

COURSE OUTLINE

(1) OVERVIEW

SCHOOL	MARITIME & INDUSTRY		
DEPARTMENT	INDUSTRIAL MANAGEMENT & TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	TETEX05	SEMESTER	6
COURSE TITLE	RECYCLING: ECONOMIC & TECHNOLOGICAL ISSUES		
DISCRETE TEACHING ACTIVITIES <i>In cases where ECTS credits are awarded to distinct components of the course (e.g., Lectures, Laboratory Exercises, etc.), please indicate them separately. If the credits are awarded as a whole for the entire course, please state the weekly teaching hours and the total number of credits</i>		WEEKLY TEACHING HOURS	ECTS
Lectures, Laboratory & Projects		4	5.5
<i>Please add additional rows if needed. A detailed description of the teaching organization and instructional methods is provided in Section (4).</i>			
COURSE TYPE <i>core (C), core elective (CE), elective (E) - background, specialization, skill development</i>	E - Specialization		
PREREQUISITE COURSES:	None.		
LANGUAGE OF TEACHING AND EXAMINATIONS:	Greek (English for ERASMUS students)		
THIS COURSE IS AVAILABLE TO ERASMUS STUDENTS	Yes		
COURSE WEBPAGE (URL)			

(2) LEARNING OUTCOMES

Learning Outcomes <i>The learning outcomes of the course are described, specifying the particular knowledge, skills, and competencies at the appropriate level that students will acquire upon successful completion of the course.</i> <i>Please refer to Appendix A</i> • Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area. • Descriptive Indicators of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B. • Concise Guide for Writing Learning Outcomes	
The course introduces students to modern methods, technologies, and recycling systems, as well as their application in environmentally friendly waste and garbage management within the context of sustainability, environmental protection, and the conservation of natural resources and energy. Special emphasis is placed on the interdisciplinary nature of the subject, as well as on critical social and economic parameters. Upon successful completion of the course, students will be able to: • Select the appropriate recycling technology based on techno-economic and social criteria. • Develop basic mathematical models to describe various processes. • Evaluate and utilize alternative waste/garbage management models.	
General Competences <i>Taking into account the general competences that a graduate should have acquired (as listed in the Diploma Supplement and outlined below), which of these competences does the course aim to develop?</i>	
<i>Searching, analyzing, and synthesizing data and information, using the necessary technologies</i> <i>Adaptation to new situations</i> <i>Decision making</i> <i>Autonomous work</i> <i>Teamwork</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Generation of new research ideas</i>	<i>Project design and management</i> <i>Respect for diversity and multiculturalism</i> <i>Respect for the natural environment</i> <i>Demonstration of social, professional, and ethical responsibility and sensitivity to gender issues</i> <i>Exercising critical and self-critical thinking</i> <i>Promotion of free, creative, and inductive thinking</i> <i>...</i> <i>Other competences: ...</i>
• Searching, analyzing, and synthesizing data and information, using the necessary technologies	

- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstration of social, professional, and ethical responsibility and sensitivity to gender issues
- Exercising critical and self-critical thinking
- Promotion of free, creative, and inductive thinking

(3) COURSE CONTENT

The course covers the following topics: basic concepts of recycling, source separation, recycling technologies, alternative waste/garbage management and recycling, economic analysis of recycling, market development, and environmental footprint. Specifically:

Week	Topics
1	Introduction to Recycling
2	Economic Analysis of Recycling
3	Social Impacts of Recycling
4	Recycling Technologies: Plastics & Paper
5	Recycling Technologies: Metals & Glass
6	Recycling of Industrial & Agricultural Waste
7	Recycling of Municipal & Construction Waste
8	Design and Operation of Recycling Centers
9	Packaging and Recycling
10	Market Development and Environmental Footprint
11	Research and Innovation Centers in Recycling
12	Socioeconomic Trends in Recycling
13	Educational Programs and Awareness-Raising

Students are trained in the simulation and optimization of processes using physical simulators, at the Laboratory of Simulation of Industrial Processes. Participation in the laboratory is carried out on a rotating schedule. The laboratory schedule is posted on the course website and on eClass at the beginning of the semester. The laboratory schedule is listed below:

Week	Laboratory Sessions
1, 5, 9	Recycling of lignocellulosic biomass and its energy recovery through thermal methods (kiln).
2, 6, 10	Recycling of lignocellulosic biomass and its holistic utilization through hydrothermal methods (autoclave).
3, 7, 11	Simulation of liquid industrial wastewater treatment from textile and dyeing industries using adsorption columns.
4, 8, 12	Copper recycling and production of electrolytic copper from scrap.
13	Rescheduling of missed laboratory sessions

Furthermore, articles, audiovisual lecture material, web links to useful resources, exercises, and software are uploaded in electronic format on the eClass platform.

(4) TEACHING and LEARNING METHODS - ASSESSMENT

TEACHING MODE <i>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</i>	• Face-to-face in a classroom or the Lab • Distance teaching & learning (if required)																		
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY <i>Use of ICT in Teaching, Laboratory Education, Communication with students</i>	Teaching: Lectures using modern audiovisual equipment, learning support through the eClass electronic platform, synchronous distance teaching via MS Teams. Laboratory: open-source and specialized software Communication with students: face-to-face during office hours, email, eClass platform, MS Teams tools																		
Organization of Teaching <i>A detailed description of the teaching methods and approach is provided.</i> <i>Lectures, seminars, laboratory exercises, fieldwork, study and analysis of literature, tutorials, internships (placements), clinical practice, artistic workshops, interactive teaching, educational visits, project work, writing assignments, artistic creation, etc.</i> <i>The student's study hours for each learning activity, as well as the hours of independent study, are specified in accordance with the principles of ECTS</i>	<table border="1"> <thead> <tr> <th>Activity</th><th>Semester Workload</th></tr> </thead> <tbody> <tr> <td>Lectures</td><td>26</td></tr> <tr> <td>Laboratory sessions</td><td>26</td></tr> <tr> <td>Case studies</td><td>18</td></tr> <tr> <td>Lab reports & project</td><td>29</td></tr> <tr> <td>Self-study of lecture material and case studies</td><td>36</td></tr> <tr> <td>Consultation Support</td><td>0.5</td></tr> <tr> <td>Exams (written)</td><td>2</td></tr> <tr> <td>Course Total</td><td>137.5</td></tr> </tbody> </table>	Activity	Semester Workload	Lectures	26	Laboratory sessions	26	Case studies	18	Lab reports & project	29	Self-study of lecture material and case studies	36	Consultation Support	0.5	Exams (written)	2	Course Total	137.5
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STUDENT ASSESSMENT <i>Description of the assessment process</i> <i>Language of assessment, assessment methods, formative or summative evaluation, multiple-choice tests, short-answer questions, essay questions, problem-solving, written assignments, reports, oral examinations, public presentations, laboratory work, clinical patient examination, artistic interpretation, other(s)</i> <i>Explicitly state assessment criteria and information on whether and where these criteria are accessible to students are included.</i>	Language of Assessment: Greek (English for ERASMUS students) Assessment Mode: Face-to-face and/or distance learning (if required) Assessment Methods: The final grade for the course is determined as follows: • 60% based on the written examination during the spring semester exam period, and in case of failure, during the September resits. • 40% based on the Lab reports and the project. The written exam includes multiple-choice questions and is conducted as a closed-book exam. Students with Learning Difficulties: Students with certified learning difficulties in reading and writing (as recognized by the competent authority) are assessed according to the procedures established by the Department. Disclosure of Assessment Criteria: The assessment criteria are communicated during the first class and are clearly stated on the course website and the eClass platform. The exam syllabus is announced on eClass following the final lecture of the semester. The exam answers are posted on eClass after the examinations take place. Students have the right to review their graded exams and receive explanations regarding their grades. In cases of further requests, the procedures outlined in the current Study Regulations apply.																		

(5) SUGGESTED BIBLIOGRAPHY

- Books: • Savidis, G.S. (2019). Enrichment of Solid Waste – Recycling Technologies, Alexandros Publications, ISBN: 9786188444874 [86198399] – in Greek • Skordilis, A. (2017). Waste Recycling Technologies, Barbounakis Publications, ISBN: 9789602672259 [68376840]– in Greek - Journals: - Other educational material: • Lecture Notes and Supporting Material provided by the Instructor • Laboratory Workbook
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