SCHOOL	School of Food and Nutritional Sciences		
ACADEMIC UNIT	Department of Food Science and Human Nutrition		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**3402**	**SEMESTER**	**8th**
COURSE TITLE	NATURAL PRODUCTS: CHEMISTRY AND BIOACTIVITY		
INDEPENDENT TEACHING ACTIVITIES *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*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Practice Exercises		5	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://w1.aua.gr/etda/en/courses/natural-products-chemistry-and-bioactivity/		

(1) LEARNING OUTCOMES

Learning outcomes

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.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Course of Natural Products: Chemistry and Bioactivity is the study and deepening of students at a theoretical and practical level with modern methods of receiving, isolating and processing natural products, primary and secondary metabolites. Classification based on their origin, chemical structure, bioactivity and biosynthesis. Study of their applications in the food and pesticide industry.

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?

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

- Working independently
- Decision making
- Generation of new research ideas
- Production of free, creative and inductive thinking

(2) SYLLABUS

1. Introduction: General about Natural Products - Understanding their action at the molecular level. Exploitation of natural products
2. Primary Metabolites: Carbohydrates: monosaccharides, oligosaccharides, polysaccharides Lipids: oils, alkynes Amino acids, peptides, proteins, enzymes: non-protein amino acids, cyanohydrin glycosides, glycosinolides, betalains, lectins, enzymes
3. Phenolic, chemical, acetate derivatives: Sikymic and phenylpropane derivatives: Phenols and phenolics, coumarins, lignans, flavonoids, anthocyanins, tannins Polyketides: quinones, orcinols, phloroglucinols
4. Terpenes and steroids: Monoterpenes, sesquiterpenes, Essential oils, pyrethroids, iridoids, sesquiterpene lactones, diterpenes, triterpenes, saponins, sterols, steroids, carotenoids, oleoresins, balms.
5. Alkaloids: Ornithine alkaloids (pyrrolidines, tropanes, pyrrolizidines) Lysine alkaloids (piperidines, quinolizidines, indolizidines) Nicotinic acid alkaloids (pyridines) Tyrosine alkaloids (tetrahydroisoquinolines, modified isoquinolines, morphines, opioids) Tryptophan alkaloids (indoles, carbolines, quinolines) Anthranilic acid alkaloids (quinolines, acridines) Alkaloids from histidine (imidazoles) 6. Isolation and Separation Techniques, Isolation and Identification of Natural Products Extraction, Filtration and Distillation Techniques Separation and Isolation Techniques: Chromatographic techniques Identification Techniques: Spectroscopic Techniques
6. Bioactivity Control Techniques Determination of total phenolics. Antioxidant activity, antimicrobial activity, Toxicity, Insect repellent-Insecticide activity, Herbicidal activity

7. Natural Products Applications: Herbs, Flavourings, Essential Oils, Natural Pigments, Natural Food Preservatives, Nutritional Supplements, Plant Protection, Medicines, Cosmetics, New products with interesting prospects.

Laboratory Exercises

1. Isolation of Cinnamaldehyde from cinnamon
2. Purity Control using chromatographic and spectroscopic techniques
3. Isolation of Caffeine from tea
4. Purity Control using chromatographic and spectroscopic techniques
5. Determination of Total Phenols: Folin-Ciocalteu Assay
6. Determination of Antioxidant Activity: DPPH, ABTS methods
7. Toxicity Assay - Method for measurement of bioluminescence of the bacterium Vibrio fischeri (MICROTOX Analyzer)

(3) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face

Lectures at the amphitheatre, and laboratory exercises at the laboratory.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Using PowerPoint presentations. Communication with students via e-mail. Learning process support through e-class access, online databases, etc.</td></tr>
<tr><td>TEACHING METHODS
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.

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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td>30</td></tr>
<tr><td>Individual laboratory work (results report)</td><td>35</td></tr>
<tr><td>Written individual work</td><td>20</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

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,</td><td>I. Written final exam in the theory of the course which includes:
1. Short Answer Questions (40%)
2. Evaluation of theory data (40%)
3. Problem solving (20%)
II. Projects presentation
III. The examination in the laboratory part of the course is formed by:</td></tr>
</table>

laboratory work, clinical examination of patient, art interpretation, other *Specifically defined evaluation criteria are given, and if and where they are accessible to students.*	1. the participation of students in the laboratory: a) oral examinations before and during the exercises (25%) b) evaluation of laboratory reports for processing laboratory results (25%). 2. final written examination (50%). Final exam in the laboratory part of the course which includes: a) short answer questions b) Multiple choice test

(4) ATTACHED BIBLIOGRAPHY

1. Natural Products from Plants Leland J. Cseke, Ara Kirakosyan, Peter B. Kaufman, Sara L. Warbe, James A. Duke, Harry L. Brielmann, CRC Press Taylor & Francis Group, 2006.
2. Chemistry of Natural Products V. Ragousi 1996.
3. Pharmaceutical Products of Natural Origin, P. Kordopatis, E. Manesi-Zoupa, George Pairas, University Publications of Crete.
4. Natural Products: Chemistry and Bioactivity, V. Konstantinou, E. Couladouros, P. Tarantilis, C. Pappas, University Notes, Agricultural University of Athens.