



Study Plan

School: School of Sciences and Technology
Degree: Master
Course: Viticulture and Oenology (cód. 753)

1st Year - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
FIT13921M	Soils, Installation and Maintenance	Agronomy	6	Semester	156
BIO13824M	Vine physiology	Biological Sciences	6	Semester	156
FIT13806M	Grapevine Plant Materials	Agronomy	3	Semester	78
QUI13655M	Microbiology of Fermentations	Biochemistry	6	Semester	156
FIT13804M	Oenological technology and processes	Agricultural and Food Engineering	6	Semester	156
GES13901M	Commercialization and Wine Marketing	Management	3	Semester	78
FIT14049M	* Vineyard and Winery Training	Agronomy Agricultural and Food Engineering	6	Semester	156

1st Year - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
FIT13803M	Training Systems	Agronomy	6	Semester	156
FIT13817M	Phytosanitary Protection of Grapevine	Agronomy	6	Semester	156
QUI13825M	Oenological Chemistry and Biochemistry	Chemistry	6	Semester	156
FIT13820M	Stabilization and Packaging	Agricultural and Food Engineering	6	Semester	156
FIT14049M	Vineyard and Winery Training	Agronomy Agricultural and Food Engineering	6	Semester	156

2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ERU13807M	Mechanization and Precision Viticulture	Rural Engineering	6	Semester	156
FIT13816M	Table Grapes and Raisin Production	Agronomy	3	Semester	78
FIT14052M	Quality Control and Sensory Analysis	Agricultural and Food Engineering	3	Semester	78
ERU13826M	Wineries and equipment	Rural Engineering	6	Semester	156
Dissertation					
Internship					
Project Work					



2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Dissertation				
	Internship				
	Project Work				

Conditions for obtaining the Degree:

*** TRANSLATE ME: Para aprovação na componente curricular é necessário a aprovação (através de avaliação ou creditação) das seguintes unidades curriculares:

1º Ano{\ }newline

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1º Semestre:

6 UC obrigatórias num total de 30 Ects{\ }newline

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2º Semestre:

5 UC obrigatórias num total de 30 Ects

2º Ano{\ }newline

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3º Semestre:

4 UC obrigatórias num total de 18 Ects

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Para a obtenção do grau é necessária a aprovação na Dissertação ou Estágio ou Trabalho de Projecto, no 3º e 4º semestre com o total de 42 ECTS ***

Program Contents

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Soils, Installation and Maintenance (FIT13921M)

1. The project of a Vineyard.
2. Conditioning factors for choosing the location of a vineyard. Orography. Climate.
3. Land Use Capacity Maps for the Vineyard.
4. Soil Properties and the Vine Performance. Physical Properties of Soil, Limitations and Root Growth. Chemical Properties of the Soil, their Limitations and the Performance of the Vine.
5. Development process for installation of a vineyard.
6. Soil and Flora Maintenance Systems.
7. Soil Conservation and Conservation Agriculture.
8. Environmental and Agronomic Practices of Fertilization in Vines.

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Vine physiology (BIO13824M)

Anatomy and morphology of the root, stem, leaf and buds of the vine. Growth and annual cycle. floral differentiation, fertility and setting.

2. Water relations:

2.2. Water consumption and evaluation of the water status of the vine.

2.3 Stomatic control mechanisms (e.g. variability between grape varieties, graft carriers, growth regulators, environmental factors)

2.4 Water movement in the plant: absorption, translocation and management of water stress. 2.5. Watering management and physiological effects on the vine.

3. Photosynthesis at the level of the vine.

3.1 Crown structure and radiation distribution, photosynthesis reactions dependent on light.

3.2. absorption and photosynthetic reduction of CO₂. Response of photosynthesis to environmental factors.

3.3. synthesis of starch and sucrose. Redistribution of sugars in the plant. Storage, use and transport of sugars in the plant.

4- Composition and development of the berry. Genetic, vine driving and environmental f



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Grapevine Plant Materials (FIT13806M)

- 1- Origin, distribution, and botanical classification in *Vitis* spp.
- 2- Identification and ampelographic characterization of grapevine cultivars and rootstocks (ampelography and ampelometry). A new ampelographic perspective, the molecular characterization of cultivars and clones.
- 3- From the variety to the clone: The evolution of the plant material in grapevine; Clonal Selection, classic breeding, marker assisted selection and plant biotechnology support.
- 4- Grapevine rootstocks. Grafting compatibility with *Vitis vinifera* and major agronomic characteristics.
- 5 – Grapevine nurseries and vine propagation techniques
- 6- National and world-wide grape cultivars. Their agronomic and oenological aptitudes. Groups of grape cultivars from several winemaker regions; Tradition or innovation.

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Microbiology of Fermentations (QUI13655M)

Microbiology Overview of fermentation processes. Microorganisms of interest in fermentation processes. Importance of Microorganisms on the quality of wines. The wine microorganisms and their natural habitat. Microbial growth. Controlling factors. Measures of microbial growth. Microorganisms of winemaking interest: biochemical, morphological and genetic differences. Nutrition and culture media. Cellular transport of nutrients. Principles of microbial metabolism. The transformation of must into wine. Alcoholic fermentation. Biochemistry of fermentation. Malolactic fermentation. Bioconversion of malic acid. Biochemistry and physiology of the malolactic fermentation. Winemaking, mixed populations: growth and kinetics. Application of starters. Microorganisms of wine spoilage.

Practical: Isolation of microorganisms from a spontaneous fermentation of grape juice. Characterization of the performance of a yeast strain during grape fermentation.

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Oenological technology and processes (FIT13804M)

Grape berry composition: changes in berry composition during ripening, the harvest decision

The winemaking process: grape and must processing, juice treatment and juice additions

Vinification of white wines – classical, oak barrels fermentation, pré-fermentative maceration

Vinification of roses wines

Vinification of red wines – mechanical operations and related biochemical process. Alcoholic fermentation and pump overs. The importance of maceration process and the different kind of maceration . Other fermentation techniques

Special vinification: sparkling wines, wine spirits

Chemical analysis of musts and wines



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Commercialization and Wine Marketing (GES13901M)

1. The commercialization and marketing global context
 - 1.1. Trade and marketing
 - 1.2. The marketing concept and its evolution
 - 1.3. The wine marketing environment
 - 1.4. The wine marketing system
 - 1.5. Wine associative cooperation and intersectorial cooperation
 - 1.6. e-agro-food marketing
2. The wine market
 - 2.1. Characteristics, Organizational Forms and Operation
 - 2.2. Methods of analysis, evaluation and market prevision
 - 2.3. The international market context
 - 2.4. Market research
3. Marketing strategy, plan and control
 - 3.1. Analysis diagnostic
 - 3.2. Marketing objectives
 - 3.3. Marketing strategy
 - 3.4. Wine Marketing-mix
 - 3.4.1 Managing the wine product, the brand and the innovation process
 - 3.4.2. Wine Communication
 - 3.4.3. Wine Distribution and Sales
 - 3.4.4. Set the price of wine
 - 3.5. The Marketing plan

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Vineyard and Winery Training (FIT14049M)

- 1 - Mission and organization of the company. Understand what is the purpose that the company pursues, as it is structured, what are the services, the organizational structure, existing powers and contracted abroad, differentiation of its products, etc.
- 2 - The Main functional areas. Monitor the activity of the major areas of the company: vines, wine-making, treatments and packaging, quality control and management. Knowing the specifications of each activity, resources available and its timing. Participation in the implementation of the various operations. Critical analysis of the performance achieved in relation to the objectives
- 3 - Description of the different routine operations at the company, from the performer point of view: objectives, needed and existing resources, needs concerning technical preparation, control and reporting to the head of the sector.

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Training Systems (FIT13803M)

- Planting and training young vines
- Ecophysiology. Relationships within the whole plant. PAR optimization. Canopy management. Water management. Water stress monitorization. RDI and PRD technologies of irrigation.- Influence of training factors in grapevine productivity and quality. Vine spacing, canopy expansion, rootstock vigour, soil fertility and water availability.
- Study of different training systems in different viticultural systems.
- Field oriented practices in grapevine production, including pruning weed identification, vine training, trellising, canopy management, water stress measurement, and sampling techniques.
- Fundamental parameters of the soil to consider when working with irrigation and water management. Obtaining the crop water requirements and deriving the need irrigation water applications. Use of the concepts of ETo, ETc and transpiration to calculate the crop requirements and irrigation amounts. Use of FAO crop coefficients.-Irrigation management



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Phytosanitary Protection of Grapevine (FIT13817M)

1. Study of the main grapevine diseases due to fungi, bacteria, phytoplasma, virus and nematodes, their symptoms, biological cycle and control;
2. Study of the main pests due to insects and mites in grapes, their symptoms, biology, and control methods;
3. Study of the main weeds infesting grapeyards;
4. Integrated Pest Management fundamentals, and concepts. Risk assessment and of Economic injury level concepts. Available control methods;
to protect the grape crop against major enemies;
- 5 - Selection of pesticides in accordance to the integrated pest management concept.
- 6 - Practical application of acquired knowledge to a vineyard

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Oenological Chemistry and Biochemistry (QUI13825M)

Chemical characterization of grapes and wines: organic acids, sugar compounds, nitrogen compounds, phenolic compounds, aromatic compounds.

Compound evolution and transformations during winemaking and wine aging.

Enzymatic transformations and oxidation processes occurring in musts and wines.

The role of enzymes and its use in enology. Coloids and coloidal phenomena occurring in wines. The chemistry of alcoholic and malolactic fermentations.

Analytical methodology used for identifying different chemical compounds in grapes and wines. Gas chromatography and liquid chromatography coupled to mass spectrometry. Atomic absorption and ICP-MS.

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Stabilization and Packaging (FIT13820M)

Wine clarification: natural settling, fining process, conditions and agents.

Filtration and centrifugation of wines: theoretical concepts, type of filters

Wine stability – chemical instability of wines (tartaric, proteins, colour, metallic). The use of temperature as a wine stability treatment, the use of clarificant agents

Ageing process: influence on wine characteristic, the effect of oxygen, the microoxygenation technique.

The use of wood in winemaking: oak barrels, staves. . .

Packing, bottling and closures: the use of cork.

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Mechanization and Precision Viticulture (ERU13807M)

The program of the course is organized into two parts:

Part 1: Mechanization in Viticulture, and Part 2: Precision Viticulture (PV);

Themes Part 1: harvesting equipment; pre-pruning and pruning equipment; equipment for management of soil and vegetation; fertilization equipment; protect health equipment; vegetation control equipment, organization of mechanization work in vineyards.

Themes Part 2: The principles of PV, PV Tools, Analysis of practical cases in PV, seminars and presentation of papers.



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Table Grapes and Raisin Production (FIT13816M)

1. Commercialization and marketing of table grapes Main Production regions in the globe , China as the great production country and Turkey as the main raisins production country. Table grapes in Portugal and work developed until 1990.
2. Sensorial evaluation of the main table grapes varieties
3. Table grapes attributes - Main seeded and non-seeded varieties; differentiation from wine grape varieties
4. Production techniques of table grapes and raisins - Trellising systems used and its implications in fruit quality; the example of 'Latada ' to maximise light interception; rootstocks used in table grapes; summer pruning; use of growth regulators in grapes.
5. Physiology of grape ripening and maturity indexes, NIR spectroscopy as a tool to evaluate maturity in grapes. Evolution of Phenolic compounds during ripening.
6. Postharvest losses during storage. Packing and commercialization of table grapes.
7. Main concepts of table grape breeding.
8. Drying table grapes, drying technology.

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Quality Control and Sensory Analysis (FIT14052M)

1. The concept of quality. Application and organization of a quality control plan. Identification of critical control points in a winery. Statistical methods for quality control.
2. The senses in sensorial evaluation. The aroma and the taste of wines. Facilities and sample preparation for wine sensorial analysis. Descriptive and hedonic tests. The panel. Wine positive characteristics and defects. Statistical analysis of sensory data. Wine tasting

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Wineries and equipment (ERU13826M)

- Winery design and layout. Environmental control technologies applied to different areas in the winery. Environmental control systems design. Energy balances. Use of cold technologies. Energy efficiency. Cleaning and sanitation systems. Characterisation of waste and residuals. Circular economy applied to wineries.