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|------------------|--------------------------|---------------|----------------|-----------------------|-------|
| Course Unit      | Oenological Microbiology |               | Field of study | Food Industries       |       |
| Bachelor in      | Oenology                 |               | School         | School of Agriculture |       |
| Academic Year    | 2023/2024                | Year of study | 2              | Level                 | 1-2   |
| Type             | Semestral                | Semester      | 1              | ECTS credits          | 6.0   |
| Code             | 9998-705-2102-00-23      |               |                |                       |       |
| Workload (hours) | 162                      | Contact hours | T 30           | TP -                  | PL 30 |
|                  |                          |               | TC -           | S -                   | E -   |
|                  |                          |               | OT 4           | O -                   |       |

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Maria Letícia Miranda Fernandes Estevinho

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. - To study the microorganisms used in the wine industry, from the field to the final product, and the factors influencing their diversity and evolution throughout the fermentation process;
2. - To understand the most relevant aspects of the physiology, growth and metabolism of microorganisms and their role in the final quality of wine;
3. To acquire skills in the identification and control of microorganisms, allowing students to understand and solve real problems in winery setting;
4. to apply the laboratory methodologies for microorganisms' study and control.
5. To understand the concepts of microbiological stabilization of wines.
6. - To Implement HACCP systems in oenology.

### Prerequisites

Before the course unit the learner is expected to be able to:  
Not applicable.

### Course contents

Wine microorganisms and their natural habitat: Wort transformation in wine: Wine fermentation, the specificity of grape must: Selection criteria for yeast for winemaking; Causes and treatments of problematic wine fermentations. Bioconversion of malic acid: LAB selection for winemaking; Wine contamination and spoilage microorganisms; Microbiological stabilization; HACCP in oenology.

### Course contents (extended version)

1. Wine microorganisms and their natural habitat: vine / grape ecosystems, winery and bottling line;
2. Wort pathways, metabolism transformation in wine: alcoholic fermentation,
  - fermentation biochemistry and metabolic
  - metabolic of sugars and nitrogen compounds.
3. Wine fermentation, the specificity of grape must
  - mixed populations, growth kinetics and conditioning factors;
  - application of yeasts; natural vs inoculated fermentations.
4. Selection criteria for yeast for winemaking;
  - Causes and treatments of problematic wine fermentations.
5. Bioconversion of malic acid: by the vine; by bacteria;
6. Lactic acid bacteria (LAB) and physiology of malolactic fermentation,
  - utilization of yeast and conditioning factors;
  - criteria of LAB selection for winemaking;
7. Wine contamination and spoilage microorganisms;
8. Microbiological stabilization;
9. Microbiological stabilization;
10. Practices: Evaluation of microbiological quality of yeasts
11. Accompanying a wine fermentation
12. Rapid screening of wine microorganisms
13. Microbiological analysis of wines by membrane filtration
14. Detection and identification of *Dekkera bruxellensis*
15. Microbiological analysis of surfaces
16. Recuperação de vinhos com defeito de prova.

### Recommended reading

1. Tógores, J. H. (2003). Tratado de enología. Ediciones Mundi-Prensa, V. 1.
2. Fugelsang, K. and Edwards, C. (2006). Wine Microbiology. Chapman and Hall, Nova Iorque, EUA.
3. Ribéreau-Gayon, P., Dub (2000). Handbook of Enology: The Microbiology of Wine and Vinifications. John Wiley and Sons, Ltd, Chichester, England
4. Jacson, R. S. (2008). Wine Science: principles and applications. 3ª Edição, Academic Press, Elsevier.
5. Delfini C., JV Formica (2001). Wine Microbiology – Science and Technology

### Teaching and learning methods

Lectures - Oral presentation methodologies using TIC (Technologies of Information and Communication). Study-cases and problem-based approaches with invited speakers. Practices - Practical work with short-reports; presentation and discussion of monographs. Performances assessed by both coursework and examinations.

### Assessment methods

1. Regular student - (Regular) (Final, Supplementary, Special)
  - Final Written Exam - 60% (Minimum 9.5 marks.)
  - Development Topics - 20%
  - Intermediate Written Test - 20% (Average of subjects and intermediate exam, minimum score 9.5)
2. Student worker - (Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 60% (Theoretical contents, minimum 9.5)
  - Final Written Exam - 40% (Practical contents, minimum 9.5)

Language of instruction

Portuguese

| Electronic validation                     |                         |                        |                                  |
|---|-------------------------|------------------------|----------------------------------|
| Maria Letícia Miranda Fernandes Estevinho | Ermelinda Lopes Pereira | António Castro Ribeiro | Paula Cristina Azevedo Rodrigues |
| 17-01-2024                                | 17-01-2024              | 27-01-2024             | 01-02-2024                       |