

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	TECHNOLOGY		
DEPARTMENT	ENVIRONMENTAL SCIENCES		
LEVEL OF STUDY	<i>Undergraduate</i>		
COURSE UNIT CODE	NEW COURSE	SEMESTER	8 th
COURSE TITLE	SUSTAINABLE TECHNOLOGIES FOR SECONDARY MATERIALS		
INDEPENDENT TEACHING ACTIVITIES in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits		WEEKLY TEACHNG HOURS	CREDITS
THEORETICAL BACKGROUND		3	3
COURSE TYPE Background knowledge, Scientific expertise, General Knowledge, Skills Development	SCIENTIFIC AREA: WASTE MANAGEMENT		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION & EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

<p>Learning Outcomes The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:</p> <p>APPENDIX A</p> <ul style="list-style-type: none"> • Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework. • Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and <p>APPENDIX B</p> <ul style="list-style-type: none"> • Guidelines for writing Learning Outcomes
<p>There is no general definition for secondary raw materials, but they usually include waste materials (e.g. mineral waste), adjacent currents (e.g. slag and ash), processing residues, material removed during the life cycle of the product. and their products and materials that have reached the end of their life cycle. We need to change our perception of such "waste materials" and, from this point on, start calling it raw material or material. In addition to the use of secondary materials for purposes such as land improvement, road construction and payment materials, their conversion into materials and products</p>

of high added value, equivalent to primary materials, could be sought. The idea of using and utilizing waste for operational purposes is particularly good, but there are still significant challenges to achieve the target, as well as concerns such as potentially dangerous substances.

The aim of the course is:

for students to understand the various technologies of energy utilization of waste as well as the utilization of waste as secondary raw materials from 2 important industries:

- The cement industry.
- The ceramic industry.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

<i>Search for, analysis and synthesis of data and information by the use of appropriate technologies, Adapting to new situations</i>	<i>Project planning and management</i>
<i>Decision-making</i>	<i>Respect for diversity and multiculturalism</i>
<i>Individual/Independent work</i>	<i>Environmental awareness</i>
<i>Group/Team work</i>	<i>Social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Working in an international environment</i>	<i>Critical thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>Development of free, creative and inductive thinking</i>
<i>Introduction of innovative research</i>	<i>.....</i>
	<i>(Other.....citizenship, spiritual freedom, social awareness, altruism etc.)</i>
	<i>.....</i>

- Adaptation to new situations
- Work in an interdisciplinary environment
- Production of new research ideas
- Respect for the natural environment
- Practice criticism and self-criticism
- Promoting free, creative and inductive thinking

(3) COURSE CONTENT

Theory

1. Introduction - Definitions
2. Legal framework for the conversion of waste into secondary raw materials.
3. Engineering - processing.
4. Biological treatment.
5. Burning - incineration.
6. Pyrolysis.
7. Gasification.
8. Plasma gasification.
9. International experience in Energy utilization of ASA and secondary raw materials.
10. Possibilities of application in Greece.
11. Secondary raw materials in the cement industry.
12. Secondary raw materials in the ceramic industry.
13. Secondary raw materials and climate change.

(4) TEACHING METHODS-ASSESSMENT

<p>MODES OF DELIVERY Face-to-face, in-class lecturing, distance teaching and distance learning etc.</p>	<ul style="list-style-type: none"> • Lectures in the classroom or by distance • Team discussion 	
<p>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY Use of ICT in teaching, Laboratory Education, Communication with students</p>	<ul style="list-style-type: none"> • Powerpoint. • View video material. • e-mail. • e-class 	
<p>COURSE DESIGN Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.</p> <p>The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</p>	<p>Activity/Method</p>	<p>Semester workload</p>
	<p>Lectures</p>	<p>39</p>
	<p>Theory study</p>	<p>16</p>
	<p>Team working</p>	<p>20</p>
	<p>Course total <i>(25 hours of workload per credit unit)</i></p>	<p>75</p>
<p>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS Detailed description of the evaluation procedures:</p> <p>Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other.....etc.</p> <p>Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</p>	<p><u>Students are assessed in Greek or English. The final grade is formed by tests which include:</u></p> <ul style="list-style-type: none"> • Written exam: 70% of the final grade (A) • Tasks: 30% of the final grade (B) <p>Final grade = 70% (A) + 30% (B)</p>	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography

- Secondary Raw Material - an overview | ScienceDirect Topics, 15/5/2019
<https://www.sciencedirect.com/topics/engineering/secondary-raw-material>
- UNEP, CRITICAL METALS FOR FUTURE SUSTAINABLE TECHNOLOGIES AND THEIR RECYCLING POTENTIAL, July 2009.
- United Nations, FCCC/TP/2018/2, Framework convention on climate change.

- European Economic and Social Committee, CCMI/078, Secondary raw materials.
- OECD, Global Material Resources Outlook to 2060.
- Τεχνολογίες επεξεργασίας ΑΣΑ και νομικό πλαίσιο, Δημήτρης Δερματάς, Αν. Καθηγητής, Σχ. Πολ. Μηχανικών, ΕΜΠ, 20 Νοεμβρίου 2015.
- European Commission, Study supporting the elaboration of guidance on best practices in EWMPs, Circular Economy action, 22/1/2019.
- Υ.ΠΕ.ΧΩ.Δ.Ε.,
ΔΙΑΧΕΙΡΙΣΗ ΑΠΟΒΛΗΤΩΝ, Η ΟΔΗΓΙΑ 96/61/ΕΚ ΓΙΑ ΤΗΝ ΟΛΟΚΛΗΡΩΜΕΝΗ ΠΡΟΛΗΨΗ ΚΑΙ ΠΕΡΙΟΡΙΣΜΟ ΤΗΣ ΡΥΠΑΝΣΗΣ (IPPC) ΚΑΙ ΟΙ ΕΛΛΗΝΙΚΕΣ ΠΡΟΤΑΣΕΙΣ ΓΙΑ ΤΙΣ ΒΕΛΤΙΣΤΕΣ ΔΙΑΘΕΣΙΜΕΣ ΤΕΧΝΙΚΕΣ.
- The European IPPC Bureau, eippcb.jrc.ec.europa.eu/reference/

- Complementary bibliography

Lecture notes and the full material of the lectures and introductory presentations of the workshops, are available through the asynchronous training platform.