COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
DEPARTMENT	DEPARTMENT OF CHEMISTRY		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	EN10	**SEMESTER**	7th or 8th Semester
COURSE TITLE	Oenology		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Theory	3	
Tutoring	2	
		5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Specialized Background, Specialization, Skills Development
PREREQUISITES:	NO
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	

(2) LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course aims to introduce students to the basic concepts of Oenology. Upon successful completion of the course, the student will have acquired the following skills:

1. To understand the basic principles of Oenology.
2. To understand terms and processes related to Oenology, such as:
   - Definition of wine and the diversity of wine chemistry
   - Wine chemistry in historical perspective – chemical reactions in wine
   - Chemosensory perception and wine flavour
   - The importance of wine biomolecules (water and ethanol, carbohydrates, organic acids, amines, amino acids and proteins, higher alcohols, esters, aldehydes, ketones and related compounds, thiols and other sulfur-containing compounds, grape aroma precursors, phenolic compounds – volatile phenols, non-flavonoid phenols, flavan-3-ols and condensed tannins, flavonols, anthocyanins)
   - Must production – overview of must composition
   - Overview of wine production
   - Maceration of grapes and extraction of their constituents
   - Yeasts and the biochemistry of alcoholic fermentation in wine
   - Red and white table wines
   - Malolactic fermentation
   - Oxidation in wine
   - Fining and clarification of wines
   - Physical and chemical stabilization of wine

- Microbiological spoilage of wine and its control
- Contaminations, flavour defects and mycotoxins
- The role of sulfur dioxide in wine – sulphur dioxide addition
- Maturation and ageing of wines
- Wine chemistry during post-fermentation processes
- Additives and processing aids
- Aroma enhancement in white wines
- Occurrence of reductive off-odours during bottle ageing
- Innovative analytical techniques and applications
- New applications in tannin characterization
- Bottling and storage of wines
- Methods of must, grape pulp and wine transfer
- Heating and cooling methods
- Must and wine acidity
- Preparation, analysis and evaluation of experimental wines
- Safety limits for selected wine constituents

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

More generally, upon completion of the course, the student will have further developed the following general competences:

- Searching for, analyzing and synthesizing data and information, using the necessary technologies
- Adaptation to new situations
- Decision-making
- Autonomous work
- Teamwork
- Exercise of criticism and self-criticism
- Respect for the natural environment
- Promotion of free, creative and inductive thinking

(3) COURSE CONTENT

1. Introduction
2. Viticulture for winemakers
3. The diversity of wine chemistry
4. What is wine?
5. Chemical reactions in wine
6. Chemistry in historical perspective
7. Chemosensory perception and wine flavour
8. Water and ethanol
9. Carbohydrates
10. Organic acids
11. Amines, amino acids and proteins
12. Higher alcohols
13. Esters
14. Aldehydes, ketones and related compounds
15. Thiols and other sulfur-containing compounds
16. Grape aroma precursor compounds

17. Introduction to phenolic compounds – volatile phenols, non-flavonoid phenols, flavan-3-ols and condensed tannins, flavonols, anthocyanins
18. Must production – overview of must composition
19. Overview of wine production
20. Maceration of grapes and extraction of their constituents
21. Yeasts and the biochemistry of alcoholic fermentation in wine
22. Red and white table wines
23. Malolactic fermentation
24. Oxidation in wine
25. Fining and clarification of wines
26. Physical and chemical stabilization of wine
27. Microbiological spoilage of wine and its control
28. Contaminations, flavour defects and mycotoxins
29. The role of sulfur dioxide in wine – sulphur dioxide addition
30. Maturation and ageing of wines
31. Wine chemistry during post-fermentation processes
32. Additives and processing aids
33. Aroma enhancement in white wines
34. Occurrence of reductive off-odours during bottle ageing
35. Innovative analytical techniques and applications
36. New applications in tannin characterization
37. Bottling and storage of wines
38. Methods of must, grape pulp and wine transfer
39. Heating and cooling methods
40. Must and wine acidity
41. Preparation, analysis and evaluation of experimental wines
42. Safety limits for selected wine constituents

(4) LEARNING & TEACHING METHODS - EVALUATION

<table>
<tr><td>TEACHING METHOD
Face to face, Distance learning, etc.</td><td>Face to face</td></tr>
<tr><td>USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)
Use of ICT in Teaching, in Laboratory Education, in Communication with students</td><td>Use of ICT in teaching, in laboratory education, and in communication with students:
Organization of course material in ppt slides
Support of the learning process via the e-class electronic platform
Communication via email</td></tr>
<tr><td>TEACHING ORGANIZATION
The ways and methods of teaching are described in detail.
Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</td><td><table><tr><th>Activity</th><th>Workload/semester</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Bibliographic research & analysis</td><td>23</td></tr><tr><td>Interactive learning</td><td>13</td></tr><tr><td></td><td></td></tr><tr><td>Total</td><td>75</td></tr></table></td></tr>
<tr><td>STUDENT EVALUATION
Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,</td><td>Written examination (mid-term and final examination)
Evaluation of assignments in the context of interactive teaching</td></tr>
</table>

Clinical examination of a patient, Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

(5) SUGGESTED BIBLIOGRAPHY

- Chemistry and Biochemistry of Wine – Winemaking, Eudoxus Book Code: 94688936, Edition: 1/2020, Authors: Andrew L. Waterhouse, Gavin L. Sacks, David W. Jeffery, ISBN: 9786185131685, Type: Textbook, Publisher: ROSILI ΕΜΠΟΡΙΚΗ – ΕΚΔΟΤΙΚΗ Μ.ΕΠΕ
- Chemistry and Biochemistry – Wine Maturation and Improvement, Eudoxus Book Code: 94688938, Edition: 1/2021, Authors: Andrew L. Waterhouse, Gavin L. Sacks, David W. Jeffery, ISBN: 9786185131692, Type: Textbook, Publisher: ROSILI ΕΜΠΟΡΙΚΗ – ΕΚΔΟΤΙΚΗ Μ.ΕΠΕ
- Oenology – Principles and Practices, Eudoxus Book Code: 77106965, Edition: 1/2018, Authors: B. Roger Boulton, Vernon L. Singleton, Linda F. Bisson, Ralph E. Kunkee, ISBN: 9789925563210, Type: Textbook, Publisher: BROKEN HILL PUBLISHERS LTD
- Various scientific papers or review articles, which may be of general interest or cover recent developments in Biochemistry (and more broadly in the biological sciences) that, as is the case everywhere, take time to be incorporated into textbooks and may change every year, are uploaded on the e-class platform.

- Relevant scientific journals:
  - Journal of Wine Research
  - American Journal of Enology and Viticulture
  - Fermentation
  - Beverages
  - AIMS Microbiology
  - AIMS Agriculture and Food
  - Foods
  - Food Research International
  - LWT – Food Science and Technology
  - Journal of Functional Foods
  - Scientia Horticulturae
  - Food Chemistry