



Study Plan

School: School of Sciences and Technology
Degree: Master
Course: Viticulture and Oenology (cód. 136)

1st Year - 1st Semester

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|----------------|-------------------------------------|---|------|----------|-------|
| GES7357 | Wine Marketing | Management | 4 | Semester | 104 |
| BIO7358 | Vine Physiology | *** TRANSLATE ME: Agronomia e Biologia *** | 5 | Semester | 130 |
| FIT7359 | Vineyards Planting Material | Agronomy | 4 | Semester | 104 |
| QUI7360 | Microbiology of fermentation | *** TRANSLATE ME: Química e Bi-química *** | 5 | Semester | 130 |
| FIT7361 | Soils, Installation and Maintenance | Agronomy | 5 | Semester | 130 |
| FIT7362 | Winemaking Technologies | *** TRANSLATE ME: Engenharia Alimentar e Agronomia *** | 5 | Semester | 130 |

1st Year - 2nd Semester

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|----------------|--|---|------|----------|-------|
| FIT7363 | Stabilisation and Packaging | *** TRANSLATE ME: Engenharia Alimentar e Agronomia *** | 5 | Semester | 130 |
| FIT7364 | Vineyards Diseases and Pest Control | Agronomy | 5 | Semester | 130 |
| QUI7365 | Oenological Chemistry and Biochemistry | Chemistry | 5 | Semester | 130 |
| FIT7366 | Plant Training Systems | Agronomy | 5 | Semester | 130 |
| FIT8079 | Vineyard/Winery Traineeship | *** TRANSLATE ME: Agronomia, Engenharia Alimentar, Engenharia Rural e Engenharia dos Recursos Hídricos *** | 12 | Semester | |

2nd Year - 3rd Semester

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|----------------|---|-----------------------|------|----------|-------|
| ERU7353 | Wineries and Equipments | Engineering | 5 | Semester | 130 |
| FIT7354 | Quality Control and Sensorial Analysis | Food Engineering | 4 | Semester | 104 |
| ERU7355 | Mechanisation and Precision Viticulture | Engineering | 5 | Semester | 130 |
| FIT7356 | Table Grapes and Raisin Production | Agronomy | 4 | Semester | 104 |



2nd Year - 4th Semester

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|----------------|------|-----------------------|------|----------|-------|
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2nd Year - 4th Semester

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|-------------------------------|--------------|-----------------------|------|----------|-------|
| Mandatory alternatives | | | | | |
| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
| | Internship | | | | |
| | Project Work | | | | |
| | Dissertation | | | | |

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: { \ }newline

{ \ }newline

1º Semestre: { \ }newline

6 UC obrigatórias num total de 28 Ects { \ }newline

{ \ }newline

2º Semestre: { \ }newline

5 UC obrigatórias num total de 32 Ects { \ }newline

{ \ }newline

3º Semestre: { \ }newline

4 UC num total de 18 Ects { \ }newline

{ \ }newline

Para a obtenção do grau é necessária a aprovação na Dissertação ou Estágio ou Trabalho de Projecto, no 4º semestre com o total de 42 ECTS { \ }newline

Program Contents

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Wine Marketing (GES7357)

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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Vine Physiology (BIO7358)

- 1- Anatomy and morphology of root, stem, leaf and vine buds. Growth and annual cycle. Floral differentiation, fertility and fruit set.
- 2- Vine Water Relations: Plant Water Status. Evaluation of leaf water potential and its interpretation. Water movement in plants: Absorption, translocation and transpiration. Physiological mechanisms in water stress condition. Measurement of sap flow and cavitation in the xylem.
- 3- Microclimate on the vine: Distribution of radiation and energy balance.
- 4- Carbon Assimilation: Absorption and photosynthetic CO₂ reduction. Synthesis of starch and sucrose. Redistribution of sugars in the plant. Storage, use and transport of sugars. Carbon assimilation capacity and microclimate.
- 5- Composition and development of fruits. Factors that influence the different chemical compounds in fruits.

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Vineyards Planting Material (FIT7359)

- 1- Origin, distribution and botanical classification in *Vitis* spp.
 - Identification and ampelographic characterization of grapevine cultivars and rootstocks using the UPOV/OIV method.
 - A new ampelographic perspective; Molecular characterization of cultivars and clones.
- 2- From the variety to the clone: The evolution of the plant material in grapevine; Clonal Selection, classic breeding, marker assisted selection and biotechnology.
- 3- National and world-wide grape cultivars. Their agronomic and oenological aptitudes. Groups of grape cultivars from several winemaker regions; Tradition or innovation.
- 4- Grapevine rootstocks. Grafting compatibility with *Vitis vinifera* and major agronomic characteristics.

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Microbiology of fermentation (QUI7360)

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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Soils, Installation and Maintenance (FIT7361)

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Winemaking Technologies (FIT7362)

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 – hiperoxigenation, oak barrels fermentation, pré-fermentativa maceration
Vinification of roses wines
Vinification of red wines – thermovinification, thermoflash maceration, carbonic maceration, fermentation on the skins, rotary tanks
Special vinification: sparkling wines, sweet wines
Chemical analysis of musts and wines



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Stabilisation and Packaging (FIT7363)

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.

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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Vineyards Diseases and Pest Control (FIT7364)

1. Study of main grape diseases due to fungi and bacteria and reference to others due to phytoplasma, virus and nematodes. Symptoms, biological cycle and disease control 2. Study of the main pests due to insects and mites in grapes. Symptoms, biology, and pest control. 3. Study of the main weeds infesting grapeyards. 4. Fundamentals of Integrated Pest Management. Concepts and use of Risk assessment and of Economic injury level. Means of control available to protect the grape crop against major enemies. 5. Practical application of acquired knowledge to a particular vineyard, with identification of predominant diseases and pests, analysis of applicable control means and selection of appropriate pesticides to use in accordance to an integrated pest management program.

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Oenological Chemistry and Biochemistry (QUI7365)

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

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 oenology.

Chemical and biochemical aspects of wine instability.

Colloids and colloidal phenomena occurring in wines.

The chemistry of alcoholic and malolactic fermentations.

Analytical methodology used for identifying different chemical compounds in grapes and wines.

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Plant Training Systems (FIT7366)

- Planting and training young vines

- Ecophysiology. Relationships within the whole plant. PAR optimization. Canopy management. Water management. Water stress monitoring. RDI and PRD technologies of irrigation.

- Influence of different 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 E_{To} , E_{Tc} and transpiration to calculate the crop requirements and irrigation amounts. Use of FAO crop coefficients



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Vineyard/Winery Traineeship (FIT8079)

- Protocol/script:

- 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. Understand the strengths and weaknesses of the organization for the achievement of its 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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Wineries and Equipments (ERU7353)

Winery design.

Environmental control. Determination of refrigeration power. Energy balances. Use of cold technologies. Design of equipment. Cleaning and sanitizing systems. Characterisation of waste and residuals

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Quality Control and Sensorial Analysis (FIT7354)

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

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Mechanisation and Precision Viticulture (ERU7355)

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 (FIT7356)

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. Table grapes attributes
Main seeded and non seeded varieties, physiology of grape ripening and maturity indexes, NIR spectroscopy as a tool to evaluate maturity in grapes. Evolution of Phenolic compounds during ripening. Main problems during postharvest storage. Packing and commercialization of table grapes.
Main concepts of table Grape breeding.
3. Production techniques of table grapes and raisins
Main rootstocks used in table grapes production. Trellis systems used and its implications in fruit quality. Effect of growth regulators in grapes.
4. Drying table grapes, different drying technology, quality standards to raisins.