

COURSE OUTLINE

(1) GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	BIOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	BIO_ΓΕ04	SEMESTER	5/7
COURSE TITLE	FOOD CHEMISTRY AND TECHNOLOGY		
INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>		WEEKLY TEACHING HOURS	CREDITS
<i>Lectures</i>		4	6
<i>Seminars</i>			
<i>Laboratory work</i>		4	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Field of Science and Skills Development.		
PREREQUISITE COURSES:	There are not prerequisite courses.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

<p>Learning outcomes <i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i>
<p>By the end of this course the student will acquire the necessary knowledge on:</p> <ol style="list-style-type: none"> 1. Chemistry, nutritional value, microbiology, and methods of production of carbohydrate-, protein- and fat-containing foods, juices, alcoholic beverages and dairy products at industrial, semi-industrial and/or household scale. 2. Industrial practices and new trends on improving the quality and the production processes of food, as well as for the production of new foods with health benefits. 3. The importance of fermentation technology in food production and the linking of biotechnology with the food industry.

Applying analytical methods for the determination of food composition.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>.....</i>
<i>Production of new research ideas</i>	<i>Others...</i>
	<i>.....</i>

By the end of this course the student will acquire:

1. Practical skills for the separation and analysis of food ingredients using classical and instrumental analytical techniques.
2. Ability to recognize the role and nutritional value of food ingredients in order to adapt their daily diet to the benefit of their own health and to deal with problems (diet, diabetes, anaemia, etc.) and to be able to advise other people respectively.
3. Capability to assess the nutritional value of industrial foods.
4. Knowledge on the production of different types of wine (dry, sweet, red, white).
5. Ability to assess the impact of the various processes of food production on its composition and quality.
6. Possibility to seek employment in companies, industries and laboratories, the majority of which in Greece are in the food sector.
7. Ability to critically evaluate knowledge for the selection of appropriate products/technologies to create new companies of food production, processing, or analysis.
8. Ability to have a consulting role in food production, processing, and analysis companies and to seek employment in these companies.

Generally, by the end of this course the student will have further developed the following general abilities (from the list above):

- *Searching, analysis and synthesis of facts and information, as well as using the necessary technologies*
- *Adaptation to new situations*
- *Decision making*
- *Autonomous (independent) work*
- *Group work*
- *Work in interdisciplinary environment*
- *Exercise of criticism and self-criticism*

Promotion of free, creative and inductive thinking

(3) SYLLABUS

1. Carbohydrate containing foods: Production of syrups (raisin syrup, carob syrup). Production of sugar - molasses. Starch and glucose industry. Honey. Sweeteners.
2. Bakery products. Raw materials. Chemical composition. Swelling. Functional properties of starch and gluten. New Trends (Starter Cultures, Enzymes, Applications of Genetic Engineering, Chemical Additives).
3. Oenology: Composition and correction of must. Alcoholic fermentation. White and red vinification. Sweet wines and Mistelles (non-fermented fortified wines). Sparkling wines. Retsina (resinated wine). Stafiditis (raisin wine). Mavrodaphni (Greek red fortified wine). Thermovinification. Wine composition. Alcoholic fermentation by-products. Aging. Diseases and defects. Wine clarification. Racking. Sulphurization. Pasteurization. Bottling. Wine Mechanics: Crushing/grape crushers. Must draining/drainers. Presses. Must transfer pumps. Bioreactor types (fermentation tanks). Must recycling (tide) during vinification. Filters. Pasteurizers. Bottle washing machines. Filling machines. Capping-tamping machines. Installation of bottling line. Wine tasting: Colour, appearance, aroma, taste, ingredients with sweet, sour or astringent feel. Sulphurized musts. Wine and other grape derivatives in human diet.
4. Vinegar. Alcoholic beverages: Distillates. Tsipouro, Tsikoudia, Ouzo, Brandy, Whiskey, Vodka. Potable alcohol from raisins, molasses, cereals and potatoes.
5. Rapid alcoholic fermentations by *Saccharomyces cerevisiae* and *Zymomonas mobilis*. Bioreactors. Alcoholic fermentation parameters. Refineries. Liquors.
6. Beer production. Malting. Brewing. Maturation. Treatments.
7. Yeasts in food & food ingredients production (other than wine). Isolation. Growth. Metabolism. Raw materials for the production of food grade yeasts. Industrial production. Food uses (beer, spirits, bakery products, food supplements, probiotics, microbiology extracts, food flavour enhancers, single cell protein, dairy yeasts, yeasts for the production of food ingredients).
8. Citrus juice industry: Raw material, juicing, factors that affect the quality of juice, heat treatment of citrus juices, concentration of citrus juices, essential oils.
9. Fats and oils. Fat and oil alterations. Treatment of raw materials and products (refining, discoloration, deodorization, hydrogenation).
10. Meat Technology: Composition, microbiology, canning, meat products.
11. Milk Technology: Composition, microbiology, treatments (filtration, cooling, pasteurization, condensation, homogenization, de creaming).
12. Dairy products.

Laboratory exercises:

1. Analytical presentation of all laboratory exercises-Tutorial.
2. Flour analysis: (a) Determination of gluten. (b) Ash determination. (c) Detection of oxidants.
3. Oil Analysis: (a) Saponification number. (b) Degree of acidity. (c) Iodine number. (d) Colour reactions. (e) Detection of antioxidant additives and paraffin oil in olive oil by thin layer chromatography.
4. Milk analysis: (a) Protein determination by the Kjeldahl method. (b) Fat determination by the Gerber method. (c) Specific weight.
5. Determination of total fat in olive pit or cocoa or nuts by Soxhlet extraction.
6. Sugar analysis: Determination of (a) reducing sugars, (b) total sugars, and (c) sucrose in

honey.

7. Sugar analysis: Determination of (a) glucose, (b) fructose, and (c) detection of sugar syrup, and (d) starch syrup in honey.
8. Oenology: *Saccharomyces*. (a) Preparation of wet and solid yeast culture. (b) Preparation of liquid yeast culture in must in order to enhance the fermentation of wine. (c) Determination of yeast concentration in fermenting must.
9. Oenology: Examination and alcoholic fermentation of grape must. (a) Measurement of density. (b) Determination of total acidity. (c) Corrections of must. (d) Alcoholic fermentation for white dry wine. (e) Alcoholic fermentation for red sweet wine. (f) Preparation of Mistelle. (g) Rapid alcoholic fermentation by addition of yeast. Kinetics of fermentation. Determination of cell concentration. (h) Microscopic examination of yeasts (observation of healthy cells, dead cells, bacteria contamination). Microscopic examination of yeast cells prior to fermentation.
10. Oenology: Chemical analysis of wines: (a) alcoholic strength, (b) total acidity, (c) volatile acidity, (d) free sulphite, (e) bound sulphite, (f) total sulphite.
11. Oenology: Treatments for the preparation of white dry and red sweet wine: (a) Fermentation monitoring every 48 hours: Macroscopic. Microscopic observation of yeasts. Enhancement of stuck fermentation with yeast. (b) Cease of fermentation by addition of alcohol in sweet wine production. (c) Determination of the end of fermentation. Racking. Clarification. Sulphurization. Wine cooling. Filtration.
12. Gas chromatographic analysis of oils (fatty acid methyl esters).
13. Sensory evaluation of wine.

(4) TEACHING and LEARNING METHODS - EVALUATION

<p style="text-align: center;">DELIVERY <i>Face-to-face, Distance learning, etc.</i></p>	<p>1. Face-to-face lectures using Information and Communication Technologies (ICTs) (e.g. powerpoint), and presentation of the theoretical background of the laboratory exercises.</p> <p>Laboratory exercises in groups of 2-3 students.</p>	
<p style="text-align: center;">USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<p>Use of ICTs (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of .ppt files, where from the students can freely download them using a password, which is provided to them at the beginning of the course.</p>	
<p style="text-align: center;">TEACHING METHODS <i>The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i></p>	Activity	Semester workload
	Lectures (4 contact hours per week x 13 weeks)	52
	Εργαστήριο (4 contact hours per week x 13 weeks)	52
	Final exam (6 contact hours)	6
	Hours for private study of the student and preparation for the final examination.	40
Course total	150 hours (total student work-load)	
<p style="text-align: center;">STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p>1. Laboratory exercises (40% of the final course grade). Average score of oral and written test after the end of each exercise, and final written examination of the laboratory exercises.</p> <p>2. Final written exam (60% of the final grade).</p> <p>All the above take place in the Greek language, as well as in English for foreign students (e.g. ERASMUS students).</p>	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. A. A. Koutinas & M. Kanellaki. Food Chemistry and Technology. University of Patras, Patras, 2009-2010 (*in Greek language only*)
2. E. Voudouris & M. Kontominas. Introduction to Food Chemistry. Eds OEDB, 2006, Greece (*in Greek language only*)
3. H.-D. Belitz, W. Grosch, P. Schieberle. Food Chemistry, 4rd ed. Springer Berlin, 2009, Heidelberg, New York.
4. O.R. Fennema. Food Chemistry. 3rd edit., Marcel Dekker Inc., 1996, New York.

Jackson, R. Wine Science, 3rd Edition: Principles and Applications. 2008, Elsevier Inc.A.

- Related academic journals: