



COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Technology		
ACADEMIC UNIT	Department of Environmental Sciences		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	AE814	SEMESTER	8th
COURSE TITLE	SECONDARY MATERIALS UTILISATION TECHNOLOGIES		
INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS		CREDITS
Teaching Hours		3	3
COURSE TYPE	Specialised general knowledge		
PREREQUISITE COURSES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/ENV_U_170/		

(2) LEARNING OUTCOMES

Learning outcomes
There is no general definition of secondary raw materials, but they typically include waste materials (e.g. mining waste), side streams (e.g. slag and ash), processing residues, material removed during the product life cycle, and products and their materials that have reached the end of their life cycle. We need to change our understanding of such "waste materials" and, from this point on, start calling them raw materials or feedstock. In addition to the use of secondary materials for purposes such as soil improvement, road construction and infill materials, we could seek to convert them into high added-value materials and products on a par with primary materials. The idea of using and recovering waste for operational purposes is particularly good, but there are still significant challenges to achieving this goal, as well as concerns regarding the existence of potentially hazardous substances. The aim of the course is to provide students with a basic understanding of the various technologies for energy recovery from waste and the use of waste as a secondary raw material by two major industry sectors: The cement industry and the ceramics industry.
General Competences
• Search for, analysis and synthesis of data and information, with the use of the necessary technology • Decision-making • Working independently • Team work • Respect for the natural environment • Criticism and self-criticism • Production of free, creative and inductive thinking

(3) SYLLABUS

• Introduction – Definitions. • Legal framework for converting waste into secondary raw materials. • Engineering – processing. • Biological processing. • Combustion – incineration. • Pyrolysis. • Gasification. • Plasma gasification. • International experience of energy utilization of MSW and secondary raw materials. • Application possibilities in Greece.
--

- Secondary raw materials in the cement industry.
- Secondary raw materials in the ceramics industry.
- Secondary raw materials and climate change.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Use of PowerPoint slides • Communication with students via e-mail • Use of asynchronous distance learning (e-class)	
TEACHING METHODS	Activity	Semester workload
	Lectures	39
	Study and analysis of bibliography	24
	Essay writing	12
	Course total (25 hours workload per credit)	75
STUDENT PERFORMANCE EVALUATION	Students' performance is evaluated in the Greek language. The final grade is determined by: • A written exam (at the end of the semester) that contributes 70% to the final grade, applying one or more of the following evaluation methods: Multiple choice questions, short-answer questions, problem solving. • Elaboration of an individual written assignment (in the 2nd half of the semester) that determines 30% of the final grade. The students may present the assignment in class. Final Grade = 70% Exam Grade + 30% Assignment Grade	

(5) ATTACHED BIBLIOGRAPHY

- European Economic and Social Committee, (2011) *Secondary Raw Materials*, CCMI/078.
- ScienceDirect Topics, (15/5/2019) *Secondary Raw Material - an overview*, <https://www.sciencedirect.com/topics/engineering/secondary-raw-material>
- UNEP, (2009) *Critical Metals for Future Sustainable Technologies and their Recycling Potential*. UNEP.