selection, soil preparation, fertilization 2° CFU Trellis system, vineyard management during the vegetative growth, plant density. Development of vineyard mechanization. 3° CFU Plant water status and irrigation 4° CFU Soil management, cover crops. Vineyard fertilization and their effects on quality grapes 5° CFU Canopy management. Optimal ripeness and different harvest techniques.
Assessment methods and criteria:	Oral exam in the presence or remotely on the Webex platform unless otherwise specified.
Forms of media:	digitalized
Required reading:	During the course the teacher will be able to provide PDFs of specific technical-scientific articles. For lectures, the teacher makes use of presentations and slides available at the student's request. The support material for the students will be uploaded on the Moodle platform
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Viticoltura di Qualità 2006; Tecniche nuove Mario Fregoni; **ISBN** 8848120369 La vite ed il vino, Coltura e cultura 2007; Bayer CropScience AAVV; **ISBN** 9788890279126 Manuale di viticoltura 2018; Edagricole - New Business Media, Milano Alberto Palliotti, Stefano Poni, Oriana Silvestroni; **ISBN** 9788850655335 Progressi in Viticoltura 2016; Edises, Napoli AAVV; **ISBN** 9788879599061 La nuova viticoltura. Innovazioni tecniche per modelli produttivi efficienti e sostenibili. 2015; Edagricole - New Business Media, Milano Alberto Palliotti, Stefano Poni, Oriana Silvestroni; **ISBN** 9788850654536
Last updated in:	October 2023

Module name:	**Studies on vineyard environments**
Module code	INT0506
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second Period
Module coordinator:	Prof. Luca Mercenaro, University of Sassari
Lecturers:	Prof. Luca Mercenaro, University of Sassari
Language:	Italian/English
Location:	Sassari
Teaching format:	The lessons will be in presence. Exercises will be carried out both in the classroom, proposing discussions of case studies extracted from technical or scientific literature, and in the vineyard through visits to different winegrowing areas of Sardinia based on weather trends
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	It is strongly recommended to take classes after attending and studying the viticulture supply chain subjects
Targeted learning outcomes:	Knowledge and understanding The student will have to achieve solid scientific knowledge and good command of scientific methods concerning basic knowledge of viticultural ecology and the models and tools that permit an critical analysis of viticultural environments Ability to apply knowledge and understanding The student component should be able to plan actions characterizing and evaluating different viticultural models and the tools used to study them. Autonomy of judgment At the end of lessons student will have to be able to choose the most appropriate ways to study viticultural environments. Communication skills In the end the student will be expected to demonstrate that they have acquired correct terminology to be used within the subject matter covered by the course and inherent in the study of viticultural terroirs Learning ability Develop ways of analyzing and interpreting both scientific papers and technical articles aimed to understanding wine environments.
Content:	The responses of vine to climate, microclimate: the temperature, radiation, light interception, rain, UR and wind. The meteorological trend and its influence on annual growth. The climate during time: the carbon balance and the climate change The responses of vine to soils: the influence of the physical and chemical

	characteristics and the water regime. The genesis of soils and their influence on the quality of the wines. The bioclimatic indexes. The zoning of vines in Italy and in the world. The new tools and models for the studies of the viticulture environments. The interactions between genotype /environment and cultural practices. Viticulture and landscape: current studies methodologies. The terroir and the productive and oenological objectives.
Assessment methods and criteria:	Intermediate test based on a written examination. Oral presentation of a specific topic. Final oral exam. Scores exprressed out of thirty.
Forms of media:	Topics are presented as schemes and figures organized in form of power point presentation. Video. Critical visit of websites.
Required reading:	Scientific articles and educational material presented during the lectures. Will be referred to the following texts for parties from which to study: Proceedings of International of congress on terroir M. Fregoni, D. Schuster, A. Paoletti: 2003. Terroir zonazione viticoltura. Ed. Phytoline, Dougherty, P. H. (Ed.). (2012). *The geography of wine: Regions, terroir and techniques*. Springer Science & Business Media. ISBN: 978-94-007-0464-0
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Viticultural pedology**
Module code	INT0622
Type of module (compulsory/optional)	compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Eleonora Bonifacio, University of Turin
Lecturers:	Prof. Eleonora Bonifacio, University of Turin
Language:	English
Location:	Asti
Teaching format:	The module consists of 30 h lectures and 10 h practicals in the classroom
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	Knowledge and understanding: at the end of the course, the students will 1) know the basic principles that shape soil distribution at different scales, and understand the mechanisms through which pedogenic factors and processes influence soil properties; 2) understand the main soil classification systems; 3) know the main mechanisms affecting soil erosion in viticultural areas; 4) know in detail the role of the soil in the terroir. Applying knowledge and understanding: students will be able to 1) evaluate which kind of soils are the most likely found in a landscape; 2) hypothesize soil fertility characteristics from soil names (USDA and WRB); 3) estimate soil erosion with models in a viticultural area Making judgements: the students will be able to make judgements on: 1) soil ability to support agricultural production at different scales; 2) the quality of soils for viticultural production. Communication skills: at the end of the course students will have an improved capacity of: 1) understanding soil-related English vocabulary; 2) using spreadsheets with formulas; 3) critically evaluating information on soils from scientific papers. Learning skills: At the end of the course, the students will have the capability to integrate their knowledge autonomously, critically reviewing the available sources of information.
Content:	1. Pedology and the study of the soil as a natural body: definitions of soil, soil profile, solum and pedon; 2. Soil morphology

	a. The soil profile. How to describe and recognize soil horizons: morphological properties b. The soil profile. How to describe and recognize soil horizons: physical and chemical properties 3. Soil genesis a. Pedogenesis and factors of soil formation: Jenny's model, soil sequences and soil functions b. The soil parent material: general effect of rock type on soil, physical disgregation and chemical weathering; igneous and metamorphic rocks and their stability towards weathering, bonding energy in minerals c. Climate and soil formation: temperature and rainfall, element leaching, translocation, effects of climate on weathering, dynamics of calcium and iron and horizon formation, lessivage, examples of climosequences d. Organisms as a factor of soil formation: effects of soil biomass, effects of animals, microrganisms and plants on soil properties, with emphasis on soil organic matter pools. e. Relief as a factor of soil formation: elevation, slope and aspect, qualitative features of soil toposequences (summit, shoulder, backslope, footslope and toeslope) and relative stability f. Effect of time on soil formation: evaluation problems, pedologic and geologic time scales, age of a soil g. Relating soil type to main forming processes at the global scale 4. Soil classification a. The main soil classification systems b. The USDA Soil Taxonomy 5. Soil Erosion a. how to estimate soil erosion in viticultural areas 6. The soil and the Terroir: examples and limitations
Assessment methods and criteria:	At the end of each topic a test will be given and the results checked and discussed in the classroom. The final examination consists of a written excersise (15 minutes time), followed by an oral part. The oral part consists in the discussion of the results of the written exercise, in questions about the topics learned in the course and in a ppt presentation about the soils of a viticultural area selected by the student. The area must be communicated at least 1 week before the exam. The final result is on a 30 basis and consists of the weighted mean of the 3 parts, with a weight of 1 for the answers to the questions and the presentation, and of 0.7 for the exercise.
Forms of media:	
Required reading:	Commented slides and excersises will be available on the Moodle platform
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Basi di pedologia - 2010; Il sole24ore Edagricoloe Certini G., Ugolini F.; **ISBN** 9788850652860 Soil for fine wines - 2003; Oxford university Press White R.E.; **ISBN** 9780195141023 Fondamenti di chimica del suolo. - 2017; Patron Editore, Bologna Sequi P., Ciavatta C., Miano T. (Coordinatori); **ISBN** 9788855533621 Lecture notes on the major soils of the world - 2001 World Soil Resources Reports, n. 94, FAO. Roma. Driessen et al (Eds.) http://www.fao.org/DOCREP/003/Y1899E/y1899e00.htm
Last updated in:	October 2023

Module name:	**Mechanic for precision viticulture**
Module code	INT0623
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Marco Grella, University of Turin
Lecturers:	Prof. Marco Grella, University of Turin
Language:	English
Location:	Asti
Teaching format:	The course consists of 30 hours of frontal lectures and 10 hours of practical exercise.
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	The course will allow students to acquire notions and useful tools for the correct choice and use of the main operating machines according to the principles of precision viticulture. KNOWLEDGE AND UNDERSTANDING At the end of the course the students are expected to know: - the basic mechanical elements with particular reference to the vineyard tractor; - the basis principles of precision viticulture, its critical points and strengths, as well as the factors that can favor or limit future developments; - the different types of machineries used for precision viticulture; - the principles on which the application of plant protection products is based and the types of sprayers used for their distribution; - the in force regulations in the ambit of plant protection products spray application and the functional inspection of sprayers. APPLYING KNOWLEDGE AND UNDERSTANDING At the end of the course, students will have the ability to: - understand the operating principle of the engine and mechanical elements of the vineyard tractor for its correct choice according to the needs of the farm; - understand the operating principle of the main technologies available in the precision viticulture sector; - understand the working principle of the different types of vineyard sprayers for their correct use and setting according to the technical

	specifications of the phytosanitary treatment and in relation to the principles of environmental sustainability; - identify the most reliable technology according to the specific agricoltural practice, taking into consideration the current legislation. MAKING JUDGEMENT The competence provided by the course will allow the student to critically analyze and judge the operational choices made in the field of precision viticulture technologies. COMMUNICATION SKILLS The student will acquire technical language so that they will afterwards be able to communicate in an appropriate and precise manner, also in relation to the in foce legislation, with both staekholders and the scientific community.
Content:	- Basics of mechanics: labour, power, passive forces and transmission - Viticulture mechanization: history, development and necessity of improvement - The concept of precision viticulture - Machineries for precision viticulture and evaluation of their possible future development - Tractor: main component, technical characteristics, and parameters for a correct choice and use in a winery farm - Crop protection machineries: types and functioning principles - Spray and droplet transport system: hydraulic, pneumatic and centrifugal - Main elements and parameters responsible of liquid atomization and how to choice the correct droplets size accrding to the treatment technical specification - Machineries for crop protection in a vineyard farm: classification components, functioning, adjusting, maintenance parameters and choice criteria - Machineries for weed control: classification components, functioning, adjusting, maintenance parameters and choice criteria - Main sprayers environmental requirements to follow EU Directives on Machinery (127/2009/EC) and regarding Sustainable Use of Pesticide (128/2009/EC) - The correct disposal of remnant materials from pesticide application - Sprayers certification and inspection in Italy and in EU - Leaf stripping machines: classification components, functioning, adjusting, maintenance parameters and choice criteria
Assessment methods and criteria:	The final exam, for all the students, consists of an oral examination pertaining to the topics addressed in the last A.Y. of course and during the practical exercises. It consists ot three questions and for each one is assigned a maximum score of 10 points. To consider the test passed,

	the student must achieve a minimum score of 6/10 points per each question. The students are expected to demonstrate their general comprehension of the topics course and their ability to connect the main concepts. The final score will be expressed in thirtieths. The exam will be held in presence at DiSAFA facilities in L.go P. Braccini 2, 10095 Grugliasco (TO). The exam method could be different only if required by rectorship decrees.
Required reading:	Slides on lectures will be provided by the teacher via Moodle. Furthermore, the text of the laws, directives and additional materials (e.g. scientific papers and supplementary booklet) used during the lessons will be also provided via Moodle.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Forme di allevamento della vite e modalità di distribuzione dei fitofarmaci 2003; Edizioni l'Informatore Agrario Balsari P;.Scienza A . **ISBN** 8872201721 Meccanica e Meccanizzazione Agricola 2013; Edagricole Bodria L.; Pellizzi G.; Piccarolo P. **ISBN** 9788850654130 Effective Vineyard Spraying: A Practical Guide for Growers 2010; www.EffectiveSpraying.com Landers A. **ISBN** 9781450724234 Precision agriculture basics 2022; Acsess Shannon D. K.; Clay D. E.; Kitchen N. R. **ISBN** 9780891183662 Agricoltura di precisione 2016; Edagricole-New Business Media Casa R. (a cura di) **ISBN** 9788850655106
Last updated in:	October 2023

Module name:	**Advanced machinery and plant engineering in viticulture and enology**
Module code	SAF0047
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Domenico Pessina, University of Milan
Lecturers:	Prof. Domenico Pessina, University of Milan
Language:	English
Location:	Milan
Teaching format:	Theoretical Lesson with numerical applications
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	At the end of the course, the student will be able to: - assess the safety and the ergonomic levels of agricultural machinery used in viticulture; - organize an efficient chain regarding the machines devoted to carry out the chemical distribution in vineyards; - characterize the automation and innovation levels of machinery for the grape harvest; - describe a winery in a systemic approach; - assess the renewable energy impact for the wine industry; - organize an automated winery by applying innovative technologies.
Content:	The course is divided into two areas. **1."Mechanics and mechanization in viticulture" (2,5 CFU, 20 hours):** - Analysis of the problems relevant to the traveling and the safety of agricultural machinery used in vineyards located on slopes and of most suitable solutions for minimizing the risk in the event of an overturning, with reference to different types of tractor architecture and the relevant influence on the tractor-implement stability (narrow-track, isodiametric and crawler tractors). Aftermarket fitting and correct use of ROPS (Roll Over Protective Structures), auto-ROPS, automatic and manual self-leveling devices, etc.). - presentation of advanced techniques to increase the efficiency of chemicals distribution, in order to minimize environmental (air and soil) pollution and protecting the operators' and consumers' health. Examination of electrostatic devices, chemical recovery systems, innovative nozzle types. Relationship between the micronization degree

	of the liquid mixture and extent of coverage, choice of the most correct spraying volume and air speed; - analysis of the contamination risk of the operators devoted to the chemical distribution and proper use of the most suitable PPEs; - increase of the efficiency of the grape harvesters quality: optical sensors for automatic sorting, refrigeration and self-calibration systems. **2. "Advanced Plant for enology" (2,5 CFU, 20 hours):** - The Winery System: Analysis of production factors, the quantification of inputs and outputs. Identification of critical issues. - Renewable energies in the wine industry: heat pumps, photovoltaic systems, the use of vine pruning, geothermal probes. Description of individual technologies and design criteria. The sustainable winery. - The absorption refrigeration systems: principles thermodynamic description of the cycle, types, performance. - The waste from wine making process: rules, characterization, management, plant. - The automation in the winery: the ring of regulation, the concept of sensor and actuator. Control strategies (proportional, proportional time, etc..). Application examples in the wine-making machinery.
Assessment methods and criteria:	Two oral discussions with the various Professors
Forms of media:	
Required reading:	**-** Handouts provided by the teacher - Lecture notes
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Sensory and consumer science for the wine industry**
Module code	SAF0325
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Monica Laureati, University of Milano
Lecturers:	Prof. Monica Laureati, University of Milano
Language:	Italian/English
Location:	Milano
Teaching format:	The course will be provided as lectures (3.75 CFU), practical laboratory activities (0.25 CFU) and working groups. Lectures and labs will be held in presence at the University of Milan (Faculty of Agricultural and Food Sciences)
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	None
Recommended prerequisites:	It is recommended (not mandatory) that the students have already attended an undergraduate course in Sensory Science.
Targeted learning outcomes:	Skills related to the understanding and appropriate use of descriptive and affective sensory methods used to explore and interpret consumer perception, choice and behavior related to the wine sector. The course will address issues related to statistical data processing in order to collaborate with the business marketing division to the implement more extensive and complete market surveys in the wine sector.
Content:	The course will focus on an overview of fundamentals of sensory science then it will cover the recent advancements in consumer research to interpret consumer perception, choice and behavior. All topics will be discussed with emphasis on wine sector case studies. The detailed program is the following: 1) Fundamentals of sensory science: - the five sense and the brain: how they interact to perceive wine sensory properties; tricks the senses may play (practical exercises) - good practices in sensory and consumer science 2) Classical sensory and consumer science methods (practical exercises): - descriptive and affective methods - preference mapping 3) Physiological and psychological factors influencing the perception and

	liking of wine (e.g. genetic variation in taste and odour perception, personality traits etc) 4) New sensory and consumer science methods (practical exercises): - Projective mapping - CATA/RATA 5) Applications of sensory and consumer science methods to the wine sector (case studies on classical and innovative methodological approaches) 6) Basics of wine marketing and communication (seminars by Prof. Corsi)
Assessment methods and criteria:	The final test consists of an oral examination to verify the degree of understanding of the theorical and practical aspects presented in the course. The evaluation parameters that will be considered are the correctness of the answers, the appropriateness of the language and the ability to summarize the concept in relation to the solution of sensory problems in the wine sector. The evaluation is in thirtieths. The mark will be communicated to the student at the end of the test. There are no intermediate tests but students must carry out a working group (to be agreed with the teacher) whose evaluation will be averaged with the mark of the oral exam.
Forms of media:	
Required reading:	
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Valutazione sensoriale: Aspetti teorici, pratici e metodologici 2021 Hoepli, Milano E. Pagliarini **ISBN** 9788820399801
Last updated in:	September 2017

Module name:	**Soil management in warm-arid environments**
Module code	INT0626
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Luciano Gristina, University of Palermo
Lecturers:	Prof. Luciano Gristina, University of Palermo
Language:	Italian/English
Location:	Palermo
Teaching format:	Lectures in classroom
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	None
Recommended prerequisites:	none
Targeted learning outcomes:	The student will be able to evaluate different soil managments with regard to environmental issue and viticulture farm managment.the course of studies in viticulture and enology will therefore be completed and enriched by the following competences: **Knowledge and learning ability:** At the end of the course, the student will have acquired basic knowledge of the morpho-physiological characteristics, the crop cycle, and the ecological requirements of the Mediterranean vineyard area. **Applying knowledge and learning:** The student will be able to identify solutions to problems related to the management of vineyards in the semi-arid environment and evaluate the results and the implications of the choices made, paying particular attention to the agronomic, ecological, and health aspects. **Making judgments:** The student will be able to provide, concerning the context, business, technical, and management recommendations aimed to improve both the productive and qualitative performances of vineyards. **Communication skills:** The student will be able to utilize simple, clear, and technically correct language to ensure an effective transfer of the knowledge acquired to the farmers and other professionals in the sector. The student will be also able to support the validity of the choices made from both the productive

	and qualitative points of view and highlight the environmental implications of the proposed interventions. **Learning ability:** At the end of the course, the student will have acquired the ability to link the different factors that can influence vineyard management and production. Moreover, the student will be able to carry out an independent update by consulting scientific and technical publications.
Content:	Overview on different soil management in vineyard over the time and in various bio-climates. Soil properties in warmarid environment Tillage: Conventional tillage, soil management in the intra-row and inter-row. Tillage machines. Minimum tillage and no tillage. Weed control. Cover crop. Effect of cover crop management on soil physical, chemical and biological characteristic, soil erosion, biodiversity, nutrient availability. Description of cover crops suitable for Mediterranean environment. Cover crop management (seeding time, green manure and relating machines Soil management and environmental issues. Soil management and GHGs emission, Nitrate control, vegetative buffer strip.
Assessment methods and criteria:	The student will be evaluated through an oral exam on the subjects of the lectures and exercises. Moreover, in order to verify the ability to provide insight into a topic and the communicative abilities, it is proposed to the students the preparation of a presentation on a inherent subject. The work is presented during the oral exam and contributes to the the final vote (30/30).
Forms of media:	
Required reading:	Lecture notes
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Fregoni M. Viticultura di qualità. Ed. Tecniche nuove, 2006 ISBN: 9788848120364
Last updated in:	October 2023

Module name:	**Insights into grapevine pathology**
Module code	INT0627
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Vanda Assunta Prota, University of Sassari
Lecturers:	Prof. Vanda Assunta Prota, University of Sassari
Language:	Italian/English
Location:	Sassari
Teaching format:	The course consists of 30 hours of frontal lessons and 10 hours dedicated to laboratory and vineyard activities.
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	Knowledge and understanding The student component will have to achieve solid scientific knowledge and good command of the scientific methods concerning the ampelopathies, the pathogens involved, the diagnostic techniques for the etiological study, methods of diffusion and learn the main containment strategies thus reaching the ability to understand the problems related to the pathologies study. Ability to apply knowledge and understanding Student component must be able to rationally plan prevention and containment actions for the main grapevine pathogens, also using alternative control methods to achieve maximum effectiveness. Autonomy of judgment At the end of lessons student will have to be able to choose the most appropriate strategies for the defense of the vine from pathogens. Communication skills In the end the student will be acquire correct terminology to be used in the context of viticultural pathology and control strategies and use appropriately the scientific-technical language related Learning ability To develop the methods of analysis and understand scientific works also to have the possibility of carrying out comparative actions for the application of different means of diagnosis and controlling the sistemics pathogens of the grapevine.
Content:	General information about the grapevine sanitary status, specific information on systemic diseases (viruses and phytoplasmas diseases) and deepening in symptomatology, etiology, epidemiology and crop protection. Monitoring in the field will provide a practical idea of field

	diagnosy, latency and recovery phenomenons. Futher, students will exercise in laboratory specific and innovative diagnostic techniques in order to detect the most dangerous grapevine pathogens (phytovirus and phytoplasmas) and their vectors. Meristem tip culture aimed to recover grapevine and eradicate virus agents will be acquired. Development of a disease control plan depending on weather and fenology.
Assessment methods and criteria:	In students agreement a final oral exam will evaluate the comprehension of the main concepts of the course. The students will be evaluated according to a mark out of thirty (from between 18 and 30/30).
Forms of media:	
Required reading:	PowerPoint presentations of the main topics will be provide to students, focusing on images of the general notions of the course and of the most important disease simptoms. Patologia vegetale 2020 EdiSES Vannacci G., P.A. Bianco, Bonanomi G., Brunelli A., Gonthier P., Lorito M., Polizzi., Rossi., Sarrocco., Scortichini M. **ISBN** 978-88-3623-0419
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Elementi di Patologia vegetale 2007 Piccin Ed. G. Belli **ISBN** 9788829921294
Last updated in:	October 2023

Module name:	**Basic of remote sensing of agriculture**
Module code	SAF0331
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Enrico Corrado Borgogno Mondino, University of Turin
Lecturers:	Prof. Enrico Corrado Borgogno Mondino, University of Turin
Language:	English
Location:	Asti
Teaching format:	The module is composed of theoretical and practical lessons. The former concern basic topics of optical remote sensing and digital photogrammetry. The latter is specifically addressed to traditional image processing workflow (spectral and geometric operations) and statistical computations aimed at translating spectral information into agronomic information. Moreover free WEB resources of remotely sensed satellite data will be presented.
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	No requirement is strictly due for this module, but basics of Mathematics, Physics, Statistics, GIS and Survey (GNSS, ordinary and digital photogrammetry) are appreciated.
Targeted learning outcomes:	*Theoretical skills* Students will be given the following theoretical bases: ▪ Fundamentals of optical multispectral remote sensing ▪ Fundamentals of aerial digital photogrammetry ▪ Fundamentals of satellite positioning (GNSS) and digital cartography ▪ Basics of digital image processing ▪ Basics of statistical modeling to relate spectral measures from multispectral imagery to agronomic information. *Practical skills* According to the acquired theoretical skills students will be able to: ▪ select the proper imaging technique and/or dataset to respond to a specific agronomic requirement ▪ radiometrically and geometrically pre-process imagery to recover measures from raw data ▪ compute proper spectral indices (NDVI, EVI,SAVI,NDWI etc.) correlated to agronomic properties of crops ▪ generate and interpret generated maps (vigor or other agronomic parameters derived by modeling from spectral indices)

	▪ analyze vigor maps to derive prescription maps ▪ To process imagery from UAV: flight plan, Ground Control Points survey by GNSS, image bundle adjustment, ortho-mosaic generation, spectral index map generation. *Critical skills* Students will be able to: ▪ Propose, project and validate the proper solution to respond to a specific agronomic instance (image type selection, survey designing, ground observation sampling, etc.) *Communication skills* Students will be able to: ▪ properly interact with farmers and with eventual external service suppliers (UAV operators, surveyors, farming machinery experts, etc.) to manage the whole process from ground data through imagery to crop management operations in field (variable rate interventions).
Content:	▪ Introduction to Remote Sensing: definitions and main physical laws ▪ Surface and radiation: reflectance, transmittance, absorbance, emittance, roughness. ▪ Spectral signature of objects; ▪ Radiation and atmosphere: transmission and scattering. Radiative transfer models. ▪ The scheme of a generic multispectral sensor: multispectral imagery characteristics ▪ Satellites for Earth Observation ▪ Basics of image processing ▪ Basics of colorimetry ▪ Imagery radiometric pre-processing ▪ Image georeferencing ▪ Image classification: supervised and unsupervised classifiers; classification validation. ▪ Spectral Indices: NDVI, EVI, SAVI, NDWI. ▪ Relating spectral indices to crop features: vigour, productivity, water potential, etc. ▪ Interpreting maps. Clustering (prescription maps) and estimation (estimate of quantitative agronomic parameters from indices). ▪ Remote sensing from airplane and UAV ▪ Basics of digital photogrammetry ▪ Basics of GNSS ▪ The UAV data processing workflow: flight plan, Ground Control Points survey by GNSS, image bundle adjustment, ortho-mosaic generation
Assessment methods and criteria:	At the beginning of a new lesson students are required to discuss with professor (10 minutes) about the content of the previous lesson. In this context students are invited to answer some technical questions and proposing their own ones. Exam will be WRITTEN. It includes: a) 4 open questions scoring 5 points each; b) 5 closed questions with the following scores: 1 for correct answer, -0.5 for wrong, 0 for NOT answered; c) on numerical exercise (score = 5) concerning one of the following topics: leveling network adjustment, error propagation, simple and multiple resection, traverse survey, photogrammetric measurements. Total maximum score is 30/30.
Forms of media:	
Required reading:	[1] Computer Processing of Remotely Sensed Images. An introduction (3rd edition), P. Mather, 2006. [2] Telerilevamento: Informazione Territoriale mediante immagini da satellite, A. Dermanis, L.Biagi, Casa Editrice Ambrosiana

	[3] Basics of Geomatics, M.A. Gomarasca, Springer, 2009. 1] Computer Processing of Remotely Sensed Images. An introduction (3rd edition), P. Mather, 2006. [2] Telerilevamento: Informazione Territoriale mediante immagini da satellite, A. Dermanis, L.Biagi, Casa Editrice Ambrosiana [3] Basics of Geomatics, M.A. Gomarasca, Springer, 2009.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Climate change and mitigation strategies in viticulture**
Module code	SAF0342
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Paolo Sabbatin, Univerity of Torino
Lecturers:	Prof. Paolo Sabbatin, Univerity of Torino
Language:	English
Location:	Asti
Teaching format:	The course will develop in 40 hours of lectures, laboratories, and field trips
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	At the end of the course, the students will understand alternative agronomic practices in viticulture developed to face the current and future challenges of vineyard management in a changing climate. Students will be able to develop a deep understanding of the main viticultural issues dictated by several environmental limitation and develop a plan to face future challenges of growing grapes. **Knowledge and understanding** At the end of the course: ▪ Terminology related to the subject of climate change and viticulture to be utilized in a technical context will be acquired. ▪ Understanding of the theory and practice of vineyard management. ▪ Understanding of the complex relationships between climate, environment, and vineyard system in the context of a climate change scenario. **Ability to apply knowledge and understanding** At the end of the course: ▪ Application of knowledge to specific crop situations. ▪ Perform observations in the vineyard to identify problems related to the impact of climate change on grape production. **Autonomy of analysis** At the end of the course:

	▪ Develop skills to identify specific cultivation practices in the vineyard to reduce the impact of climate change on the quality of the grapes and production overall. ▪ Evaluation of the most effective viticultural practices in relation to different cultivation environments. **Communication skills** At the end of the course: ▪ Ability to communicate with agronomists, enologists and viticulturists the grape cultivation challenges induced by climate change. ▪ Use of a common technical and scientific language in viticulture. **Learning ability** ▪ Ability to use information and to develop technically and scientifically personal knowledge.
Content:	▪ **Climate change and future scenarios** Climate change, human activities, and emissions of greenhouse gases. Steady increase in temperature worldwide but significant differences from one region to another. Temperatures are predicted to increase by from 1 °C to 3.7 °C until the end of the century with modifications in rainfall patterns. Vine water status, evapotranspiration, and rainfall. Climate change and increase radiation and the frequency of extreme weather events. Models to better understand temporal and spatial shifts in climate variability and of climate change trends. ▪ **Climate change spring frost and hail events** Definition and impact of frost; spring frost and winter frost. Mitigation strategies from cultivar selection to pruning and training alternatives. Damaging rain events, early and late in the season, impact on fruit quality at harvest. Hail damages, methods of protection and vineyard management after a devastating hail event. ▪ **Higher temperature and summer heat waves** Impact of extreme heat on vine physiology and fruit quality. Extreme light exposure on vine performance and fruit quality. Impact of water stress on vine growth, yield, and fruit quality. How to recognize symptoms of extreme summer weather events in the vineyard. Mitigation strategies against extreme summer weather events; from canopy management to training system and cultivar selection. The role of irrigation and vineyard resiliency to heat and water stress. ▪ **Excess and nutritional deficiency** Water stress and high temperature impact on mineral nutrition of grapevines. Excess and deficiency of micro and macro nutrients. The role of soil, leaf tissue n and petiole diagnostic to correct excess/deficiency in mineral nutrition. ▪ **Grapevine resilience to abiotic stress** Grapevine physiological adaptation mechanisms to extreme weather events. Role of cultural ad rootstocks selection; early vs late budburst and ripening. Exploration of the beneficial agronomical practices to minimizing drastic shifts in temporal patterns of phenological events from spring growth to harvest.
Assessment methods and criteria:	Student performance will be evaluated during the entire course through several tools such as topic discussions and specific presentations. The final exam will be oral and/or written, and it will cover the entire program developed during the lectures, the laboratory activities, and the field trips. The final score will be expressed out of thirty
Forms of media:	Video projection
Required reading:	

Optional reading	
Other learning resources/tools (specific to the module) if applicable	Manuale di Viticoltura 2018; Edagricole Palliotti A., Poni S. Silvestroni O. **ISBN** 8850655339 The Science of Grapevines 2015; Elsevier, Academic Press. Keller M. **ISBN** 0128163658
Last updated in:	September 2017

Module name:	**Diverse wines: Marketing threats and opportunities**
Module code	SAF0343
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Stefano Massaglia, Univerity of Torino
Lecturers:	Prof. Stefano Massaglia, Univerity of Torino
Language:	English
Location:	Asti
Teaching format:	The course is based on lectures (3.5 ECTS credits, 24 hours), and practical activities in class (0.5 ECTS credits, 4 hours) and in the field (01 ECTS credits, 8 hours).
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	At the end of the course, the student will have to demonstrate knowledge and understanding of the most relevant opportunities and threats related to a strategy of diversification. The student will also have to demonstrate critical and judgment skills by discussing the results obtained in the practical activities and in the educational visits.
Content:	Course syllabus The teaching program includes the presentation and discussion of the following topics: 1 Introduction: Supply, demand and Wine market's organization evolution over the 20th century. The competitive arena the 21th century: old and new players for new consumption needs and habits. Global trends in the wine business. Recent wine consumption patterns. The peculiarity of the wine: commodity vs relational good. The implications in terms of marketing strategies; 2 Diversity in the wine sector: 2.1 Wine attributes: A definition of diverse wines as an experience good final consumers. The analysis of the concept of diversity along the wine supplychain will start from the detection of characteristics and attributes of wines that can define a wine as "diverse" in the opinion of specific targets of final consumers. 2.2 Wine retail: Diverse wines as a comprehensive sales/marketing strategy for retailers.

	2.3 Enterprise diversity in the business of wine: 3. Differentiation within the wine market, risks and opportunities. The existing process of differentiation that characterizes Wine supply will be analyzed (proliferation of grape varieties and appellations of origin, growing and vintage techniques, dispersion of wine prices) in order to recognize successful marketing strategies. 4. Marketing mix for diverse wines: the costs and benefits associated.
Assessment methods and criteria:	The final exam will be oral and will cover the entire program developed during the lectures, the practical activities held in class and the field trips. The final score will be expressed out of thirties.
Forms of media:	Power point presentations
Required reading:	The didactic material (Lecture slides and research articles) is made up of the material made available to the students in the Moodle platform.
Optional reading	Suggested reading - Yeung, Peter; Thach Liz, Luxury wine marketing: The art and science of luxury wine branding, ISBN 10: 1913022048 / ISBN 13: 9781913022044, Published by Infinite Ideas Limited, United Kingdom, 2019
Other learning resources/tools (specific to the module) if applicable	Wine Marketing and Sales, Third Edition: Success Strategies for a Saturated Market 2019 Wine Appreciation Guild Thach, Liz; Wagner, Paul; Olsen, Janeen **ISBN** 193587943X
Last updated in:	October 2023

Module name:	**Production of special wines**
Module code	SAF0344
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Simone Giacosa, Univerity of Torino Prof. Daniela Fracassetti, Univerity of Milano
Lecturers:	Prof. Simone Giacosa, Univerity of Torino Prof. Daniela Fracassetti, Univerity of Milano
Language:	English
Location:	Asti
Teaching format:	frontal lessons laboratory classes, visits, seminars
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	The course Production of special wines will provide the following learning outcomes and competencies: **Knowledge and understanding** At the end of the course the students will: ▪ know the production aspects and the peculiar characteristics typically used for the production of special wines. **Ability to apply learned knowledge** At the end of the course the students will be able to: ▪ describe the production and the main characteristics of specific special wines. **Autonomy of judgments** At the end of the course, the students should know: ▪ the aspects needing the monitoring for the production of specific special wines; ▪ evaluate the evolution of wine according to the applied production strategies. **Communication skills** At the end of the course, the students should know: ▪ to use the technical terminology of special vinifications; ▪ to communicate the aspects of the winemaking processes used for the production of special wines.

Content:	The Production of special wines course addresses the microbiological and technological aspects that characterize the winemaking process of special wines, paying particular attention to the most important special wines. The course considers the possible critical issues that could have an impact on the production and the characteristics of special wines. The topics covered during the course are related to the production of: ▪ Traditional method and Martinotti method sparkling wines ▪ Lightly-sparkling or semi-sparkling wines ▪ Sweet wines ▪ White wines with maceration (orange wines) ▪ Ice wines ▪ Straw wines made from grapes subjected to a dehydration process (appassimento, passito wines; on-vine, off-vine, under controlled or uncontrolled conditions, sun-drying, etc.) ▪ Fortified wines ▪ Wines produced with biological or oxidative aging Specific case studies will be conducted on the most representative wines for each category, including Franciacorta, Champagne, Prosecco, Asti, Sforzato della Valtellina, Amarone della Valpolicella, Moscato di Scanzo, Sauternes, Caluso Passito, Vernaccia di Oristano, Marsala, Sherry, Porto. Visits to wineries performing these winemaking protocols are possible to complete the understanding of specific techniques.
Assessment methods and criteria:	The exam will be organized in two parts: ▪ the first part will consist in a presentation (10 minutes) made by the student on the findings of a scientific article (evaluation 50%); the article, chosen by each student among those concerning the production of special wines and available on Web of Science or Scopus databases, needs to be agreed upon with the teachers via email by the end of the registration period for each exam date; ▪ the second part will be an oral discussion of the course topics (open questions) (evaluation 50%). The evaluation parameters will be: ability to concisely discuss about the chosen presentation topic, demonstration of acquisition of the concepts; ability to organize knowledge; correct use of the specialized vocabulary. The final grade will be expressed out of 30 points. The exam is passed with a minimum evaluation of 18/30.
Forms of media:	Video projection
Required reading:	Course materials provided on the Moodle platform to integrate students own notes.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Handbook of Enology 2021 John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK Ribéreau-Gayon P., Dubourdieu D., Donèche B., Lonvaud A., Darriet P., Towey J. **ISBN** 9781119588320 https://bibliopass.unito.it/login?url=https://doi.org/10.1002/9781119588320open_in_new Third edition, two volumes. E-book disponibile con sottoscrizione UniTO sul sito dell'editore / The ebook is available through UniTO subscription on the publisher website: https://bibliopass.unito.it/login?url=https://doi.org/10.1002/9781119588320 Sweet, Reinforced and Fortified Wines: Grape Biochemistry, Technology and Vinification 2013 John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

	Mencarelli F., Tonutti P. **ISBN** 9781118569184 https://bibliopass.unito.it/login?url=https://doi.org/10.1002/9781118569184open_in_new The ebook is available through UniTO subscription on the publisher website: https://bibliopass.unito.it/login?url=https://doi.org/10.1002/9781118569184
Last updated in:	October 2023

Module name:	**Wine starter microbiology**
Module code	INT0617
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second Period
Module coordinator:	Prof. Mariagiovanna Fragasso, University of Foggia
Lecturers:	Prof. Mariagiovanna Fragasso, University of Foggia
Language:	Italian/English
Location:	Foggia
Teaching format:	The course consists of frontal lessons (4 credits) and practical activities in the laboratory (1 credit).
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	Basics of Microbiology, and Food Microbiology
Targeted learning outcomes:	KNOWLEDGE AND UNDERSTANDING The course aims to provide adequate knowledge on the main microorganisms of oenological interest, in order to allow the student to manage and monitor wine fermentations, as well as the control of the main microbial spoilages and/or responsible for the production of toxic metabolites. APPLYING KNOWLEDGE AND UNDERSTANDING The acquired skills will be useful to be applied critically to the various and / or innovative winemaking methods. MAKING JUDGEMENTS The course also aims at providing rigorous analysis and evaluation tools, and to offer an overview of the main innovations in the sector. Through the study of these documents, the student will be able to improve his / her judgment and proposal skills in relation to the microbial oenology sector, also enabling the acquisition of technical language and specialized terminology. COMMUNICATION SKILLS The development of communication skills, both oral and written will be further stimulated through critical discussion during lessons, laboratory experiences and through the final oral test. LEARNING SKILLS The learning ability will be stimulated through the critical discussion of the topics with the aim of developing appropriate application skills.

Content:	**<u>Frontal Lessons (4 ECTS credits)</u>** 1) Ecology and Phyiology of yeast on grape and in musts. 2) Saccharomyces cerevisiae: main and secondary metabolisms 3) Alcoholic fermentation (AF), AF starter cultures and stuck fermentations. 4) Technological and quality traits of wine yeasts 5) Rifermentations 6) Non conventional starter cultures (non *Saccharomyces* and yeasts for alcohol-free beverages) 6) Mixed fermentations and starter cultures 7) Ecology of lactici acid bacteria in wine environments. Malolactic fermentation (MLF) and MLF starter cultures. 8) Acetic acid bacteria and vinegar 9) Microbial alterations of wine: *Brettanomyces* spp. Spoilage lactic acid bacteria. 10) Toxic metabolites of microbial origin in wines: ochratoxin A and biogenic amines. Laboratory activities (1 ECTS credit) Isolation of autochthonous wine yeasts by using differential culture media. Phenotypic characterization of indigenous yeasts isolated from grapes. Preparation of micro-vinifications by using autochthonous yeasts and commercial starters.
Assessment methods and criteria:	The learning verification takes place through an oral test (single or group) lasting about 20 minutes. 3 questions will be asked on subjects of the teaching program. Knowledge of the topics covered, clarity and ability of using a technical language will be evaluated. The vote will be expressed out of thirty; the exam will be passed with a score of 18/30.
Forms of media:	videoprojection.
Required reading:	Notes and teaching material. The materials provided by the teacher will be made available on the IT educational platform of the University of Foggia.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Microbiologia della Vite e del Vino 2022 CEA casa editrice ambrosiana P. Romano, M. Ciani e L. Cocolin (eds.) ISBN: 9788808-89978-1
Last updated in:	October 2023

Module name:	**Viticolture and enology policy**
Module code	SAF0015
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Antonio Seccia, University of Foggia
Lecturers:	Prof. Antonio Seccia, University of Foggia
Language:	Italian/English
Location:	Foggia
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	**Knowledge and understanding** The student must know and understand the economic and regulatory aspects relating to the wine industry in relation to the national and international context, for the performance of the professional activity of oenologist as well as for all activities relating to the production of grapes, the subsequent oenological activities and the marketing of wine both in bulk and packaged according to the different methods. **Ability to apply knowledge and understanding** The student must be able to interpret and apply the legal rules on the basis of specific economic contexts, have the ability to understand and solve problems connected with the economic-regulatory aspects as well as be endowed with decision-making autonomy both at the production and marketing level. **Autonomy of judgment** The didactic activities will allow the student to achieve an appropriate autonomy of judgment in relation to the different application areas of the regulations concerning viticulture and wine production in the different territorial contexts and for the different market contexts. Furthermore, such autonomy of judgment can be modulated according to the different strategic behaviors of the companies in the evaluation of specific market targets. **Communication skills** The teaching as a whole will allow the student to acquire an adequate technical language and terminology. The development of communication skills will be stimulated through class discussion, the possibility of solving case studies and/or carrying out group presentations on assigned topics. **Learning ability**

	Learning skills will be stimulated through classroom discussions, case study solutions and analysis of scientific articles through power point presentation.
Content:	1. Introduction to wine economics: production, strategies and consumers 2. Overview of the national aand international wine market 3. Institutions and international regulations on the production and marketing of vitivinicultural products 4. European Union rules and the Common Market Organization (CMO) for wine 5. The Italian legislation for the wine market and the "Testo Unico del vino" 6. The wine legislation for Protected Designation of Origin (PDO), Protected Geographical Indication (PGI), varietal wines and traditional terms 7. General rules on production and trade 8. The Italian Consortia for the protection of the wines designations 9. Rules on traceability, HACCP, safety and labelling 10. Private standards and certifications schemes for the environmental impact and the corporate social resposability 11. Case studies
Assessment methods and criteria:	Oral exam with score 30/30
Forms of media:	oral lectures and slides
Required reading:	Sequino S., Bonifazi L., Apollonio M. (2019) "La nuova normativa vitivinicola. Tracciabilità, semplificazione, autocontrollo dopo il Testo unico del vino", Edagricole ISBN:978-88-506-5552-6 Gregori M., Galletto L., Malorgio G., Pomarici E., Rossetto L. (2017) " Il Marketing del Vino capire decidere agire" , EDISES ISBN: 978-88-7959-941-2 Notes taken during classroom. Papers given by the lecturer La nuova normativa vitivinicola. Tracciabilità, semplificazione, autocontrollo dopo il Testo unico del vino 2019 Edagricole Sequino S., Bonifazi L., Apollonio M. **ISBN** 978-88-506-5552-6
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Vineyard mite control**
Module code	INT0507
Type of module (compulsory/optional)	
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Antonella Marta Di Palma, University of Foggia
Lecturers:	Prof. Antonella Marta Di Palma, University of Foggia
Language:	Italian/English
Location:	Foggia
Teaching format:	Traditional
Workload:	The course consists of 36 hours of lectures and 6 hours devoted to laboratory work.
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	The student must be able to recognize in the field the presence of different mite species, symptoms and damage and hence be able to organize an integrated pest management program.
Content:	**General part** **Phylum Artropoda**: general morphology and biology. Phylogeny and Classification. **Arachnida and Acarina**: general morphology, internal anatomy, biology, ethology, ecology, reproduction, embryonic e post-embryonic development. **Vineyard Mites**: damage, ecology, population dynamic, monitoring, IPM **Predatory mites and Suppliers of Natural Enemies** **Systematic** **Vineyard Mites**: Tetranychidae: Panonychus ulmi, Tetranychus urticae, Eotetranychus carpini, Tenupalpidae: Brevipalpus lewisis, Eriophyidae: Calepitrimerus vitis, Colomerus vitis, Eriophyes oculivitis. **Predators**: Phytoseiidae.
Assessment methods and criteria:	The final exam is an oral exam of about 20 minutes with questions on at least four topics of the program.
Forms of media:	Slide presentations
Required reading:	Ragusa S. Tsolakis H. La difesa della vite dagli artropodi dannosi. Università degli studi di Palermo. Zangheri L. Pellizzari Scaltriti G. - Parassitologia animale dei vegetali. C.L.E.U.P. Padova. AA.VV. - Manuale di Zoologia Agraria. Antonio Delfino Editore.

	Lecture notes. AA.VV. World crop pests. Spider mites: Their biology, natural enemies and control. Vols 1A and 1B. Helle and Sabelis (eds), Elsevier Science Publishers. Lecture notes.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Physiology and quality of grapevine production in warm and dry climate**
Module code	INT0504
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Laura de Palma, University of Foggia
Lecturers:	Prof. Laura de Palma, University of Foggia
Language:	Italian/English
Location:	Foggia
Teaching format:	Traditional
Workload:	The lectures consist of 32 hours (4 credits) and of 16 hours (1 credit) of practical activities in vineyard and in laboratory.
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	The student needs to have a good preliminary knowledge concerning grapvine biology and growing techniques, parameters of grape quality and related evaluating methods, and, morever, to have basic knowledge of plant ecophysiology.
Targeted learning outcomes:	The students, by recalling previous knowledge of plant physiology as related to the agro-environmental conditions, must achieve the below described learning results. KNOWLEDGE AND UNDERSTANDING The students must know and understand elements of grapevine biology, ecology and propagation, and acquire basic skills on grapevine varieties and growing techniques. APPLYING KNOWLEDGE AND UNDERSTANDING The students must be able to understand how to apply the main viticultural practices according to the production targets and the agro-environmental conditions. MAKING JUDGEMENTS The class discussion on the topics being studied will stimulate the students to develop independent judgment to be applied for the achievement of high qualitative and quantitative production standards within the growing environment. COMMUNICATION SKILLS Through the lectures, the individual study, and he consultation of scientific papers, the students will be encouraged to acquire communication skills apt to support a proper transfer of technical information. LEARNING SKILLS

	The ability to learn, update knowledge, apply innovations and develop criteria for their management will be stimulated through: lectures, classroom discussion, practical activities.
Content:	The teaching program starts by recalling knowledge on the main climate types, grapevine climatic requirements, vegetative and reproductive behaviours of grapevine grown in warm environments. Afterwards, the following topics will be treated: - rootstock and grapevine cultivar response to draught and thermal excess; - influence of the main climatic factors and of the vine water status on grape composition; - dynamics of phenol compound production and influence of environmental factors; - diurnal and seasonal patterns of main parameters of ecophysiological leaf functionality as related to vine water status. The gained knowledge will be applied to understand: - the influence of climate changing on viticulture and methods to face their effects; - the response of grapevine genotypes to multiple environmental stresses (water-temperature-light). Finally, during the practical activities in vineyard and in laboratory, the student takes contact with instruments used to assess vine ecophysiological functionality and acquires ability in analysing parameters of grape quality.
Assessment methods and criteria:	Individual oral examination. The student will answer to two main questions focused on the teaching program, plus minor questions in order to provide details. The student will have to demonstrate knowledge and understanding of the lecture theoretical topics and, moreover, capacity to apply the knowledge to address the vine physiological behaviours toward the obtaining of satisfying quality results in warm growing environments. The vote will be expressed out of thirty; the exam will be passed with a score of 18/30.
Forms of media:	Videoprojection
Required reading:	Technical and scientific paper provided by the teacher. The materials provided by the teacher will be made available on the IT educational platform of the University of Foggia.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Viticoltura di Qualità 2013 Tecniche nuove Mario Fregoni **ISBN** 9788848129190 Traité de la vigne. Pratiques Vitivinicoles. 2020 Dunod Carbonneau A., Torregrosa L., Deloire A., Pellegrino A., Jaillard B. et al. **ISBN** 9782100798575 EAN EBOOK: pdf 9782100812837
Last updated in:	October 2023

Module name:	**Sustainable management of fungal diseases of grapevine**
Module code	SAF0345
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof.Silvia Laura Toffolatti, University of Milano
Lecturers:	Prof.Silvia Laura Toffolatti, University of MIlano
Language:	English
Location:	Milano
Teaching format:	The course is based on lectures (3,5 CFU, 28 hours), and practical activities in class (0.25 CFU, 4 hours) laboratory (0.75 CFU, 12 hours) and in the field (0.5 CFU, 8 hours).
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	General knowledge of plant pathology and in particular on the structures of phytopathogenic fungi and fungal diseases
Targeted learning outcomes:	KNOWLEDGE AND UNDERSTANDING At the end of the course, the student must be able to: - know the main problems related to the defense of the vine from fungal diseases; - understand and evaluate the sustainability of the most suitable means for managing the main fungal diseases of grapevine within the frame of a sustainable viticulture. ABILITY TO APPLY KNOWLEDGE AND UNDERSTANDING At the end of this course the student will have to know: - Critically interpret the results obtained in the exercises and in the educational visit. AUTONOMY OF JUDGMENT At the end of this teaching the student will know: - how to identify and choose the most suitable means for the sustainable management of fungal diseases of the vine in different wine-growing areas; - how to evaluate the effectiveness of the defense strategy. COMMUNICATION SKILLS At the end of the course the student will know: - Use technical language in the description of the disease management practices.
Content:	FIRST PART Principles of integrated disease management, sustainability of defense in viticulture.

	Basic concepts and definitions Genetic means: host-pathogen interaction, resistance (zig-zag model) and susceptibility, sources resistance to pathogens, grapevine improvement for disease resistance, management of resistant vines in the field. Chemical means: defense with fungicides (criteria, problems and opportunities); resistance to fungicides (definitions, selection of resistant strains, monitoring and anti-resistance strategies); management of chemical treatments (disease forecasting models). SECOND PART Sustainable protection Sustainable management of defense against the main fungal diseases of the vine (with particular reference to downy and powdery mildews) through the use and management of genetic, agronomic and chemical means: new perspectives for obtaining resistant vines, monitoring and management of resistance to fungicides, use of disease forecasting models.
Assessment methods and criteria:	The final exam consists of an interview and the evaluation is expressed in thirtieths. During the oral exam, two questions will be posed to the student in spoken form: the first question will concern the first part of the program (basic concepts and definitions); the second one will concern the second part of the program (sustainable protection from specific diseases). The student will have to answer the questions in such a way as to demonstrate sufficient knowledge of the subject and fulfilment of the learning outcomes to pass the exam.
Forms of media:	
Required reading:	Lecture slides and papers Il materiale didattico sarà fornito dal docente sulla piattaforma moodle. The teaching material will be provided by the teacher via moodle platform.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Applied agrometeorology in a changing climate**
Module code	SAF0346
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Single period January-May
Module coordinator:	Prof. Gabriele Cola, University of Milano
Lecturers:	Prof. Gabriele Cola, University of Milano
Language:	English
Location:	Milano
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	**Theoretical skills** Students will be able to master the fundamental theoretical notions for understanding the climate system and its interaction with agricultural production, with particular reference to climate change and its effects on the agricultural sector. **Practical skills** With reference to the theoretical part, the students will be able to: ▪ Analyse and interpret meteorological time-series, defining the levels of anomaly ▪ Quantify the environmental resources and limitations for agricultural production, by means of interpretative models ▪ characterise the features of the growing seasons in the specific climate contexts ▪ characterise, by means of the above described interpretative techniques, different agricultural contexts at different scales, from the individual field to the farm to the consortium, up to the wider territorial scales. **Analytical skills** Students will be able to: ▪ make quantitative assessments of the environmental potentials and limitations to agricultural production of a specific study area, with reference to different spatial scales ▪ quantitatively analyze the behaviour of the single agricultural season, in comparison with the climate reference period, in order

	to highlight the seasonal main features and definitine the most appropriate adaptation strategie. **Communication skills** Students will gain technical skills and the appropriate terminology for professional activities. The team exercise will end with a report of critical analysis of the results obtained, in order to develop the communicative skills useful for the profession.
Content:	**Part 1 - FUNDAMENTALS OF AGROMETEOROLOGY** the climate system meteorology and climatology the scales of atmospheric phenomena thunderstorms and phoen the measuring systems the weather forecasts ***EXPERIMENTAL LAB*** the measured data - quality, reconstruction, spatialization Statistical tools for climatological analysis Basic territorial analysis tool using GIS applications **Part 2 - ATMOSPHERIC DRIVING VARIABLES IN RELATION TO AGRICULTURAL PRODUCTION** Modelling approach to agroecosystems and agricultural productions Thermal resources and limitations Phenological modeling Water resources and limitations - water balances The agrometeorological zonation at different scales **EXPERIMENTAL LAB** Development and application of interpretative models of environmental resources and limitations at different scales Statistical tools for agrometeorological analysis **Part 3 - CLIMATE CHANGE AND AGRICULTURAL PRODUCTION** Climate change and its effects on agriculture Climate scenarios and their use in agriculture Strategies of adaptation to climate change.
Assessment methods and criteria:	Grade in thirtieths During the course, online tests and collective class discussion of the results Team activity of agro-climatological analysis, applying the interpretative tools learned during the course - This activity determines a maximum 3/30 bonus for the final evaluation. **Final written test** composed of: ▪ Three open questions on the theoretical knowledge of agrometeorology (5/30 each) ▪ Three numerical exercises on agroclimatological analysis (time series analysis and application of agrometeorological interpretative models) (5/30 each) To pass the test, the student will have to obtain a satisfactory result in both the theoretical and practical parts With regard to the theoretical part, the correct knowledge of the required notions, the use of the appropriate technical terminology and the expositive clarity will be evaluated. With regard to the exercise part, the accuracy of the results, the correctness of the procedure and the clarity of the presentation will be assessed.

Forms of media:	
Required reading:	Teaching and bibliographic materials delivered by the teacher on the Moodle platform.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Marketing strategies to improve Sicilian wines**
Module code	INT0513
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Stefania Chironi, University of Palermo
Lecturers:	Prof. Stefania Chironi, University of Palermo
Language:	Italian/English
Location:	Palermo
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	After completing the course the student, with the knowledge gained, you will be able to set up a marketing plan for a winery; carry out studies on communication and the importance of the labels as marketing tools for the enhancement of Sicilian wines
Content:	Introduzione al corso: marketing del vino e comunicazione Il ruolo del marketing nelle imprese e nella società e la sua evoluzione nel tempo Concetti fondamentali del marketing: gli strumenti del marketing, le 4 P del marketing (marketing mix). Gli orientamenti dell'impresa nei confronti del mercato: concetto di produzione, di prodotto, di vendita, di marketing, di marketing sociale, marketing territoriale, marketing del vino Il processo di marketing e la sua pianificazione: analisi delle opportunità, ricerca dei mercati obiettivo, sviluppo delle strategie di marketing, pianificazione delle azioni di marketing, realizzazione e controllo. La segmentazione del mercato e la definizione dei mercati obiettivo Il comportamento del consumatore Il brand: importanza per il consumatore Il modello del ciclo di vita del prodotto e le politiche di prezzo La comunicazione, strategie e tecniche di comunicazione Comunicare il vino: il linguaggio, l'immagine, lo slogan perfetto L'etichetta come strumento di marketing del vino
Assessment methods and criteria:	The final exam consists of an oral exam that provides ability to reason and the connection between the knowledge acquired during the course

Forms of media:	Presentations and slide
Required reading:	Notes from the lessons of the "Marketing for the valorisation of Sicilian wines" course, handouts prepared by the teacher.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Marketing Management 2015 Pearson KotlerP., Keller K., Ancarani F., Costabile M. **ISBN** 9788891902405 Il marketing del vino - A cura di Gregori M. 2017 EdiSES Galletto L., Malorgio G., Pomarici E., Rossetto L. **ISBN** 9788879599412
Last updated in:	October 2023

Module name:	**Tablegrape protected cultivation**
Module code	SAF0017
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	First period
Module coordinator:	Prof. Laura de Palma, University of Foggia
Lecturers:	Prof. Laura de Palma, University of Foggia
Language:	English
Location:	Foggia
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	The student needs to have a good preliminary knowledge of grapvine biology and growing techniques, parameters of grape quality and related evaluating methods, entomology and methods to contrast grapevine phytophagous.
Targeted learning outcomes:	KNOWLEDGE AND UNDERSTANDING At the end of the teaching course the student will be able: - to know the types of covers used in table grape viticulture as well as the related growing techniques; - to know how to plan the integrated and organic pest management on this crop by applying the most recent techniques for sustainable vineyard protection, with the aim to preserve the functional biodiversity; - to understand the specific purposes of different covering techniques, the relative physiological technological implications, the influences exerted on the development of arthropod infestations and on the qualitative and quantitative characteristics of the final product. APPLYING KNOWLEDGE AND UNDERSTANDING At the end of the teaching course, the student must: - knowing how to direct the choice of the type of protecting cover according to productive strategies; - knowing how to guide the application of cultural practices and of arthropod control techniques suitable for achieving adequate qualitative and quantitative results of viticultural production under covers. MAKING JUDGEMENTS The class discussion on the topics being studied will stimulate the students to develop independent judgment to be applied for the achievement of high qualitative and quantitative production standards within table grape protected cultivation. COMMUNICATION SKILLS

	Through the lectures, the individual study, and he consultation of scientific papers, the students will be encouraged to acquire communication skills apt to support a proper transfer of technical information. LEARNING SKILLS At the end of the teaching course, the student must be able to autonomously provide his / her own technical updating on the topics covered.
Content:	**Viticultural Tecnologies.** **Lectures (2 CFU)** **Teaching course introduction**. Aims, contents and organization of the teaching activities. **Vineyard protected cultivation**. Origin of fruit tree protected cultivation in Italy. Importance of Italian tablegrape industry. Types of protective structures for tablegrape growing. **Netting tablegrape vineyard**. Netting types and purposes. General features. Adopted plastic materials. Main traits and viticultural implications of: hail nets, wind-brake nets, shade nets, photoselective nets, insect nets. **Tablegrape plastic sheet covering**. Covering types and purposes. Thrust to diffuse tablegrape covering. Main traits of proper cover materials. Protecting grape from external agents: the "screen covering" technique. Advancing berry ripening: the "early covering" technique and related effects. Delaying grape harvest: the "late covering" technique and related effects. Photoselective plastic sheet covering and related effects. **Practical activities (1 CFU)** Assessing plastic film radiometric properties. Visit to protected vineyards. Assessing indoor and outdoor microenvironment. **Sustainable control of arthropods.** **Lectures (1.5 CFU)** Principles of arthropod pest management in vineyards, with special regards to protected cultivation. Arthropod biodiversity in vineyards. New arthropod issues. The foundation of IPM: sampling, thresholds, and modeling. Alternatives to chemical control. IPM in organic viticulture. Pest thresholds: challenges to developing pest thresholds in grapes. Examples of pest thresholds developed for use in vineyard management. Geographic models used in grape IPM. Biological Control of Arthropods and its Application in Vineyards. What next for vineyard IPM? **Pratical activities (0.5 CFU)** Visit to vineyard farms with innovative management approaches.
Assessment methods and criteria:	Individual oral examination. The student will answer to two main questions per each of the two parts of the teaching course (topics of the teaching program). Each questions will have the same importance in determining the final vote. The student will have to demonstrate knowledge and understanding of the lecture theoretical topics and of their practical applications. The exposition wil be evaluated as well. The vote is expressed out of thirty; the exam is passed with a score of 18/30.
Forms of media:	Ppt presentations, videos, etc. and scientific articles
Required reading:	Viticultural tecnologies: Technical and scientific papers provided by the lecturer. The materials provided by the teacher will be made available on the IT educational platform of the University of Foggia.
Optional reading	

Other learning resources/tools (specific to the module) if applicable	Arthropod Management in Vineyards: Pests, Approaches and Future Directions 2014 Springer Verlag Noubar J. Bostanian J. Charles Vincent, Rufus Isaacs (Eds.) **ISBN** 9400794363 ISBN-13: 978-9400794368 La Difesa della Vite dagli Artropodi dannosi. Curatela
Last updated in:	October 2023

Module name:	**Tablegrape processing**
Module code	SAF0018
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	First period
Module coordinator:	Prof. Sandra Pati, University of Foggia
Lecturers:	Prof. Sandra Pati, University of Foggia
Language:	English
Location:	Foggia
Teaching format:	Traditional
Workload:	Lectures and Case Studies (4 CFU), and Practical Activities (1CFU)
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	<u>Knowledge and understanding</u> The student will know the table grape microbiology, the main steps and the critical point of table grape processing and will understand the influence of processing variables on the product characteristics Appling knowledge and unedrstanding The student - will be able to use the information on the Table grape characteristics to set up the processing on the most appropriate product - will be able to apply the knowledge to manage and control the processing and the relevant problems Making judgements The student will gain autonomy and ability in problem solving Communication skills will show communication and knowledge transferring skills Learning skills The student will gain learning skills useful to improve autonomously the knowledge
Content:	Lectures and Case Studies (4 Credits) - Hints concerning the table grape composition and the indicators of grape quality. - Production of not fermented, partially fermented, fermented and probiotic table grape juices. - Production of purees with high concentrations of nutraceutical. - Stabilization of juice and purees. - Composition of the final products made with table grape varieties.

	Practical activities (1 Credit) - Projection of video concerning grape processing - Use of innovative methods for the microbiological stability of tablegrape and final products.
Assessment methods and criteria:	The assessment of learning consists in an oral examination. The student will answer to 5 questions, including one on a topic chosen by the student. The student will have to demonstrate knowledge and understanding of the theoretical topics and capacity to apply the knowledge to the management of the table grape processing. The assessment in 30/30 will consider equally knowledge, under standing, critical ability, capacity of appropriate technical language and comunication skills.
Forms of media:	Scientific papers and slides
Required reading:	Electronic and printed materials supplied by the lecturer.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Tablegrape innovation**
Module code	SAF0019
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second period
Module coordinator:	Prof. Antonino Pisciotta, University of Palermo
Lecturers:	Prof. Antonino Pisciotta, University of Palermo
Language:	English
Location:	Palermo
Teaching format:	40 hours of lectures in classroom and in the experimental field.
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	Knowledge and understanding The Tablegrape innovation teaching aims to transfer to the students the scientific and technical knowledge necessary to know the specifics of the table grape compartment. Students will acquire the knowledge necessary to understand the possible answers of table grapes to variations in environmental factors (physiological aspects) and cultivation (management aspects). In particular, the students will have the opportunity to understand the physiological processes that allow table grape varieties to tolerate/overcome/recover abiotic stress conditions (water, thermal and light stress) and the criteria for deciding whether and how to intervene to favor/Interfere with certain essential biological processes for fructification purposes. Applying knowledge and understanding The teaching disseminates the knowledge and skills necessary to establish and manage vineyards of table grapes, in relation to the different production objectives and the different types of plant. It also allows the holistic approach to understand climate relations, biotic stresses, crop productive productivity and quality of production, and is the key prerequisite for successfully applying the knowledge gained to the world of production. Making judgments To be able to harmonize all factors of production (environment, cultivar, crop management) and suggest innovative technical solutions to favor the best outcome of the production activity. Communication skills After acquiring the specific technical correct use of language and having the basic knowledge of the processes of vegetative and reproductive biology and agronomic needs, the student will be able to advise

	entrepreneurs and address the farmer to the most appropriate technical choices for economic success of the crop Learning ability It concretizes the acquisition of the ability to relate the various factors that contribute to determining the productive result in the table grape sector by adjusting the choices to change the socio-economic conditions of the market and the product's destination taking into account the most recent technical innovations that can contribute to achieving the production goals.
Content:	1° CFU Objectives of the discipline and its subdivision and articulation. The table grape sector in the World, Italy and Sicily. The productive objectives in the table grape sector. The specifics of genetic improvement. Ecology: the choice of site; Soil-climate relationships and biological factors (vine and rootstock) and agronomic (crop technique) of viticultural production; Bio-climatic indices. 2° CFU The "vineyard system" in modern table grape viticulture. Architecture of table grape vineyards, description of the breeding methods and vine pruning types and criteria of choice. Planting distances Physiological pruning bases: training and production pruning principles. 3° CFU Source-sink relationship management (interaction and competition), optimization of the functionality and efficiency of the "vineyard system". Description and operational problems of winter and summer pruning. 4° CFU Soil management, cover crops. Irrigation, fertigation and their effects on quality grapes 5° CFU Vineyard establishment for early and late production. Innovations of production process.
Assessment methods and criteria:	Oral examination. The vote will be expressed in 30/30. Will be evaluated the exposure qualities, the expertise in the use of specialized language, the skills to discourse the knowledge and critical thinking skills on the study.
Forms of media:	Presentations and slides
Required reading:	AA. VV. L'uva da tavola. BayerCropScience, 2010; Note in slides
Optional reading	
Other learning resources/tools (specific to the module) if applicable	L'uva da tavola, Coltura&Cultura 2010 Bayer CropScience AAVV **ISBN** 9788896301098
Last updated in:	October 2023

Module name:	**Economics of food safety and nutrition**
Module code	SAF0049
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	First period
Module coordinator:	Prof. Antonio Stasi, University of Foggia
Lecturers:	Prof. Antonio Stasi, University of Foggia
Language:	English
Location:	Foggia
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ETCS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	He must be able to put into practice the knowledge that will be learned during lessons and class exercises through presentations to the rest of the class in which results obtained starting from exercises and readings made during the course will be exposed. Learning aims to develop abstraction skills about the concepts of food safety, human nutrition, international and European policies for food safety. Knowledge and understanding The student will need to know the regulation and analysis of the economics of nutrition and food safety Ability to apply knowledge and understanding The student must be able to put the knowledge into practice for the application of the notions learned. Judgment autonomy Through the study of the theoretical foundations and application insights provided during the course, the student will be able to practice the analysis on data collected independently or on official sources. Communication skills The course will provide skills and development of technical language. The exercises will conclude with the development of reports containing the critical analysis of the results obtained in order to develop the communication skills useful for analysis in the profession. Learning ability The structuring of teaching through innovative methods will allow the development of new learning skills based on learning by doing, on the

	use and experimentation through the practice of theoretical intuitions and technical language. The non-use of powerpoints, interpersonal interaction and the consequentiality of the concepts starting from the class learning level will improve the class's learning skills. The level of attention will be stimulated through examples based on real and current data useful in the profession. Peer tutoring will allow for the development of peer discussions by channeling information and teaching tools more effectively than traditional delivery methods.
Content:	What is about economics of food safety and nutrition Market impact of Food safety Economics of nutrition Esercitazione: studies and papers of about Economics of Food safety and Nutrition Utility and demand theory and methodologies Esercitazione: class discussion and presentations
Assessment methods and criteria:	The part of the Data Processing exam is based on the ongoing evaluation of analysis and presentation of scientific papers. In addition, the final test will consist in the presentation of the results obtained by carrying out a study similar to those studied in the ongoing evaluation that will be developed through group work.
Forms of media:	Video projections, web-sites
Required reading:	Economics of food safety 1991 Elsevier Press Julie Caswell **ISBN** 9789401170765 Strategy and policy in the food system 1996 Food Marketing Policy Center Julie Caswell and Ronald W. Cotterill **ISBN** 9780429703072
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Tablegrape soiless cultivation**
Module code	SAF0023
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second Period
Module coordinator:	Prof. Rosario Di Lorenzo, University of Palermo
Lecturers:	Prof. Rosario Di Lorenzo, University of Palermo
Language:	English
Location:	Palermo
Teaching format:	Front lessons and two outdoor visits to the farm where table grapes are grown
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	**Knowledge and understanding:** Acquire the knowledge needed to plan and organize a soilless table grape plant and evaluate whether or not to implement it. **Ability to apply knowledge and understanding:** Identify solutions to problems related to the construction and management of a soilless plant and evaluate the implications and results of one's choices, paying particular attention to environmental aspects and production objectives. **Autonomy of judgment:** The student must be able to suggest, in relation to the specificities of the context, entrepreneurial, managerial and technical choices aimed at conferring productive capacity and usefulness to the soilless system. **Communication skills:** Use a simple, clear and technically correct language to guarantee an effective transfer of the acquired knowledge to the various interlocutors of the supply chain and to support the validity of the choices made. **Learning ability:** Carry out an autonomous and continuous updating through the critical consultation of scientific and technical publications.
Content:	1 Panoramic view of table grapes in the world, Italy and Sicily 2 Process and product innovations in table grapes 3 Out of ground: strengths and weaknesses 4 Choice of containers and substrates 5 Choice of variety for off-the-ground 6 The vineyard system in the ground: training and production cycle 7 Climate management in the off-shore greenhouse

	8 Management of the plant grown on the ground 9 Water and mineral nutrition in the ground
Assessment methods and criteria:	Comparison between students during classroom and oral exam. The result of the exam will be evaluated in thirtieths (30/30 cum lode) and will be passed with a minimum vote of 18/30.
Forms of media:	Slides presentation
Required reading:	Specific scientific and technical publications on the subject
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Plant protection**
Module code	SAF0020
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second Period
Module coordinator:	Prof. Patrizia Bella, University of Palermo
Lecturers:	Prof. Patrizia Bella, University of Palermo
Language:	English
Location:	Palermo
Teaching format:	The teaching will take place with frontal lessons, laboratory exercises. Visits to table grape vineyards will be also organized.
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	The student will be able to interconnect all the knowledge acquired in order to make hypotheses about the possible causes of the disease and to select the most appropriate control strategies. Furthermore, the student will be able to use a proper scientific language.
Content:	Brief review on basic concepts of plant diseases, including pathogens, disease cycle and epidemiology. Control of plant diseases: cultural practices, physical, biological and chemical methods; phytosanitary measures; use of resistant varieties; integrated pest management. Classification of pesticide, mechanism of action, fungicide resistance. Plant disease forecasting models and decision support system. Plant disease diagnosis: symptoms and signs, isolation and identification of fungi and bacteria, identification of fungi based on microscopic features, serological and molecular methods, Koch's postulates. Disease of table grape and their management. Diseases caused by oomycetes and fungal pathogens, plant diseases caused by procaryotes, viral diseases. Disease of post-harvest disease of table grape and their management.
Assessment methods and criteria:	The oral exam will take place to ascertain the ability of the student to properly discuss and correlate the topics of the discipline, and to identify the major phytopatological problems of the table grape and to suggest the appropriate control measures. The final grade is expressed on a scale of 30. The examination is considered unsatisfactory if the student shows a superficial knowledge of the topics and exposes them in unclear manner. Sufficient or satisfactory evaluation is expected if the student demonstrates a basic level of knowledge and a little or a limited ability to

	interconnect the different contents of the discipline (18-25/30). The evaluation is good or excellent if the student demonstrates a good or excellent knowledge of the subjects, which are described with an appropriate or perfect scientific language (26-30/30).
Forms of media:	Power point presentations
Required reading:	Vannacci et al., 2021 Patologia Vegetale. Esises Università. Napoli ISBN978-88-3623-0419 Matta et al., 2017. Fondamenti di Patologia Vegetale. Pathon Editore, Bologna. ISBN 9788855533829 Agrios G., 2005. Plant Pathology - 5th Edition -; Elsevier ISBN 978-0120445653 Compendium of Grape Diseases, Disorders, and Pests, 2015 Second Edition ISBN:978-0-89054-481-5 Power point presentations and other learning materials (scientific articles).
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Plant growth regulators**
Module code	SAF0022
Type of module (compulsory/optional)	Optional
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Turin
Semester:	Second Period
Module coordinator:	University of Palermo
Lecturers:	University of Palermo
Language:	English
Location:	Palermo
Teaching format:	Traditional
Workload:	40 hours
Credit points:	5 ECTS credits
Requirements under the examination regulations:	none
Recommended prerequisites:	none
Targeted learning outcomes:	Students enrich their knowledge of vineyard management for table grapes production concerning specific objectives, cultivation of seedless cultivars and, different cultivation environments.
Content:	Recalls of plant physiology and hormone action mechanisms are treated; management of source-sinks relationships and budding issues, flower biology and fruiting in table grape about the three factors of production.
Assessment methods and criteria:	At the end of the teaching, each student will be assigned a precise and concrete case study relating to different varieties, different cultivation environments, and specific production objectives. It will be required to propose a plan for the use and application of plant growth regulators. The student will present a case study during the oral exam. The evaluation will be based on the ability to present and demonstrate the knowledge necessary for the management of the case study.
Forms of media:	Power point presentations
Required reading:	Note in slides provided by the teacher and access to databases.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Vineyard and / or Winery Stage**
Module code	
Type of module (compulsory/optional)	
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year
Semester:	3rd or 4th semester of the Vinifera EuroMaster degree programme
Module coordinator:	Master thesis tutor
Lecturers:	----------
Language:	Italian/English
Classification within the curriculum:	All specializations
Teaching format:	Internship
Workload:	125 hours
Credit points:	5 credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Stage linked to the Master thesis
Content:	Master thesis research argument
Assessment methods and criteria:	----------
Forms of media:	----------
Required reading:	----------
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Master Thesis** **at the Consortium among the Universities of Turin, Milan, Palermo, Foggia and Sassari**
Module code	
Type of module (compulsory/optional)	
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Consortium among the Universities of Turin, Milan, Palermo, Foggia and Sassari
Semester	3rd or 4th semester
Module coordinator:	Prof.Luca Giorgio carlo Rolle, University of Turin
Supervisors:	Academic staff of the Consortium among the Universities of Turin, Milan, Palermo, Foggia and Sassari, and academic staff members of the EMaVE Consortium and associated partners.
Language:	English
Classification within the curriculum:	Core module
Teaching format	The Thesis consists of the elaboration of a written report about an independent scientific work of the student and a defense.
Workload:	20 weeks for the elaboration of the thesis; plus adequate time for personal preparation for the defence
Credit points:	25 ECTS credits
Requirements under the examination regulations:	Admission to the thesis is granted if the student has - successfully completed the modules of the first academic year. Admission to the defence is granted under the condition that: - the written report was evaluated at least with the grade "E - pass"; - the student has completed all other compulsory modules of the second academic year successfully and obtained at least 120 ECTS credits (including the credits allocated to the Master Thesis)
Recommended prerequisites:	----------
Targeted learning outcomes:	The student is able to carry out scientific research independently in a given time implementing adequate scientific methods. In addition the student is able to present his/her results to a jury and answers questions related to the field of research.
Content:	Thesis document
Assessment methods and criteria:	Delivery of a written thesis report at the submission date, prepared under formal requirements of the University of Turin . Thesis defence in front of an examination jury of at least 3 academic members according to no 13.2 of the Study and Examination Regulations of the Vinifera EuroMaster degree programme.
Forms of media:	Research methods depending on the topic of the thesis. Written report; presentation media for the defence.
Required reading:	Books and scientific papers related to the topic of the thesis. The Required reading research is part of the Master Thesis.

Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Modules offered by
Consorzio tra le Università di Udine, Padova, Verona e Bolzano

Students of the Vinifera EuroMaster degree programme have to attend the following modules in the second academic year (M2):

- One specialization (to be chosen one out of six) 20 ECTS credits
- Elective modules* of an equivalent of 10 ECTS credits
- Language training (Italian for foreigners) 3 ECTS credits
- Master Thesis 27 ECTS credits
- Internship (included in the thesis) (up to 7 ECTS credits)

The ECTS user's guide indicates that one credit corresponds to 25 to 30 hours of work. In this module manual, 25 hours of work are assumed per credit.

Specialisation:

Research and development for a Sustainable Viticulture (UDINE) (20 ECTS credits)

	Credit points
Module group: Advanced Grapevine Physiology, Breeding and Climate Change	**10**
Improving vineyard resilience under climate change (AGR/03)	2
Environmental factors and secondary metabolism (AGR/03)	3
Winery management and climate change (AGR/01)	2
Advanced grapevine breeding (AGR/03)	3
Module group: Sustainable and Precision Viticulture	**10**
Sustainable grapevine nutrition (AGR/13)	3
Soil management and irrigation (AGR/03)	2
Advances in precision vineyard mechanisation (AGR/09)	3
Advanced organic viticulture (AGR/03)	2

Module group: Advanced Grapevine Physiology, Breeding and Climate Change

Module name	**Improving vineyard resilience under climate change**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Falchi, Rachele (University of Udine)
Lecturers:	Pitacco, Andrea (University of Padova)
Language:	English
Classification within the curriculum:	Module of specialization: Research and Development for a Sustainable Viticulture Module group: Advanced Grapevine Physiology, Breeding and Climate Change
Teaching format:	Regular lectures; student's team work in small groups
Workload:	Face to face lectures: 16 h Student's personal study time in the module: 34 h
Credit points:	2 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	The students can apply tools and criteria to evaluate research activity in plant physiology related to grapevine. They can analyse experimental data, published papers, graduation theses and use them to judge critically the research activity and its development. They have experience in team work.
Content:	1. Climate Change and Viticulture (Climate Change: a multifaceted threat; Scenarios and perspectives of Climate Change) 2. Control of vineyard microclimate (Mass and energy exchanges; Radiative fluxes; Sensible and latent heat fluxes; Leaf and canopy energy balance; Penman-

	Monteith equation; Movement of water in the Soil-Plant-Atmosphere Continuum) 3. Pathways to a resilient Viticulture (Ecosystem services of viticulture; Carbon sequestration; Resilience, adaptative capability and sustainability)
Assessment methods and criteria:	Oral examination
Forms of media:	PowerPoint presentations
Required reading:	Sliders with specific literature reference reported
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Environmental factors and secondary metabolism**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Falchi, Rachele (University of Udine)
Lecturers:	Falchi, Rachele (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialisation Research and development for a Sustainable Viticulture Module group: Advanced Grapevine Physiology, Breeding and Climate Change (University Udine)
Teaching format:	Regular lectures; student's team work in small groups
Workload:	Face to face lectures: 16 h; student's team work in small groups, seminars and guided tours: 8 h; Student's personal study time in the module: 36 h
Credit points:	2 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students will gain an understanding of secondary metabolism in grapevines, including their biosynthesis and how they relate to grape traits. Students will be able to evaluate how environmental stress factors, such as water availability and temperature fluctuations, can influence the synthesis of secondary metabolites in grapevines, also from the molecular point of view.
Content:	Stages of berry development: physiological and transcriptomic variations during development. Primary metabolism in the berry during the ripening phase. Phloematic unloading mechanisms. Berry acidity: variations during growth. Biosynthesis and role of ethylene and abscisic acid in the berry. Importance and role of secondary metabolites in grapevine. Biosynthesis and regulation of the content of non-flavonoid and flavonoid compounds in grapes. Synthesis and accumulation of volatile compounds in the berry. Effect of water, light and temperature stress on grape qualitative parameters and secondary metabolites.

Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard
Required reading:	
Optional reading	Rienth M, Vigneron N, Darriet P, Sweetman C, Burbidge C, Bonghi C, Walker RP, Famiani F, Castellarin SD. Grape Berry Secondary Metabolites and Their Modulation by Abiotic Factors in a Climate Change Scenario-A Review. Front Plant Sci. 2021 Mar 22;12:643258.
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Winery management and climate change**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine)
Semester:	3rd Semester
Module group coordinator:	Falchi, Rachele (University of Udine)
Lecturers:	Trestini, Samuele (University of Padova)
Language:	English
Classification within the curriculum:	Module of specialization: Research and development for a Sustainable Viticulture Module group: Advanced Grapevine Physiology, Breeding and Climate Change
Teaching format:	Regular lectures, laboratory course
Workload:	Face to face lectures: 12 h, student team working in a small group 4 h Student's personal study time in the module: 34 h
Credit points:	2 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students will be provided with the necessary tools to adapt farm/winery management to the changing conditions resulting from climate change, using management approaches aimed at increasing the resilience of the firm. This will involve examining sustainability standards and risk management tools within a national and European regulatory framework.
Content:	Risk, Uncertainty, and Climate Change: Basic knowledge will be provided regarding the concepts of risk and uncertainty, approaching methodology related to risk analysis, and strategies for risk reduction and management. Climate Change and Winery Management: Impact assessment of risk induced by climate change on the wine sector and winery management. Strategies, and tools for risk reduction and management will be addressed, along with sustainability

	standards, and national and Union policies. Applications for risk analysis and management will also be covered.
Assessment methods and criteria:	Written exam with exercises, open-ended questions, and multiple-choice questions.
Forms of media:	PowerPoint presentations
Required reading:	Sliders with specific literature reference reported
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Advanced Grapevine Breeding**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine)
Semester:	3rd Semester
Module group coordinator:	Falchi, Rachele (University of Udine)
Lecturers:	Falchi, Rachele; Cipirani, Guido (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and development for a Sustainable Viticulture Module group: Advanced Grapevine Physiology, Breeding and Climate Change
Teaching format:	Regular lectures, laboratory course
Workload:	Face to face lectures: 16 h; student's team work in small groups, seminars and guided tours: 8 h; Student's personal study time in the module: 36 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students will have a deep understanding of the fundamental principles and goals of grapevine breeding, including genetic diversity, varietal improvement, and breeding methodologies. They will be able to evaluate various grapevine traits, including disease resistance, fruit quality, yield, and adaptability, and make informed decisions regarding which traits to prioritize in breeding. The role of biotechnology in grapevine breeding, including the use of genetic engineering, tissue culture, and in vitro selection for improved grape varieties will be also considered.
Content:	Objectives in grapevine breeding programs (tolerance to biotic/abiotic stresses, viticultural traits). Traditional grapevine breeding techniques: generation of crossing populations (emasculation, collection of pollen, pollination, seed management).

	Limitations for cross breeding (crop-specific limitations, genetic resources, knowledge about grapevine genetics, socioeconomic aspects). Molecular tools in grapevine breeding: grapevine genome, use of DNA sequence information for assisting conventional breeding (MAS, QTL), evaluation of tolerance to water deficit for the study of the association between phenotype and genotype, evidence of transcriptomics on the response of the vine to abiotic/biotic stresses. Grapevine breeding programs in Italy: case studies about the major ongoing grapevine breeding programs in Italy. Genetic resistance to grapevine diseases: pathogens and insects, to fungi, bacteria, and other agents, Immunity, passive and active resistance. Horizontal and vertical resistances. The sources of resistance: germplasm of the genus Vitis. Crossbreeding and selection to introduce resistance into elite varieties: traditional methods. Mapping and cloning of resistance genes. NBT (New Breeding Technology) and resistance
Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard
Required reading:	Sliders with specific literature reference reported
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module group: Sustainable and Precision Viticulture

Module name	**Sustainable grapevine nutrition**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Gubiani, Rino (University of Udine)
Lecturers:	Pinton, Roberto (University of Udine)
Language:	English
Classification within the curriculum:	Module of Research and development for a Sustainable Viticulture Module group: Sustainable and Precision Viticulture
Teaching format:	Regular lectures, laboratory exercises during the semester
Workload:	Face to face lectures: 20 h; laboratory exercises: 4 h; Student's personal study time in the module: 45 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	The students have deep knowledge on the chemical and biochemical aspects of grapevine mineral nutrition, availability and uptake of macro- and micro- nutrients, The course will afford the basis for the interpretation of soil and plant analyses in order to know the nutritional conditions of soil and plants and to define the optimal fertilizer strategy.
Content:	Dynamics of nutrients in the soil and equilibria among the forms available to plants. Soil and plant factors affecting nutrient availability and determining the use efficiency of the essential macro- and micro-nutrients. Dynamics of organic matter and role of microbial biomass in soil-plant interaction. Soil management strategies for maintaining fertility and correcting nutritional imbalances. Role of nutrients in development and production of grapevine. Sustainable techniques for the supply of essential plant nutrients to the soil.

	Fate of nutrients supplied to the soil and evaluation of the environmental impact of fertilization. Analytical approaches for the definition and control of the nutritional status of soils and plants, with special regard to grapevine. Case studies analysis. Perspectives of scientific research for the development of innovative and sustainable approaches to grapevine nutrition.
Assessment methods and criteria:	Oral examination
Forms of media:	Power point presentations
Required reading:	MARSCHNER, H.: Marschner's mineral nutrition in higher plants. Elsevier, Academic Press. 2012. Bibliographical material provided by the lecturer
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	Soil management and irrigation
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Gubiani, Rino (University of Udine)
Lecturers:	Sodini, Mirko (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and development for a Sustainable Viticulture Module group: Sustainable and Precision Viticulture
Teaching format:	Regular lectures, exercises with models and simulations
Workload:	Face to face lectures: 24 h; laboratory exercises: 5 h; Student's personal study time in the module: 46 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Basics in soil science.
Targeted learning outcomes:	The students possess the capacity to evaluate different techniques aimed at enhancing soil and water conservation in a high quality production system.
Content:	1. Estimation of water requirements in viticulture. Monitoring of soil water status and water balance. Modelling application of regulated deficit irrigation. Notes on irrigation methods and equipment.methods 2. basics of decision support system to manage irrigation and model water status 3. Cover crops management. Cover crops selection, termination, and termination methodology. Ecosystem services of Under vine vegetation. 4. Rainfall and soil management: runoff, erosion, interaction with cover crops

Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard
Required reading:	PowerPoint presentations and bibliograhic material Sodini M, Callesen T, Canton M, Tezza L, Bastos Campos F, Zanotelli D, Tarolli P, Sivilotti P, Pitacco A, Tagliavini M (2023) Major threats caused by climate change to grapevine. Italus Hortus 30:1–24. ALLEN, R G. ; PEREIRA, L. S. ; RAES, D. ; SMITH, M.: Crop Evapotrans-piration. Guidelines for computing crop water requirements. FAO Irrigation and Drainage Paper, 56, 1998. RAMOS, M. C.: Soil water balance in rainfed vineyards of the Penedès region (Northeastern Spain) affected by rainfall characteristics and land levelling: influence on grape yield. In: Plant Soil, 2010, **333**, 375–389. AUDE RIPOCHE, A. et al.: Design of intercrop management plans to fulfil production and environmentalobjectives in vineyards. In: Eur. J. Agr. 2010, **32**, 30-39. ACEVEDO-OPAZO, C. et al.: Effects of grapevine (Vitis vinifera L.) water status on water consumption, vegetative growth and grape quality: An irrigation scheduling application to achieve regulated deficit irrigation. In: Agr. Water Mngt., 2010, **97**, 955-964. Vanden Heuvel J, Centinari M (2021) Under-Vine Vegetation Mitigates the Impacts of Excessive Precipitation in Vineyards. Frontiers in Plant Science 12 Steenwerth K, Belina KM (2008) Cover crops enhance soil organic matter, carbon dynamics and microbiological function in a vineyard agroecosystem. Applied Soil Ecology 40:359–369. Rodrigo-Comino J, Seeger M, Iserloh T, Senciales González JM, Ruiz-Sinoga JD, Ries JB (2019) Rainfall-simulated quantification of initial soil erosion processes in sloping and poorly maintained terraced vineyards - Key issues for sustainable management systems. Science of The Total Environment 660:1047–1057. Biddoccu M, Zecca O, Audisio C, Godone F, Barmaz A, Cavallo E (2018) Assessment of Long-Term Soil Erosion in a Mountain Vineyard, Aosta Valley (NW Italy). Land Degradation & Development 29:617–629.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	Advances in precision vineyard mechanisation
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine)
Semester:	3rd Semester
Module group coordinator:	Gubiani, Rino (University of Udine)
Lecturers:	Gubiani, Rino (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and development for a Sustainable Viticulture Module group: Sustainable and Precision Viticulture
Teaching format:	Regular lectures, laboratory and field exercises during the semester
Workload:	Face to face lectures: 24 h Student's personal study time in the module: 51 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	The students have deep knowledge on the chemical and biochemical aspects of grapevine mineral nutrition, availability and uptake of macro- and micro- nutrients, The course will afford the basis for the interpretation of soil and plant analyses in order to know the nutritional conditions of soil and plants and to define the optimal fertilizer strategy.
Content:	Dynamics of nutrients in the soil and ratios between the forms available to plants. Soil and plant factors affecting nutrient availability and determine the use efficiency of the essential macro- and micro-nutrients. Dynamics of organic matter and role of microbial biomass in soil-plant interaction. Soil management strategies for maintaining fertility and correcting nutritional imbalances. Role of nutrients in development and production of grapevine. Sustainable techniques for the supply of essential plant nutrients to the soil. Fate of nutrients brought to the soil and evaluation of the environmental impact of fertilization.

	Analytical approaches for the definition and control of the nutritional status of soils and plants, with special regard to grapevine. Case studies analysis. Perspectives of scientific research for the development of innovative and sustainable approaches to grapevine nutrition.
Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard
Required reading:	BARBER, S. A.: Soil nutrient bioavailability. Wiley, 1995. MARSCHNER, H.: Marschner's mineral nutrition in higher plants. Elsevier, Academic Press. 2012. BARKER, A. V. ; PILBEAM, D. J.: Handbook of plant nutrition. CRC, 2015. BOHN, H. L. ; MCNEAL, B. L. ; O'CONNOR, G. A.: Soil chemistry. Wiley, 2001. FOLLET, R. H. ; MURPHY, L. S. ; DONAHUE, R. L.: Fertilizers and soil amendments. Prentice-Hall, 1981. ALLOWAY, B. J.: Micronutrient Deficiencies in Global Crop Production, Springer, 2010. ISHERWOOD, K. F: Mineral fertilizer distribution and the environment. IFA/UNEP, 2000. CALZAVARA, R. ; GRAZIANO, P. L. ; PERELLI, M.: La grande guida dei Fertilizzanti. Arvan, 2002. BENEDETTI, A. : SEQUI, P.: I fertilizzanti organici. Vol.1 - Edizioni L'Informatore Agrario, 1998.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Advanced Organic Viticulture**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Gubiani, Rino (University of Udine)
Lecturers:	Sivilotti, Paolo (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and development for a Sustainable Viticulture Module group: Sustainable and Precision Viticulture
Teaching format:	Regular lectures, exercises with models, vineyard visits
Workload:	Face to face lectures: 12 h; exercises: 4 h; Student's personal study time in the module: 34 h
Credit points:	2 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Grapevine physiology, viticulture, agronomy, grapevine pathology
Targeted learning outcomes:	Knowledge of organic agriculture principles applied to the viticulture sector. Understanding of problems arising in viticulture, skills to find appropriate solutions
Content:	During the course the following topics will be elucidated: brief history, European and Italian legislation, organic certification. Cultivation techniques: soil management, canopy management, and grapevine nutrition in organic viticulture. Defence against pathogens (downy mildew, powdery mildew, other fungi) and pests (insects, spidermites) and mites in organic viticulture
Assessment methods and criteria:	Oral examination
Forms of media:	PowerPoint presentations
Required readings:	https://en.wikipedia.org/wiki/History_of_organic_farming

	report OIV 2021. Focus OIV - The world organic vineyard https://www.bioagricert.org/en/certification/organic-production/european-union.html https://organic-farmknowledge.org/news-events/news/detail/organic-farming-copper-re-approved-in-europe Regulation (EC) no 203/2012 Council Regulation (EC) no. 126/2012 Bigot G., Mosetti D., Cargnus E., Freccero A. et al. (2021).. Vitis Journal of Grapevine Research 61:53–62. Falchi R., Petrussa E., Braidot E., Sivilotti P. et al. (2020). International Journal of Molecular Sciences 21(4):145. Gatti M., Garavani A., Squeri C., Capri C. et al. (2022). European Journal of Agronomy 136:126490. Abad J., Hermoso de Mendoza I., Marín D., Orcaray L. and Gonzaga Santesteban L. (2021). Oeno One 55: 295-312. Cabús A., Pellini M., Zanzotti R., Devigili L. et al. (2017). Crop Protection 96:103-108. Mosetti D., Sivilotti P. and Bigot G. (2019). BIOWeb of Conferences 13:02001
Optional reading	Other literature speciefied on the slides
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Specialisation:
Research and development in Enology
(UDINE) (20 ECTS credits)

	Credit points
Module group: Advanced biomolecular and chemical techniques applied to enological products	**10**
Application of rapid molecular methods and biosensors for the identification of microorganisms in viticulture and enology (AGR/16)	5
Advanced chromatographic techniques in grape and wine analysis (CHIM/10)	5
Module group: Separation, stabilisation and packaging techniques in enology	**10**
Stabilisation techniques for a low impact enology (AGR/15)	4
Physical separation processes and wine conditioning and packaging technologies (AGR/15)	6

Module group: Advanced biomolecular and chemical techniques applied to enological products

Module name	**Application of rapid molecular methods and biosensors for the identification of microorganisms in viticulture and enology**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Manzano, Marisa (University of Udine)
Lecturers:	Manzano, Marisa (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and Development in Enology Module group: Advanced biomolecular and chemical techniques applied to enological products
Teaching format:	Regular lectures and laboratory courses
Workload:	Face to face lectures: 32 h; Laboratory courses: 15 h; Student's personal study time in the module: 78 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Good knowledge of biology and general microbiology
Targeted learning outcomes:	The students have advanced knowledge in microbiology techniques based on molecular analysis applied to must and wine.
Content:	Optimization of Polymerase Chain reaction. Utilization of PCR in food and beverage analyses. Amplification methods for unknown sequences (RAPD). Molecular analyses and DNA point mutation detection. Electrophoresis methods for in the identification of food and beverages contaminant microrganisms and for strain differentiation: Temporal Temperature Gradient Electrophoresis (TTGE), Denaturing Gradient Gel Electrophoresis (DGGE), Single Strand Conformation Polymorphism (SSCP), Restriction

	Fragment Lenght Polymorphism (RFLP). DNA fingerprints. DNA molecular probes and molecular ibridization systems (Southern Blotting). DNA sequencing: chemical and enzymatic methods, automated DA sequencing. DNA rapid screening systems: DNA microarray and DNA microchip. DNA based biosensors, their construction and utilization for specific microorganism detection. Computer cluster creation.
Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard
Required reading:	REDDY, C. A.: Methods for General and Molecular Microbiology. ASM, Washington, 2007. WESTERMEIER, R.: Electrophoresis in Practice. Wiley-VCH, Weinheim, 2005. MARKS, R. et al.: Handbook of Biosensors and Biochips. Wiley, Chichester, 2007. GLICK, B. J. ; PASTERNAK, J.: Molecular Biotechnology. ASM, Washington, 2003. POLI, G.: Biotecnologie conoscere per scegliere. UTET, 2001. RATLEDGE, C. ; KRISTIANSEN, B.: Biotecnologie di base. Zanichelli, 2004.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Advanced chromatographic techniques in grape and wine analysis**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Manzano, Marisa (University of Udine)
Lecturers:	Moret, Sabrina; Nicolò Dossi (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and Development in Enology Module group: Advanced biomolecular and chemical techniques applied to enological products
Teaching format:	Regular lectures and paper discussion
Workload:	Face to face lectures: 33 h; laboratory activities:14 h Student's personal study time in the module: 78 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Basic knowledge of chemistry
Targeted learning outcomes:	Students have profound knowledge about the main parameters influencing alcoholic fermentation.
Content:	The importance of sample preparation in wine and grape analysis: Liquid-Liquid Extraction (LLE) , Solid-Phase Extraction (SPE), Solid-Phase Microextraction (SPME), Stir bar sorptive extraction (SBSE), Molecularly Imprinted Polymers (MIP), QuEChERS: basic principles and relevant applications examples (i.e., polyphenols, organic acids, mycotoxins, etc) Gas chromatography in wine and grape analysis: Basic principles of GC, GC instrumentation and column, GC separations, GCxGC tecnhinque, identification and quantification of detected compounds, relevant applications examples. Liquid chromatography in wine and grape analysis: Basic principles of LC, LC instrumentation, column and detectors, LC

	and fast LC separations, identification and quantification of detected compounds, relevant applications examples.
Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard
Required reading:	KÖNIG, H. ; UNDEN, G. ; FRÖHLICH, J.: Biology of Microorganisms on Grapes, in Must and in Wine. Springer, Berlin, 2009. PRIEST, F. G. ; CAMPBELL, I.: Brewing Microbiology. Kluwer, New York, 2003. RIBEREAU-GAYON, P. ; DUBORDIEU, B. ; LONVAUD, A.: Handbook of Enology, VOL 1 & 2,. Wiley, Hoboken, 2006. ROSE, A. H.: Yeast technology. Academic Pr., London, 1993. VINCENZINI, M. ; ROMANO, P. ; FARRIS, G.: Microbiologia del vino. CEA, Milano, 2005.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module group: Separation, stabilisation and packaging techniques in enology

Module name	Stabilisation techniques for a low impact enology
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Celotti, Emilio (University of Udine) file:///C:/Users/Emilio/Downloads/result-14.pdf
Lecturers:	Celotti, Emilio (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and Development in Enology Module group: Separation, stabilisation and packaging techniques in enology
Teaching format:	Regular lectures
Workload:	Face to face lectures: 36 h; Student's personal study time in the module: 64 h
Credit points:	4 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Good knowledge of grape quality control and good knowledge of red and white winemaking
Targeted learning outcomes:	The students have a deep knowledge of several low impact techniques concerning the wine stability considering chemical physical microbiological and organoleptic aspects. They know the physical, chemical and technological aspects of wine stability obtained using a low impact enology
Content:	The clarification by flotation combined with the hyperoxidation and cross-flow filtration of the musts. Winemaking in protection from oxygen, use of antioxidants and technical gases. Low input techniques to preserve the organoleptic properties of the wine. New oenological practices recently approved for the stabilization of wines. Systems for the study and management of the colloidal

	stability of wines. Rapid techniques for the control of chemical and physical stability of wines. Management of yeast derivatives and polysaccharides in wine. Conservative and subtractive techniques for the wine stabilization with low impact techniques. Tartaric precipitation and techniques for tartaric stabilization of wine. Use of ultrasound in the winemaking industry. Stabilization of red wine colour by the management of oxygen in maceration and aging. Filterability index of wines and sterile filtration. Practical laboratory experiments on topics and technical visits at specialized external companies.
Assessment methods and criteria:	Oral examination
Forms of media:	visual supports (PowerPoint)
Required reading:	RIBEREAU-GAYON, P. ; DUBORDIEU, D. ; DONECHE, B. ; LONRAU, A.: Handbook of Enology. Volume 1. The Microbiology of Wine and Vinifications (2nd Ed.). Wiley, Chichester, U.K., 2006. RIBEREAU-GAYON, P. ; GLORIES Y. ; MAUJEAN, A. ; DUBORDIEU, D.: Handbook of Enology. Volume 2. The Chemistry of Wine, Stabilization and Treatments (2nd Ed.). Wiley, Chichester, U.K, 2006. CELOTTI, E. ; CACCIOLA, V. ; DELL'EVA, M.: Recent acquisitions on interactions between tannins and polysaccharides. 2010. Oral communication, 60th German Grape and Wine Congress, Stuttgart march 24th to 28th, PDF 31-41 ZIRONI, R. ; CELOTTI, E. ; BATTISTUTTA, F.: Research for a marker of the hyperoxygenation treatment of musts for the production of white wines(1997). In: Am. J. Enol.Vitic., 1997, 48, 150-156. FERRARINI, E. ; CELOTTTI, E. ; ZIRONI, R. ; Buiatti, S.: Recent advances in the process of flotation applied to the clarification of grape musts. In: Journal of Wine Research, 1995, 6(1), 19-33 CACCIOLA, V. ; FERRAN BATLLO, I. ; FERRARETTO, P. ; VINCENZI, S. : CELOTTI, E.: Study of the Ultrasound effects on yeast lees lysis in winemaking. In: Eur. Food Res. Technol., 2013, 236, CELOTTI, E. ; BRANCA, G. ; MARTELLOZZO, E.: Evaluation de qualité et d'efficacité des bentonites. In: Bull. OIV, 2006, 79, 909-910, 628-648. Codex Enologique International, OIV, Codex International des Pratiques Enologiques, OIV, Enological OIV resolutions. https://www.oiv.int/it Natolino Andrea, Roman Tomas, Gallo Adelaide, Celotti Emilio (2023). Yeasts protein extracts: sustainable strategy for wine protein stabilization, oral communication for International Award at Enoforum WEB Scientist, 13 March 2023., Enoforum Italia 16-18 MAGGIO 2023 IVES Cenference Series in press Natolino A., Tat L., Roman T., Gallo A., Celotti E., 2023. Use of potassium polyaspartate on white wines: interaction with proteins

	and aroma compounds, Food Research International, 168 (2023) 112768, 1-9. Emilio Celotti, Georgios Lazaridis, Jakob Figelj, Yuri Scutari, Andrea Natolino, 2022. Comparison of a Rapid Light-Induced and Forced Test to Study the Oxidative Stability of White Wines. In Special Issue "Wine Sensory Faults: Origin, Prevention and Removal" Molecules 2022, 27(1), 326, 1-14. Natolino A. and Celotti E., 2021-22. Ultrasound treatment of red wine: Effect on polyphenols, mathematical modeling, and scale-up considerations. LWT - Food Science and Technology, online 23 November 2021; 154 (2022) 112843, 1-8. Celotti E., Roman T., Nicolini G., Bellantuono E., Osorio M., Cardona J., Natolino A., 2021. High power ultrasound on protein stability of white wines: preliminary study of amplitude and sonication time, LWT - Food Science and Technology, 147 (2021) 111602. Comuzzo P., Natolino A., Celotti E. 2021-22. Sustainable approach to quality control of grape and wine, 327-349. Book Chapter in Improving Sustainable Viticulture and Winemaking Practices, 1st Edition Elsevier / academic press. Celotti E., Stante S., Ferraretto P., Roman T., Nicolini G., Natolino A., 2020. High power ultrasound treatments of red young wines: effect on anthocyanins and phenolic stability indices. Foods, 2020, 9, 1344. Tomás Román Villegas, Loris Tonidandel; Giorgio Nicolini; Elisabetta Bellantuono; Laura Barp; Roberto Larcher; Emilio Celotti, 2020. Evidence of the possible interaction between ultrasound and thiol precursors, Foods 2020, 9, 104.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Physical separation processes and wine conditioning and packaging technologies**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Udine
Semester:	3rd Semester
Module group coordinator:	Celotti, Emilio (University of Udine)
Lecturers:	Comuzzo, Piergiorgio (University of Udine)
Language:	English
Classification within the curriculum:	Module of specialization: Research and Development in Enology Module group: Separation, stabilisation and packaging techniques in enology
Teaching format:	Regular lectures; technical visits; seminars
Workload:	Face to face lectures: 40 h; Technical visits 8 h; Seminars 7 h Student's personal study time in the module: 95 h
Credit points:	6 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	The students acquire knowledge concerning the critical aspects connected to bottling, packaging and delivering wine; they also learn insights about how to manage bottling as well as the technologies used for wine filtration and the physical separation processes in enology.
Content:	Importance of packaging; Modifications of wine after packaging and factors affecting oxygen permeation in the package. Predictive stability tests and treatments carried out before bottling. Materials for wine packaging: production and technical characteristics. Glass, stainless steel kegs, cans, PET, Bag in Box and Tetrabrik containers; Capsules and Labels: production, technical characteristics and controls; Glues for labeling: starch, dextrin, casein, synthetic and

	hot-melt glues; Self-adhesive labels; Cardboard boxes for packaging; Quality control on packaging materials. Wine closures: corks, synthetic closures, screw caps, other closures; Management and technical decisions related to wine capping. Elements of hygiene and safety for wine conditioning plants. Main components of a wine packaging line and their management. Solid-liquid separation: characteristics of the solids. Static sedimentation; Stokes law. Flotation: basic principles, mechanisms of gas-solid interaction; differential pressure flotation: flotation plants; Discontinuous flotation; Centrifugation: basic principles; Centrifugal separators: Vertical centrifuges; Hydrocyclones; Dekanters. Filtration: basic principles and Darcy law; Filtration systems: Press filters, Pressure chamber filters, Vacuum filters; Criteria for filter selection. Materials for filtration: cellulose and plate sheets, perlite and diatomite. Membrane filtration: production and characteristics of membrane filters; Final filtration; Dimensioning of membrane filters; Changes induced by filtration. Cross-flow filtration (CFF): materials, module configuration, management and changes induced by CFF. Electrodialysis. Dealcoholization techniques: Spinning cone column, Pervaporation. Osmotic processes: Nanofiltration and Reverse osmosis for wine treatment
Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard, videos
Required reading:	
Optional reading	Ribéreau-Gayon P., Dubourdieu D., Doneche B., Lonraud A. Handbook of Enology. Volume 1. The Microbiology of Wine and Vinifications (2nd Ed.). John Wiley & Sons Ltd., Chichester, U.K. (2006). Ribéreau-Gayon P., Glories Y., Maujean A., Dubourdieu D. Handbook of Enology. Volume 2. The Chemistry of Wine, Stabilization and Treatments (2nd Ed.). John Wiley & Sons Ltd., Chichester, U.K. (2006). Margalit, Y. Elementi di chimica del vino. Eno-One, Reggio Emilia (2005) Brotto, L., Battistutta, F., Tat, L., Comuzzo, P., & Zironi, R. (2010). Modified nondestructive colorimetric method to evaluate the variability of oxygen diffusion rate through wine bottle closures. J. Agric. Food Chem., 58(6), 3567-3572.

	Godden P., Francis L., Field J., Gishen M., Coulter A., Valente P., Høj P., Robinson E. Wine bottle closures: physical characteristics and effect on composition and sensory properties of a Semillon wine. 1. Performance up to 20 months post-bottling. Australian Journal of Grape and Wine Research, 7:64-105 (2001). Anelli, G.; Massantini, R.; Villani, R. Prove di conservazione del vino in contenitori alternativi al vetro. Industrie delle Bevande, 12:429-438 (1987). Buiatti, S.; Celotti, E.; Ferrarini, R.; Zironi, R. Wine packaging for market in containers other than glass. J. Agric. Food Chem., 45:2081-2084 (1997). Galassi, S. Studi sul confezionamento del vino in contenitori alternativi al vetro. Industrie delle Bevande, 2:30-35 (1985). Lorusso, S. I contenitori alternativi al vetro per il confezionamento dei vini. Caratteristiche di conservazione e costi a confronto. Industrie delle Bevande, 6:254-267 (1985). Spera, G. Contenitori in materia plastica per la conservazione del vino: P.E.T. e Bag in box. Industrie delle Bevande, 8:257-262 (1991). Peri C. La filtrazione nell'industria alimentare. Edizioni AEB, Brescia, Italy (1983). Records A., Sutherland K. Decanter centrifuge handbook (1st Ed.). Elsevier Advanced Technology, Oxford (2001) Pickering G.J. Low- and Reduced-alcohol Wine: A Review. Journal of Wine Research, 11(2): 129-144 Comuzzo, P., & Battistutta, F. (2019). Acidification and pH Control in Red Wines. In A. Morata, Red Wine Technology (pp. 17-34): Academic Press. Karbowiak, T.; Gougeon, R. D.; Alinc, J. B.; Brachais, L.; Debeaufort, F.; Voilley, A.; Chassagne, D., Wine Oxidation and the Role of Cork. *Critical Reviews in Food Science and Nutrition* 2010, 50, 20-52. Lopes, P.; Saucier, C.; Y.;, G., Nondestructive colorimetric method to determine the oxygen diffusion rate through closures used in winemaking. *J. Agric. Food Chem.* 2005, 53, 6967-6973. Lopes, P.; Saucier, C.; Teissedre, P.-L.; Glories, Y., Main Routes of Oxigen Ingress through Different Closures into Wine Bottles. *Journal of Agricultural and Food Science* 2007, 55, 5167-5170. Hart, A.; Kleinig, A., The role of oxygen in the aging of bottled wine. *Aust. Grapegrow. Winemaker* 2005, 497a, 79-80, 82-84, 86, 88.
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Specialisation:
Economy and Marketing in Wine Business (VERONA) (30 ECTS credits)

	Credit points
Module group: Wine marketing and communication	**10**
Advanced tools for marketing and communication (AGR/01)	5
New wine marketing tools (AGR/01)	5
Module group: Wine business management tools	**10**
Financial statement analysis and planning (SECS-P/07)	5
Investments analysis and appraisal in the wine business (AGR/01)	5
Module group: Sustainable Wine Management	**10**
Approaches to sustainability in the wine industry (AGR/01)	5
Sustainable wine market analysis and perspectives (AGR/01)	5

Module group: Wine marketing and communication

Module name	Advanced tools for marketing and communication
Module code	AG1058
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Capitello, Roberta (University of Verona)
Lecturers:	Bazzani, Claudia (University of Verona)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: Economy and Marketing in Wine Business Module group: Wine marketing and communication (University of Verona)
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 50 h; Student's personal study time in the module: 75 h (including student's research project on a topic of the module)
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Basic knowledge of marketing communication -
Targeted learning outcomes:	Students have a good knowledge of the strategic role and of the implementation of marketing and communication process in the field of business management and decision-making process..
Content:	Main topics: - Creating Customer Relationships and Value through Marketing - Developing Successful Marketing and Organizational Strategies - Competitive Strategy - Market research - Market Segmentation, Targeting, and Positioning - Qualitative research methods - Quantitative research methods - Supply chain management

Assessment methods and criteria:	Written exam. The exam will consist of three open questions. The student should develop a discussion for each question in order to show depth and breadth of knowledge, economic language skills, ability to critical analysis and ability to link the different topics proposed during the course.
Forms of media:	Access to Moodle platform at the University of Verona to gather teaching material
Required reading:	Lecture's presentations, power point and blackboard, academic papers recommended during lectures
Optional reading	- Kerin, Hartely, Ruderius; Marketing (11° edition), - Michael R Solomon, Tracy Tuten; Social Media Marketing: Pearson New International Edition, - Anol Bhattacherjee; Social Science Research: Principles, Methods, and Practices
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	New wine marketing tools
Module code	AG1059
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Capitello, Roberta (University of Verona)
Lecturers:	Capitello, Roberta (University of Verona)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: Economy and Marketing in Wine Business Module group: Wine marketing and communication (University of Verona)
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 50 h; Student's personal study time in the module: 75 h (including student's research project on a topic of the module)
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Basic knowledge of marketing communication -
Targeted learning outcomes:	Students have a good knowledge of the strategic role and of the implementation of marketing and communication process in the field of business management and decision-making process.
Content:	The approach to the wine marketing. The 8Ps of wine marketing. The phases of marketing research. How to obtain secondary data. Primary data for wine businesses. Advanced data gathering and analysis techniques. Wine consumer behaviour. The perception of wine quality. Wine choice. Wine market segmentation. The role of social and psychological variables in consumer clustering. Wine branding and labelling. Corporate and collective brand strategies. Wine packaging styles. Communication goals and new media in the wine industry. Territorial marketing and the role of food and wine business. Food and wine supply and destination branding.

Assessment methods and criteria:	Written exam. The exam will consist of three open questions. The student should develop a discussion for each question in order to show depth and breadth of knowledge, economic language skills, ability to critical analysis and ability to link the different topics proposed during the course.
Forms of media:	Access to Moodle platform at the University of Verona to gather teaching material
Required reading:	Lecture's presentations, power point and blackboard, academic papers recommended during lectures
Optional reading	HALL, M. C. ;, MITCHELL, R.: Wine Marketing. A practical guide, Butterworth-Heinemann, Elsevier, 2008. CHARTERS, S.: Wine and Society. The social and cultural context of a drink. Butterworth-Heinemann, Elsevier, 2006. HALL, M. C. ; SHARPLES, L.: Food and wine festivals and events around the world. Butterworth-Heinemann, Elsevier, 2008. CARLSEN, J. ; CHARTERS, S.: Global wine tourism. Research, Management and Marketing. Cabi, 2006.
Other learning resources/tools (specific to the module) if applicable	-
Last updated in:	October 2023

Module group: Wine business management tools

Module name	**Financial statement analysis and planning**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Scarpa, Riccardo (University of Verona)
Lecturers:	Moggi, Sara (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Economy and Marketing in Wine Business Module group: Wine business management tools
Teaching format:	Regular lectures
Workload:	Face to face lectures: 47 h; Student's personal study time in the module: 78 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	
Content:	1. Financial and Managerial Accounting + stakeholder perspective 2. Analyzing and Recording Business Transactions 3. Adjusting the Accounts 4. Foundations of Financial Reporting 5. Inventory and depreciation 6. IAS 41 – the accounting treatment for biological assets 7. Income Statement 8. Financial statement analysis 9. Sources of Finance

	10. Managerial Accounting and Cost Concepts 11. Activity-Based Costing 12. Management control for Sustainability in wineries 13. Measuring and reporting Sustainability in wineries
Assessment methods and criteria:	Attending students: Essay consignment and presentations (70%) + Written Exam (+colloquium) (30%) No-attending students: Written Exam (+colloquium) (30%)
Forms of media:	Power point, blackboard
Required reading:	Moggi, S., Pagani, A., & Pierce, P. (2020). The rise of sustainability in Italian wineries: key dimensions and practices. Electronic Journal of Management, 1(2020), 1-20. Christ, K. L., & Burritt, R. L. (2013). Critical environmental concerns in wine production: an integrative review. Journal of Cleaner Production, 53, 232-242. Biondi, L., Gulluscio, C., Rossi, A., & D'Alessio, L. (2017). Accounting costs without a cost accounting system: the case of a small Italian winery of excellence. Piccola Impresa/Small Business, (3).
Optional reading	Moggi, S., Pierce, P., & Bernardi, N. (2021). From sustainability to thrivability: A novel framework for entrepreneurial ecosystems. International Entrepreneurship and Management Journal, 1-25.
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Investments analysis and appraisal in the wine business**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Scarpa, Riccardo (University of Verona)
Lecturers:	Scarpa, Riccardo (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Economy and Marketing in Wine Business Module group: Wine business management tools
Teaching format:	Regular lectures
Workload:	Face to face lectures: 50 h; Student's personal study time in the module: 75 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	The students are able to examine the estimation of value as related to investments, real estate valuation and rights, at present more relevant for wineries.
Content:	1. Introduction to the course and its organisation, history and evolution of the subject, basic concepts and links to economics. 2. Introduction to the elements of financial mathematics and their use in discounting and future values of assets and incomes, interest (simple and compounded), periodicities, annuities, discounting and the role of time, present & future value 3. Diversity between saving and investment, examples in wine sector. 4. Flows of revenues and costs, cumulations at beginning, at the end and at intermediate moments, amortization instalments, annual and multi-annual values limited or perennial.

	5. Determinants of discount factors, differences between real and nominal interest rates. 6. Uncertainty in investment plans and its formal inclusion as subjective and objective probabilities. 7. Identification and assessment of the returns to investment from labour-saving technology. 8. A typical revenue and cost distribution over time for a vineyard, and its optimal age of replacement. 9. Investment analysis in activities of wine-making, wine aging and bottling. 10. Assessment of investments from the financial, social and familial perspective. 11. Portfolio management and subjective versus market valuation of financial products 12. Grape hail insurance, private and subsidised. 13. Numerical risk simulation, with and without subjective probabilities (group assignment) 14. Market value of the vineyard plot, and market value of the vertically integrated winery and its optimal scale 15. Threshold prices for entry and exit decision under uncertainty. 16. Investment analysis in individual reputation and in the district of production 17. Case studies from around the world. 18. Tutorials on computation with R (via R-Studio) and MS-Excel
Assessment methods and criteria:	Oral examination
Forms of media:	Power point and blackboard
Required reading:	SHERRICK, B. J. ; ELLINGER, P. N. ; LINS, D.: A.: Time Value of Money and Investment Analysis, Dept. of Agricultural and Consumer Economics and Dept. of Finance, University of Illinois, Urbana – Champaign, 2000. BAUER, L. ; BUSHE, D.: Managing the Modern Farm Business: Agricultural Investment Analysis, Faculty of Extension, University of Alberta, 2005. BAUER. L.: Agricultural Investment Analysis, Faculty of Extension, University of Alberta, 2005.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module group: Sustainable Wine Management

Module name	Approaches to sustainability in the wine industry
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Module coordinator:	Scarpa, Riccardo (University of Verona)
Lecturer:	Scarpa, Riccardo; Ricci, Elena Claire (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Economy and Marketing in Wine Business Module group: Sustainable Wine Management
Teaching format:	The course includes: lectures using slides, in-depth seminars with the participation of experts, discussions with students, group work for deepening some specific issues and for a first application of the knowledge obtained to real cases.
Workload:	Face to face lectures 40 h Student workload 85 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	The module on Approaches to sustainability in the wine industry will cover the following topics: - Sustainability as value for wine regions and wineries: introduction. - Life Cycle Analysis of wine production at the different stages of the supply chain. - Implementing sustainability: main tools and programs. Certification schemes and the protocols at the national and international level. - Case studies.
Assessment methods and criteria:	

Forms of media:	
Required reading:	
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	Sustainable wine market analysis and perspectives
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Module coordinator:	Scarpa, Riccardo (University of Verona)
Lecturer:	Ricci, Elena Claire (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Economy and Marketing in Wine Business Module group: Sustainable Wine Management (University Verona)
Teaching format:	The course includes: lectures using slides, in-depth seminars with the participation of experts, discussions with students, group work for deepening some specific issues and for a first application of the knowledge obtained to real cases.
Workload:	Face to face lectures: 50 h; Student's personal study time in the module: 75 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	No prerequisites
Targeted learning outcomes:	At the end of the course, the student will acquire the ability to: • critically assess sustainability approaches • propose and apply sustainability principles in corporate strategies.
Content:	The module on Sustainable Wine Market Analysis and Perspectives will cover the following topics: The evolving concept of the sustainable development and its application to the wine sector. Principles of the circular economy. Sustainability trends, future market scenarios for sustainable wine making and marketing strategies. The role of institutions in promoting sustainable wine (institutional design for sustainability). Winegrowers views and motivations: drivers and barriers to the adoption of sustainable practices. Market research for sustainable wine focusing on consumer

	interest and concerns related to the sustainability of wine. Case studies.
Assessment methods and criteria:	Project work and written examination.
Forms of media:	Slides, blackboard,websites, Wooclap.
Required reading:	Course material and scientific papers.
Optional reading	S. Taylor. The Business of Sustainable Wine. 2017. Board and Bench publishing
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Specialisation:
Identity, Typicality, Terroir
(VERONA) (20 ECTS credits)

	Credit points
Module group: Wine identity and typicality	**10**
Wine identity and typicality (AGR/15)	4
Analytical methods and data treatments strategies for products authentications (CHIM/10)	3
Microbial terroir (AGR/16)	3
Module group: Analysis of viticultural terroirs	**10**
Elements of terroirs (AGR/03)	4
Viticulture soils and rootstocks in grapevine cultivation (AGR/13)	3
Varietal and genetic identity of grapevine (AGR/07)	3

Module group: Identity, Typicality, Terroir

Module name	**Wine identity and typicality**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Ugliano, Maurizio (University of Verona)
Lecturers:	Ugliano, Maurizio (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Identity, Typicality, Terroir Module group: Wine identity and typicality
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 32 h; Student's personal study time in the module: 68 h (including student's research project on a topic of the module)
Credit points:	4 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	Wine quality and the value of the identity and typicality of wines Sensory defects in wines as limiting factors for the expression of identity and typicality: microbiological defects, defects of chemical origin, exogenous chemical contamination. Technological aspects of wine faults management. Technical tasting of wines representative of the main organoleptic faults. White and rosé vinification and the main models of typicality and identity Thiolic wine models. Chemical and sensory characteristics, technological aspects (with technical wine tasting) Terpenic wine models. Chemical and sensory characteristics, technological aspects (with technical wine tasting)

	Models of wine from neutral white grapes. Chemical and sensory characteristics, technological aspects (with technical wine tasting) Red vinification and the main models of typicality and identity Medium-bodied red wine models. Chemical and sensory characteristics, technological aspects (with technical wine tasting) Full-bodied red models with different phenolic profiles and destined to aging. Chemical and sensory characteristics, technological aspects (with technical wine tasting) Models based on special vinifications: white passito, Amarone, others. Chemical and sensory characteristics, technological aspects (with technical wine tasting) Winery practices for managing the typicality and identity of productions in the context of climate change.
Assessment methods and criteria:	Oral exam
Forms of media:	PowerPoint presentation
Required reading:	Selected literature reported on the slides
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Analytical methods and data treatments strategies for products authentications**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Ugliano, Maurizio (University of Verona)
Lecturers:	Ciulu, Marco (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Identity, Typicality, Terroir Module group: Wine identity and typicality
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	Food traceability Definition, basic concepts, examples. European seals. Food authenticity, safety and integrity. Food fraud: definitions and examples relating to products in the wine sector. Fraud detection bodies and control tools. Analytical methods Definition and classification of analytical methods. Errors in chemical analysis. Quantitative methods. Validation of analytical methods (overview). Presentation of OIV Compendium methods. Chromatographic methods General aspects of chromatography. Classification of the main chromatographic techniques.

	Gas chromatography. Principles of the technique. Gas chromatographic instrumentation (overview). Gas chromatographic analytical methods applied to wine products. HPLC. Principles of the technique. HPLC instrumentation (overview). HPLC techniques. HPLC analytical methods applied to products of the wine sector. Mass spectrometry Principles of the technique. Mass spectra. Mass spectrometer: ion sources, analysers and detectors. Tandem mass spectrometry. Chromatographic techniques coupled to mass spectrometry. Application examples of LC-MS, LC-MS/MS and GC-MS methods for verifying the authenticity of wine products. Isotope ratio mass spectrometry (IRMS) Stable isotope ratios of bioelements: basic concepts, variability factors, use in official contexts, databases, instruments (overview). Chromatographic techniques coupled to isotope mass spectrometry. Examples of application of isotopic mass spectrometry concerning the oenological chain. ICP-MS Principles of the ICP-MS technique and instrumentation (overview). Mineralisation. Isobaric interferences. ICP-MS applications to products of the wine industry. Multivariate analysis General principles of multivariate analysis. Definition and classification of the main multivariate analysis methods. Supervised and unsupervised methods. Multivariate statistical approaches for the authentication of products from the wine sector. Omics" approaches Analysis tools, techniques and methods. Metabolomics and applications in oenology
Assessment methods and criteria:	Oral exam. The student will prepare a presentation regarding a scientific article chosen in agreement with the teacher. The presentation involves the preparation of slides and should last approximately 15 minutes; the presentation will be followed by a discussion aimed at verifying the degree of understanding and depth achieved by the student.
Forms of media:	
Required reading:	
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	Microbial terroir
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Ugliano, Maurizio (University of Verona)
Lecturers:	Felis, Giovanna (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Identity, Typicality, Terroir Module group: Wine identity and typicality
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	Microbial biogeography and culture-independent analysis techniques of microbial biodiversity (PCR-DGGE, metabarcoding and metagenomics): general aspects and specific application to the vine-wine context. Cultivation and identification of microorganisms: concept of species and strain for yeasts and bacteria and their importance for the concept of microbial terroir. The valorisation of microbial biodiversity: from the characterization of the strains to the production of microbial biomass (basics).
Assessment methods and criteria:	Oral exam, based on the critical presentation of a scientific paper. During the exam, the student must demonstrate the knowledge acquired during the course, including technical language, and the understanding of the experimental design and itspros and cons.

Forms of media:	PowerPoint presentations
Required reading:	Specific literature reported on slides
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module group: Analysis of viticultural terroirs

Module name	Elements of terroirs
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Zamboni, Anita (University of Verona)
Lecturers:	Fasoli, Marianna (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Identity, Typicality, Terroir Module group: Analysis of viticultural terroirs
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 32 h; Student's personal study time in the module: 68 h (including student's research project on a topic of the module)
Credit points:	4 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	To follow the course and pass the exam, knowledge of basic notions of biochemistry, agricultural genetics and viticulture and physiology of the vine is required.
Targeted learning outcomes:	Know the different approaches to the notion of terroir as defined in viticulture, and the possibilities to analyze and classify the elements that compose it, such as the climate, the soil, the grape variety.
Content:	The course introduces the student to the study of wine-growing territories intended as complex systems of interaction between cultivars and specific abiotic and biotic factors related to climate, soil, rootstock and cultivation techniques. The student will know the different approaches to the notion of terroir as defined in viticulture, and the possibilities to analyze and classify the elements that compose it. Through participatory discussions, the illustration of case studies and the application of the above knowledge, the student will have acquired the ability to understand the link between the quality of the wine production and the territory, and will be able

	to evaluate the characteristics and potential of typicality of a cultivation site.
Assessment methods and criteria:	The exam consists in an oral colloquium. The exam is aimed at evaluating the student's knowledge of the whole program of the course paying attention to the depth of acquired knowledge and the ability to systematically connect topics. The exam can also entail presentation and critical discussion of a case study. The mark will be expressed in 30-point scale.
Forms of media:	Not applicable.
Required reading:	Not applicable.
Optional reading	The Science of Grapevines. Keller, Márkus. 2020. Elsevier Science & Technology. ISBN:0128163658
Other learning resources/tools (specific to the module) if applicable	Not applicable.
Last updated in:	October 2023

Module name	**Viticulture soils and rootstocks in grapevine cultivation**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Zamboni, Anita (University of Verona)
Lecturers:	Zamboni, Anita (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Identity, Typicality, Terroir Module group: Analysis of viticultural terroirs
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h (including student's research project on a topic of the module)
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	To follow the course and pass the exam, knowledge of basic notions of biochemistry, agricultural genetics and physiology of the vine is required.
Targeted learning outcomes:	Know the soil characteristics able to influence the grapevine metabolism and relate them to the typicality aspects.
Content:	- The soil as an element of terroir (myth or reality?). - The main characteristics of soil (granulometry, organic matter, pH, C.E.C.) and of the environment (e.g. water availability) and their influence on the terroir. - The rhizosphere as key element of the grapevine-soil interaction. - The anomalous soils (acid, alkaline, saline, submerged) and their effects on the viticulture. - The rootstocks and grapevine mineral nutrition. The relation between cultivar and rootstock.
Assessment methods and criteria:	The exam consists in an oral colloquium. The exam is aimed at evaluating the student's knowledge of the whole program of the course paying attention to the depth of acquired knowledge and

	the ability to systematically connect topics. The mark will be expressed in 30-point scale.
Forms of media:	Not applicable.
Required reading:	- Marschner's mineral nutrition of higher plants. Third Edition. Marschner, Petra. 2012. Academic Press. ISBN: 1283249871 - The Science of Grapevines. Keller, Márkus. 2020. Elsevier Science & Technology. ISBN: 0128163658
Optional reading	Not applicable.
Other learning resources/tools (specific to the module) if applicable	Not applicable.
Last updated in:	October 2023

Module name	Varietal and genetic identity of grapevine
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Zamboni, Anita (University of Verona)
Lecturers:	Bellin, Diana (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: Identity, Typicality, Terroir Module group: Analysis of viticultural terroirs (University of Verona)
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h (including a practical research project on a topic of the module)
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	To follow the course and pass the exam, knowledge of basic notions of agricultural genetics, viticulture and physiology of the vine is required.
Targeted learning outcomes:	Know the most recent molecular tools for genetic, genomic analysis and high throughput genotyping in grapevine; apply, evaluate and communicate results of genetic analysis for the variety and clone identification and for describing the genetic diversity and relationships among varieties, in the frame of the identity of a cultivation area.
Content:	Molecular tools for grapevine genetics and genome analysis: SSR discovery and their application; genome sequencing history; current version of assembly and annotations; resequencing and new sequencing approaches; SNPs and current tools for high throughput SNPs genotyping and genome analysis (Arrays, RADSeq and GBS examples; rhAMP) Evaluation of genetic distance: general concepts about genetic distance; variety definition and varietal identification in grapevine by SSR and by SNPs; scoring of parent/offspring relationships and genetic relationships in grapevine; basics on grapevine domestication history knoleedge; genetic diversity estimation; germplasm collections and example of their study and

	characterization; clones; varietal vs clonal identification in grapevine by molecular analysis; Complex traits and variance components, environmental effect and genotype/environment interaction; methods for trait mapping in biparental cross populations or by genotype/phenotype association in variety collections; discussion of approaches and recent studies for the interpretation of grape genetic identity features, varietal traits and environmental interaction; Grape breeding: traditional methods, marker assisted selection (MAS) and available markers and overview of current breeding projects and main targets, perspective on new breeding technologies (NBT) and some example of application
Assessment methods and criteria:	The exam consists in an oral colloquium. The exam is aimed at evaluating the student's knowledge of the whole program of the course paying attention to the depth of acquired knowledge and the ability to systematically connect topics. The mark will be expressed in 30-point scale.
Forms of media:	Not applicable.
Required reading:	Not applicable.
Optional reading	Miglioramento genetico delle piante, Edagricole 2018
Other learning resources/tools (specific to the module) if applicable	Scientific papers provided by the lecturer
Last updated in:	October 2023

Specialisation:
New Frontiers in Viticulture and Enology (VERONA) (20 ECTS credits)

	Credit points
Module group: Advancements in precision grape and wine production	**10**
Precision management of grape ripening and post-ripening (AGR/03)	4
New breeding technologies for next-generation grapevine (AGR/07)	3
Precision enology (AGR/15)	3
Module group: Environmental Sustainability	**10**
Integrated pest management and phytosanitary certification (AGR/12)	3
Sustainable management of winery waste and wastewater (AGR/09)	2
Sustainable management of soil and water in viticulture (AGR/08)	3
Advanced approaches in sustainable vine nutrition (AGR/13)	2

Module group: Advancements in precision grape and wine production

Module name	**Precision management of grape ripening and post-ripening**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Tornielli Giovanni Battista (University of Verona)
Lecturers:	Tornielli Giovanni Battista (University of Verona)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: New Frontiers in Viticulture and Enology Module group: Advancements in precision grape and wine production
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 32 h; Student's personal study time in the module: 68 h (including student's preparation of the critical presentation of a case study agreed upon with the lecturer)
Credit points:	4 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	The ripening dynamics of grapes and the evolution of quality traits. Alignment and decoupling of ripening parameters. - Physiological basis and molecular interpretation of the maturation process. Monitoring systems, agronomic and hormonal approaches, precision cultivation practices for the control and management of ripening. Ripening, overripening, dehydration ("appassimento"). Methods and aims of grape drying for wine production. The case of Amarone and other passito wines from the Verona province. Technological, physical, chemical, physiological and molecular aspects of the process of grape dehydration. Study and control of grape

	dehydration kinetics. Intrinsic factors and environmental parameters that influence the dehydration rate and the development of qualitative traits in dried grapes. Didactic methods
Assessment methods and criteria:	The learning outcomes will be assessed by an oral test. The aim of the test is to ascertain the knowledge of the topics covered in the program through the critical discussion of a case study agreed upon with the lecturer. The depth and breadth of knowledge acquired, the ability to systematically connect knowledge, and the language properties will be assessed. The ability to synthesize and the critical sense in the presentation of case studies will also be evaluated.
Forms of media:	
Required reading:	
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**New breeding technologies for next-generation grapevine**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Tornielli Giovanni Battista (University of Verona)
Lecturers:	Zenoni Sara (University of Verona)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: New Frontiers in Viticulture and Enology Module group: Advancements in precision grape and wine production (University of Verona)
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h (including student's research project on a topic of the module)
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	• illustration of the most recent platforms for obtaining genomic, transcriptomic and metabolomic data; • processing, integration and biological interpretation of -omic data; • description and discussion of the most recent studies conducted with -omic approaches on plant and berry development, also in relation to the environment and cultivation practices; • description of the most recent biotechnological approaches, known as New Breeding Techniques (NBT), for the genetic improvement of the vine: limits and future perspectives;

	• illustration of the in vitro regeneration, somatic embryogenesis and protoplasts isolation processes; • the genome editing approach as a fundamental tool for the development of the new generation viticulture.
Assessment methods and criteria:	The evaluation consists in an oral exam with open questions. The student has the opportunity to present and discuss results of a scientific paper chosen from some proposals of the teacher or by the student himself. The performance of the presentation will be evaluated and will contribute to the final evaluation. The knowledge related to the main approaches of genetic improvement of the vine in relation to new molecular technologies will be evaluated. The ability to argue and propose solutions to address current and future problems of viticulture will be evaluated
Forms of media:	
Required reading:	
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	Precision enology
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Tornielli Giovanni Battista (University of Verona)
Lecturers:	Slaghenaufi, Davide (University of Verona)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: New Frontiers in Viticulture and Enology Module group: Advancements in precision grape and wine production (University of Verona)
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	The main topics covered in the course are: Introduction to the course, factors influencing sensorial quality and microbiological chemical stability of wine. Definition of precision enology. Determination of enological aims and development of targeted winemaking protocols. Process control. At-line control methods, instruments and enological interest of the data (spectroscopy, refractometry, potentiometry, electrochemistry). In-line sensor systems, instruments and enological interest of the data (pH, O2, temperature). Internet of Things (IoT) systems and automation in cellar. Statistical data processing and development of predictive models for decision support. Data fitting, linear and non-linear

	regressions, parameter identification. Elements of machine learning
Assessment methods and criteria:	Oral exam
Forms of media:	PowerPoint presentations
Required reading:	Specific literature reported on slides
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module group: Environmental Sustainability

Module name	**Integrated pest management and phytosanitary certification**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Mori, Nicola (University of Verona)
Lecturers:	Polverari, Annalisa; Mori, Nicola (University of Verona)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: New Frontiers in Viticulture and Enology Module group: Environmental Sustainability
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	Section "Arthropods" (N. Mori AGR/11) Quarantine pests, current legislation (EU Reg. 652/2014, 2016/2031, "019/1702) identification techniques (morphological-molecular), planning area-wide and prompt monitoring. Ethological, physiological and genetic manipulation of insects (RNAi, sterile male technique) for the containment of native and alien grapevine pests. Functional biodiversity. Use of multi-trophic interactions (semiochemical, attract & kill, push & pull) and alteration of symbiotic microorganisms for the sustainable control of harmful arthropods. Development of effective and innovative approaches to protect grapevine from artropods. Section "Plant pathology" (A. Polverari AGR/12) Integrated pest management: European and national reference legislation. Phytosanitary certification: quarantine and monitoring of emerging pathogens; advanced molecular methods for diagnosis; new sequencing technologies for the identification and

	characterization of pathogens. Biological and biotechnological toold for the containment of pathogens. Environmental impact certifications. Use of biodiversity and study of multi-trophic interactions in the vineyard.
Assessment methods and criteria:	
Forms of media:	
Required reading:	Power point files of the lessons will be delivered to the students, together with the scientific papers related to the discussed topics.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Sustainable management of winery waste and wastewater**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Mori, Nicola (University of Verona)
Lecturers:	Bolzonella, David (University of Verona)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: New Frontiers in Viticulture and Enology Module group: Environmental Sustainability
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 24 h; Student's personal study time in the module: 51 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	The course will firstly give some fundamental definitions for the concept of sustainability and its interaction with general politics and regulatory frameworks. Then, the treatment of winery waste and wastewaters will be considered.
Assessment methods and criteria:	Oral exam
Forms of media:	PowerPoint presentations
Required reading:	Specific literature reported on slides
Optional reading	

Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Sustainable management of soil and water in viticulture**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Mori, Nicola (University of Verona)
Lecturers:	Tarolli, Paolo (University of Padova)
Language:	Italian/English
Classification within the curriculum:	Module of specialization: New Frontiers in Viticulture and Enology Module group: Environmental Sustainability (University of Verona)
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 50 h; Student's personal study time in the module: 75 h (including student's research project on a topic of the module)
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	none
Targeted learning outcomes:	-
Content:	Remote Sensing & digital terrain analysis Soil erosion monitoring and modelling Sustainable water management (water storage and drainage systems) Nature based solution for land degradation mitigation The course aims to train students on soil and water conservation in hilly wine-growing areas concerning the increasing stresses posed by climate change. Geographic Information Systems (GIS) and recent remote sensing technologies will be considered in the analysis with a focus on the last advanced innovative topographic survey methodologies (e.g. lidar, photogrammetry with drones) for the understanding of hydro-erosive processes

	with digital terrain models (DTM). Field instrumentations and numerical models for the analysis and prediction of soil erosion will also be illustrated. Students will learn how to manage water resources (e.g., water storage and drainage systems) in vineyards cultivated on steep-slope landscapes, also under water scarcity scenarios. Finally, nature-based solutions will be discussed to mitigate soil erosion, minimizing the impact on the ecosystems. Overall, the course will offer the students valuable tools for sustainable management of vineyards under climate change scenarios.
Assessment methods and criteria:	The evaluation is based on the capability of the candidate to discuss and present real case studies, raising problems, and highlighting likely solutions to mitigate a critical issue. A project work of 15 pages is required.
Forms of media:	PowerPoint presentations
Required reading:	Lectures, scientific articles, technical reports
Optional reading	-
Other learning resources/tools (specific to the module) if applicable	Field trip, story-telling scientists & stakeholders
Last updated in:	October 2023

Module name	**Advanced approaches in sustainable vine nutrition**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at University of Verona
Semester:	3rd Semester
Module group coordinator:	Mori, Nicola (University of Verona)
Lecturers:	Varanini, Zeno (University of Verona)
Language:	English
Classification within the curriculum:	Module of specialization: New Frontiers in Viticulture and Enology Module group: Environmental Sustainability
Teaching format:	Regular lectures; guest lectures
Workload:	Face to face lectures: 16 h Student's personal study time in the module: 34 h
Credit points:	2 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	
Targeted learning outcomes:	
Content:	General aspects of plant mineral nutrition. The soil: general aspects. Organic matter as an element of soil fertility. Nitrogen in the soil-plant system and nitrogen nutrition in the vine. Potassium in the soil-plant system and potassium nutrition in the vine. Magnesium in the soil-plant system and magnesium nutrition in the vine. Iron in the soil-plant system and ferric nutrition in the vine. The problem of Cu in the soil-plant system Biostimulants and sustainable viticulture. Fertilization of the vine: sustainable practices and innovative fertilizers
Assessment methods and criteria:	The learning outcomes will be assessed by an oral test. The aim of the test is to ascertain the knowledge of topics covered in the program through the critical discussion.
Forms of media:	

Required reading:	
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Specialisation:

Sustainable Management of Mountain Viticulture within Landscape Valorisation

(BOLZANO) (20 ECTS credits)

	Credit points
Module group: Vineyard management and wine production in mountain areas	**11**
Vineyard management in mountain areas (AGR/03)	3
Smart technologies for viticulture and winery management (AGR/09)	5
Wine production processes and plans (AGR/15)	3
Module group: Protection and valorisation of viticultural systems in mountain areas	**9**
Plant pathogens and disease management strategies in vineyards in mountain areas (AGR/12)	3
Management and use of agrochemicals and their fate in the environment (AGR/13)	3
Conventional and innovative strategies for grapevine genetic improvement (AGR/07)	3

Module group: Vineyard management and wine production in mountain areas

Module name	Vineyard management in mountain areas
Module code	-
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at the Free University of Bozen-Bolzano
Semester:	3rd semester
Module group coordinator:	Boselli, Emanuele (Free University of Bozen-Bolzano)
Lecturers:	Andreotti, Carlo (Free University of Bozen-Bolzano)
Language:	English
Classification within the curriculum:	Module of specialization: Sustainable Management of Mountain Viticulture within Landscape Valorisation Module group: Vineyard management and wine production in mountain areas
Teaching format:	Frontal lectures: the topics are introduced and discussed with the class also by mean of case studies from the literature and the common practice. Exercises: these are organized in vineyards and are practically-oriented activities on relevant aspects discussed during the lectures.
Workload:	Frontal lectures: 16 h; Laboratory exercises and field trips: 12 h; Student's personal study time in the module: 47 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	The course will provide students with scientific and technical knowledge on the main aspects related to the management of vineyards located in mountain areas. Students will understand and critically consider the main factors involved in mountain environment and their consequences on grapevine physiology, ripening process and cultivation management. Finally, students will learn how the exploitation of the mountain conditions can

	lead to an enhancement of the final quality of grapes, while maintaining yield level and overall sustainability.
Content:	Course contents are the follow: The altitude effect on vineyard microclimatic conditions: role of temperature, daily temperature excursion, light intensity and quality, exposition The effect of altitude on grape quality Cultural management of mountain vineyards: site preparation in steep slope conditions (contour farming, up- down the slope, terracing systems), means against soil erosion (cover crops, tilling, etc.), canopy management (canopy defoliation, trimming, grapevine training systems for steep slopes conditions and in relation with vineyard exposition) Protection against adverse meteorological conditions (late frost, early frost, too high radiation, sunburn damages) Sustainable use of water and nutrients inputs in sloped vineyards Climate change and mountain viticulture (DOC modification, adaptation to warmer conditions, control of ripening dynamic of grapes, exploitation of new areas at higher altitudes). Selection of new cultivars potentially suitable for mountain environment.
Assessment methods and criteria:	Oral exam (70%) and students' project work (seminar, 30%).
Forms of media:	PowerPoint presentations and case studies
Required reading:	There are no specific textbooks on the course topics. The lecturer will provide students with the pdf of the lectures and with selected papers from the international literature on the subject
Optional reading	-
Other learning resources/tools (specific to the module) if applicable	-
Last updated in:	October 2023

Module name	**Smart technologies for viticulture and winery management**
Module code	-
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at the Free University of Bozen-Bolzano
Semester:	3rd semester
Module group coordinator:	Boselli, Emanuele (Free University of Bozen-Bolzano)
Lecturers:	Liberatori, Sandro (Free University of Bozen-Bolzano)
Language:	English
Classification within the curriculum:	Module of specialization: Sustainable Management of Mountain Viticulture within Landscape Valorisation Module group: Vineyard management and wine production in mountain areas
Teaching format:	Regular lectures, web platform, team working and groupproject, visit of manufacturing plants and farms.
Workload:	Frontal lectures: 30 h; Laboratory exercises and field trips: 14 h; Student's personal study time in the module: 81 h
Credit points:	5 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Provide students with basic knowledge on mechanizationin mountain areas, specific knowledge on safety requirements and performances of machines, homologations and use according to environment protection and high quality production, evaluation of innovation and transfer of technologies. Being able to apply standard requirements in the design and evaluationof machines, provide for a proper use of machines, to measure the level of innovation and provide for technology transfer.
Content:	International standards and their application in the field of performances, safety and environment protection related to machines, the use of machines for quality production, measurement of the level of innovation of machines, technology transfer.
Assessment methods and criteria:	1/3 oral examination, 1/3 group work, 1/3 written examination; 25% skill to properly set a problem, 25%skill to find a solution,

	25% level of knowledge of the topics, 25% ability for presentations
Forms of media:	PowerPoint presentations and case studies
Required reading:	Course material by the lecturer
Optional reading	-
Other learning resources/tools (specific to the module) if applicable	-
Last updated in:	October 2023

Module name	Wine production processes and plans
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at the Free University of Bozen-Bolzano
Semester:	3rd semester
Module group coordinator:	Boselli, Emanuele (Free University of Bozen-Bolzano)
Lecturers:	Boselli, Emanuele (Free University of Bozen-Bolzano)
Language:	English
Classification within the curriculum:	Module of specialization: Sustainable Management of Mountain Viticulture within Landscape Valorisation Module group: Vineyard management and wine production in mountain areas
Teaching format:	
Workload:	Frontal lectures: 18 h; Laboratory exercises and field trips: 12 h; Student's personal study time in the module: 45 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	The students can manage adequately the different wine production processes and plants with emphasis on extreme wines
Content:	Application of winemaking processes and plants to areas where altitude implies difficult climatic conditions and steep slopes (even at low altitudes) limit land use possibilities and lead to increased processing costs. Main characteristics of extreme wines made from white varieties (Gewürztraminer, Pinot blanc, Kerner, Müller Thurgau, Sylvaner and others) and red varieties (Lagrein, Pinot noir, Schiava and others). Insights into PIWI wines. Techniques for preserving the aroma of extreme wines and preventing defects. Hands-on laboratory experiments, technical visits to specialized outside wineries and expert seminars.
Assessment methods and criteria:	Team project work: power point presentation done in groups on a topic related to the course combined with anindividual interview

Forms of media:	Power point and blackboard
Required reading:	Key notes provided by the lecturer in the E – learning platform of unibz
Optional reading	Ribéreau-Gayon P., Dubourdieu D., Donèche B., Lonvaud A. – Handbook of Enology – Vol. I and II – free pdf version available in internet OIV technical standards and documents http://www.oiv.int/en/technical-standards-and-documentsCervim website: http://www.cervim.org/
Other learning resources/tools (specific to the module) if applicable	-
Last updated in:	October 2023

Module group: Protection and valorisation of viticultural systems in mountain areas

Module name	**Plant pathogens and disease management strategies in vineyards in mountain areas**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at the Free University of Bozen-Bolzano
Semester:	3rd semester
Module group coordinator:	Pii, Youry (Free University of Bozen-Bolzano)
Lecturers:	Hafiz Husnain Nawaz (Free University of Bozen-Bolzano)
Language:	English
Classification within the curriculum:	Module of specialization: Sustainable Management of Mountain Viticulture within Landscape Valorisation Module group: Protection and valorisation of viticultural systems in mountain areas (Free University of Bozen-Bolzano)
Teaching format:	The frontal lectures are combined with interactive elements, such as descriptive case examples and discussions. In the practical part, selected contents covered in the lectures, are examined in greater depth in the field and/or in the laboratory. Short project papers on a topic of choice will be prepared by the students and presented to the class.
Workload:	Frontal lectures: 16 h; Laboratory exercises and field trips: 12 h; Student's personal study time in the module: 45 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Students will gain in-depth knowledge of abiotic disorders and the biology of the most important grapevine pathogens, understanding how plant pathogens and their host plants interact in the environment. They will also be able to recognise and identify symptoms of disorders and symptoms and signs of diseases and formulate hypotheses about the causes of disorders and diseases. Furthermore, students will gain the

	ability to make informed judgments about the appropriate diagnostic technique and the develop of a strategy to control grapevine disorders and diseases.
Content:	The course will start with an outline of grapevine disorders and diseases with epidemic potential. Subsequently, the course will focus on the most important grapevine diseases caused by viruses and viroids, bacteria and phytoplasmas, oomycetes and fungi, and nematodes. Special focus will be given to the disease epidemiology and the environmental factors potentially favouring the development of infectious grapevine diseases in mountain areas. Disease control strategies in integrated and organic farming systems will be covered, including the application of disease forecasting and expert systems as well as the reference legislation for the production and marketing of vine propagation materials. A focus on the most innovative biocontrol techniques will follow together with an overview of the plant protection product registration process. The grapevine disorders caused by environmental factors will be discussed, and great attention will be given to the situation in mountain areas. Finally, the importance of advanced diagnostic tools for the prevention and containment of grapevine diseases will be discussed and implemented in the laboratory.
Assessment methods and criteria:	Oral exam (60%) and students' project work (40%) assessed through a presentation and technical assignments to be developed in groups. To pass the module, both the written exam and the project work must be assessed with a positive mark.
Forms of media:	PowerPoint presentations and case studies
Required reading:	Agrios, GN (2005). Plant Pathology, Fifth edition. Elsevier LDT, Oxford, 921 pages. ISBN 978-0120445653 Bettiga, LJ (Ed.). (2013). Grape Pest Management, Third edition. University of California - Agriculture and Natural Resources Publications, 609 pages. ISBN 978-1601078001 Wilcox, WF, Gubler, WD, Uyemoto JK (Eds.). (2015). Compendium of Grape Diseases, Disorders, and Pests, Second edition APS Press. 232 pages, ISBN 978-0890544792
Optional reading	
Other learning resources/tools (specific to the module) if applicable	Additional reviews and articles related to the topics of the module will be provided by the lecturer
Last updated in:	October 2023

Module name	**Management and use of agrochemicals and their fate in the environment**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at the Free University of Bozen-Bolzano
Semester:	3rd semester
Module group coordinator:	Pii, Youry (Free University of Bozen-Bolzano)
Lecturers:	Pii, Youry (Free University of Bozen-Bolzano)
Language:	English
Classification within the curriculum:	Module of specialization: Sustainable Management of Mountain Viticulture within Landscape Valorisation Module group: Protection and valorisation of viticultural systems in mountain areas
Teaching format:	Frontal Lectures and Lab exercises
Workload:	Frontal lectures: 16 h; Laboratory exercises: 12 h; Student's personal study time in the module: 47 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Basic knowledge of plant biochemistry and plant physiology.
Targeted learning outcomes:	*Knowledge and understanding* Students will acquire knowledge expertise on the agrochemicals modes of action and the fate of these chemicals in the agro-ecosystem, with specific reference to vineyards. This knowledge will allow the sustainable management of this agricultural practice for the protection of grapevine. *Applying knowledge and understanding* Students will be able to understand the movement and the cycle of pesticides within grapevine plants and vineyards. *Making judgements* The knowledge acquired will allow students to make judgements and to manage the use of agrochemicals in vineyards. *Communication skills*

	Students will acquire the ability to describe chemical and biochemical processes related to the use of agrochemicals in vineyards management. *Learning skills* Students will acquire the skills and expertise to widen and to update their knowledge about the contents and the topics discussed within the course.
Content:	Classification of agrochemicals. Agrochemicals and their metabolism within cells: mode of action of fungicides (interference with respiration, biosynthesis of sterols, chitin, tubulin and nucleic acids); mode of action of insecticides (neurotoxic and decoupling insecticides); mode of action of herbicides (interference with photosynthesis, biosynthesis of amino acids and biosynthesis of lipids). Innovative pesticides. Agrochemicals metabolism in plants: reactions of oxidations, reduction, hydrolysis and conjugation. Agrochemicals fate in soil: movement (leaching, run-off, volatilization), adsorption (adsorption isotherms and adsorption coefficients) and degradation (photodecomposition, chemical and microbiological degradations). Practical exercise: determination of agrochemical adsorption and agrochemical degradation in soils.
Assessment methods and criteria:	Oral exam. The final assessment will consist in an oral exam, which will consist in a) questions to evaluate the knowledge and the understanding of the topics discussed during the classes and b) questions aimed at establishing the ability to apply such knowledge to hypothetical case studies. The ability to rework the experience acquired during laboratory exercises will also be evaluated. The final mark will be awarded based on the following criteria: the clarity of the response, the ability to summarize, evaluate, and establish relationships between topics
Forms of media:	Power Point presentations
Required reading:	Course slides and suggested scientific literature. Müller F. “Agrochemicals : composition, production, toxicology, applications” ISBN 3-527-29852-5 Roberts T.R. “Metabolic pathways of agrochemicals” ISBN 0-85404-494-9;ISBN 0-85404-499-X
Optional reading	--
Other learning resources/tools (specific to the module) if applicable	--
Last updated in:	October 2023

Module name	**Conventional and innovative strategies for grapevine genetic improvement**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at the Free University of Bozen-Bolzano
Semester:	3rd semester
Module group coordinator:	Pii, Youry (Free University of Bozen-Bolzano)
Lecturers:	Vannozzi, Alessandro (Free University of Bozen-Bolzano)
Language:	English
Classification within the curriculum:	Module of specialization: Sustainable Management of Mountain Viticulture within Landscape Valorisation Module group: Protection and valorisation of viticultural systems in mountain areas
Teaching format:	
Workload:	Frontal lectures: 18 h; Laboratory exercises and field trips: 12 h; Student's personal study time in the module: 45 h
Credit points:	3 ECTS credits
Requirements under the examination regulations:	-
Recommended prerequisites:	Basic knowledge of plant genetics and genomics
Targeted learning outcomes:	Students will acquire knowledge on the principles of grapevine genetics and inheritance and on traditional breeding methods for grapevine improvement. Students will also learn how to use advanced biotechnological tools like molecular markers and gene editing in conventional or advanced breeding strategies to enhance grapevine disease resistance and overall quality. Furthermore, they will develop skill in select grapevine varieties suitable for specific climates and to promote sustainable viticulture practices through genetic approaches. Ultimately, students will be equipped to analyse real-world challenges in grapevine cultivation and genetic solutions.
Content:	1. Grapevine genetic improvement for biotic/abiotic stress resilience

	- Genetic diversity and genetic resources in Vitis; Intervarietal hybridization and interspecific introgression as traditional breeding tools for resistance; - Genomic selection and Marker-Assisted Breeding (MAB); 2. Novel biotechnologies applied to the fight against biotic and abiotic stresses - Transgenesis, intragenesis and cisgenesis: advantages, limits and applications for disease resistance and environmental stress tolerance. - Application of editing technology to improve tolerance to the main fungal pathogens and environmental stresses. - Post-transcriptional gene silencing as a sustainable tool in the fight against the main biotic stress
Assessment methods and criteria:	At the end of the course, students will be required to take an oral exam. Additionally, as part of the practical activities, there will be a journal club session where students will have to present, through brief presentations (3-minute speeches), scientific articles related to the course topics
Forms of media:	Power Point presentations
Required reading:	Course slides and suggested scientific literature (articles, reviews etc)
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Language Training** **Italian as a foreign language** **at Udine-Padova-Verona-Bolzano**
Module code	
Type of module (compulsory/optional)	
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Module coordinator:	Sbrizzai, Elena (University of Udine)
Lecturer:	Sbrizzai, Elena (University of Udine)
Language:	Italian
Classification within the curriculum:	Mandatory module
Teaching format:	Regular lectures (including conversation and written exercises)
Workload:	75 hours
Credit points:	3 ECTS credits
Requirements under the examination regulations:	----------
Recommended prerequisites:	Italian level A2 (e.g. obtained during M1)
Targeted learning outcomes:	Students understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with most situations likely to arise whilst travelling in an area where the language is spoken. They can produce simple connected text on topics which are familiar or of personal interest. They are able to describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans.
Content:	Elements of Italian grammar, structure of the sentence, dictionary. Conversation practice.
Assessment methods and criteria:	written and oral tests
Forms of media:	Newspapers, internet, video, photography, power point presentations
Required reading:	Various Authors „Rete! 1", Italian course for foreigners
Optional reading	

Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name	**Master Thesis** **at the Consortium among the universities of Udine, Padova, Verona, Bolzano**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year at Udine, Padua, Verona or Bolzano
Semester:	4th semester
Module coordinator:	General coordination by Prof. Paolo Sivilotti and Prof. Piergiorgio Comuzzo
Lecturer:	The supervisors for the master's thesis has to be a professor belonging to the academic staff of the 4 partner universities, while the co-supervisor could also be one professor from an associate partner (see list in Vinifera Euromaster website). The student has to choose a supervisor of the subject of his interest, and then conduct the experimentation under the guidance and the requests of the supervisor.
Language:	English
Classification within the curriculum:	Core module
Teaching format	The Thesis consists of the elaboration of a written report about an independent scientific work of the student and a defense.
Workload:	22 weeks for the elaboration of the thesis; plus adequate time (at least 2 weeks) for personal preparation for the defence.
Credit points:	27 ECTS credits
Requirements under the examination regulations:	Admission to the thesis is granted, if the student has - successfully completed the modules of the first academic year Admission to the defence is granted under the condition that: - the written report was evaluated at least with the grade "E - pass"; - the student has completed all other compulsory modules of the second academic year successfully and obtained at least 93 ECTS credits (including the ECTS credits allocated to the Master Thesis)
Recommended prerequisites:	----------

Targeted learning outcomes:	The student is able to carry out scientific research independently in a given time implementing adequate scientific methods. In addition the student is able to present his/her results to a jury and answers questions related to the field of research.
Content:	Thesis document
Assessment methods and criteria:	Delivery of a written thesis report at the submission date, prepared under formal requirements of the University of Udine 3 weeks before the date of thesis defence. Thesis defence in front of an examination jury of at least 5 academic members according to no 13.2 of the Study and Examination Regulations of the Vinifera EuroMaster degree programme.
Forms of media:	Research methods depending on the topic of the thesis. Written report; presentation media for the defence.
Required reading:	Books and scientific papers related to the topic of the thesis. The Required reading research is part of the Master Thesis.
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023

Module name:	**Vineyard and / or Winery Internship at Udine-Padova-Verona-Bolzano**
Module code	
Type of module (compulsory/optional)	Compulsory
Higher education cycle	Second cycle / Master's level
Mode of delivery	Face-to-face
Academic Year:	2nd academic year
Semester:	during Vinifera EuroMaster degree programme, 2nd academic year – internship can be done before or after the lessons which take place in January-September of each year
Module coordinator:	Master thesis tutor
Lecturer:	----------
Language:	Italian/English
Classification within the curriculum:	All specializations
Teaching format / class hours per week during the semester:	Internship
Workload:	175 h
Credit points:	7 ECTS credits (included in the ECTS credits of the thesis)
Requirements under the examination regulations:	----------
Recommended prerequisites:	----------
Targeted learning outcomes:	Internship linked to the Master thesis
Content:	Internship in winery is intended to allow the student having a direct experience about grapevine cultivation, grape production, harvest, wine making, wine stabilization. The student participates to the different operations working but also being part of the decisional processes, verifying the decision criteria in relation to the wine-style to be produced. The internship activity can be part of the thesis activity and the credits are included in thesis credits. Internship can be done in small wineries as well as great wineries, and more than one internship may be done, in the region Friuli Venezia Giulia, in other Italian regions, in Europe or overseas.
Assessment methods and criteria:	----------

Forms of media:	----------
Required reading:	----------
Optional reading	
Other learning resources/tools (specific to the module) if applicable	
Last updated in:	October 2023