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	EN21	**SEMESTER**	8th Semester
COURSE TITLE	GREEN CHEMISTRY		

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**
	3	3
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*	Background
PREREQUISITES:	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass2.emt.duth.gr/courses/CHEM-N1102/

(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.

Upon successful completion of the course, students will have acquired

- An understanding, consolidation, and ability to apply the knowledge and techniques necessary to become familiar with the 12 principles of Green Chemistry.
- Familiarity with Green Chemistry methods and techniques for designing products and processes that reduce or eliminate hazardous and toxic chemical compounds for humans and the environment ("green" products).
- Contact with the relevant research activity of the Department of Chemistry and organization of visits to pilot and industrial chemical process facilities.

Adaptability to the constantly evolving field of Green Chemistry and Green Chemical Technology with an emphasis on process design and the production of products from renewable raw materials that make a significant contribution to Sustainable Development. Acquisition of general skills, such as retrieving and analyzing information from the Internet in databases and from primary literature, teamwork, ability to present research results and critical analysis of the literature orally and in writing.

General Skills
Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*

Decision making *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Sustainability* *Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

Applying knowledge in practice. Searching for, analyzing, and synthesizing data and information, using the necessary technologies. Adapting to new situations. Decision-making. Working in an international environment. Working in an interdisciplinary environment. Generating new research ideas. Respect for the natural environment. Promoting free, creative, and inductive thinking.

(3) COURSE CONTENT

1. Introduction. The place of chemistry in the world and the environment, Evolution of the environmental movement, The role of chemists.

2. What is Green Chemistry? From theory to practice.

3. Tools of Green Chemistry.

4. Principles of Green Chemistry.

5. Assessment of the impact of Green Chemistry.

6. Assessment of starting materials and raw materials.

7. Assessment of different types of chemical reactors.

8. Assessment of methods for designing safer chemicals.

9. Examples of Green Chemistry applications.

10. Future Trends in Green Chemistry.

11. Green Chemistry Experiments.

(4) LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
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.*	

Activity	Workload/semester
Lectures	35
Bibliographic research & analysis	20
Project	45
Total	100

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, Clinical examination of a patient, Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	Final exam during exam periods. Assessment Methods: - Written exam with short-answer questions (formative, summative), - Written Assignment (Formative, Summative), - Public Presentation (Formative, Summative)

(5) SUGGESTED BIBLIOGRAPHY

1. GREEN CHEMISTRY: THEORY AND PRACTISE, ANASTAS T. PAUL, WARNER C. JOHN, ISBN139789605242346, Μετάφραση: ΑΜΠΕΛΙΩΤΗΣ ΚΩΝΣΤΑΝΤΙΝΟΣ, ΚΑΠΑΣΣΑ ΜΑΡΙΑ, ΣΙΣΚΟΣ Α. ΠΑΝΑΓΙΩΤΗΣ.
2. ΠΡΑΣΙΝΗ ΧΗΜΕΙΑ ΚΑΙ ΠΡΑΣΙΝΗ ΤΕΧΝΟΛΟΓΙΑ, 2012, ΑΘ. ΒΑΛΑΒΑΝΙΔΗΣ, ΘΩΜΑΙΣ ΒΛΑΧΟΓΙΑΝΝΗ, Έκδοση: 978-960-9695-00-8/2012, Κωδικός Βιβλίου στον Εύδοξο: 20524925
3. ΠΡΑΣΙΝΗ ΧΗΜΕΙΑ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑ ΣΤΗ ΒΙΩΣΙΜΗ ΑΝΑΠΤΥΞΗ, 2015. Α. Ζουμπούλης, Κ. Τριανταφυλλίδης, Ε. Πελέκα, ΕΛΛΗΝΙΚΑ ΑΚΑΔΗΜΑΙΚΑ ΣΥΓΓΡΑΜΜΑΤΑ ΚΑΙ ΒΟΗΘΗΜΑΤΑ, ΚΑΛΛΙΠΟΣ,(www.kallipos.gr), ISBN 978-960-603-089-5, Κωδικός Βιβλίου στον Εύδοξο: 320184
4. Πράσινη Χημεία - Θεωρία και Πράξη (P.T. Anastas, J.C Warner), 2007. Διαθέτης (Εκδότης): ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, ISBN: 978-960-524-234-6. Κωδικός Βιβλίου στον Εύδοξο: 314