



## COURSE OUTLINE

### (1) GENERAL

SCHOOL	School of Technology		
ACADEMIC UNIT	Department of Environmental Sciences		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	AY502	SEMESTER	5th
COURSE TITLE	LIQUID WASTE TREATMENT and MANAGEMENT		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Teaching Hours		5	6
COURSE TYPE	Special Background		
PREREQUISITE COURSES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	<a href="https://eclass.uth.gr/courses/ENV_U_131/">https://eclass.uth.gr/courses/ENV_U_131/</a>		

### (2) LEARNING OUTCOMES

<b>Learning outcomes</b>
The aim of the course is to acquaint students with the nature of the various pollutants in liquid waste and their main sources, the pollution that is potentially caused, as well as the main pollution control technologies that are applied on a case-by-case basis to liquid waste.
<b>General Competences</b>
<ul style="list-style-type: none"><li>• Search for, analysis and synthesis of data and information, with the use of the necessary technology</li><li>• Decision-making</li><li>• Working independently</li><li>• Team work</li><li>• Respect for the natural environment</li><li>• Criticism and self-criticism</li><li>• Production of free, creative and inductive thinking</li></ul>

### (3) SYLLABUS

<ul style="list-style-type: none"><li>• Forms and sources of environmental pollution.</li><li>• Physical and chemical characteristics of liquid waste.</li><li>• Methods of determining the organic load and the quantitative composition of liquid waste.</li><li>• Primary treatment, sandblasting, type I &amp; type II sedimentation.</li><li>• Secondary treatment: principles of aerobic and anaerobic biological processes; systems: activated sludge, biological filters, pond systems (aeration and stabilization), secondary sedimentation.</li><li>• Tertiary treatment: chlorination, dechlorination, sludge treatment, sludge disposal; processes: nitrification and denitrification</li><li>• Advanced non-biodegradable wastewater and sludge treatment methods: photo ozonolysis, Fenton and UV-Fenton reactions, photocatalysis, electrochemical oxidation, oxidation in conditions beyond the critical water point.</li></ul>
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### (4) TEACHING and LEARNING METHODS – EVALUATION

<b>DELIVERY</b>	Face-to-face
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b>	<ul style="list-style-type: none"><li>• Use of PowerPoint slides</li><li>• View material in video</li><li>• Communication with students via e-mail</li><li>• Use of asynchronous distance learning (e-class)</li></ul>

TEACHING METHODS	Activity	Semester workload
	Lectures	39
	Laboratory practice	26
	Seminars	13
	Educational visits	13
	Essay writing	25
	Study and analysis of bibliography	34
	<b>Course total (25 hours workload per credit)</b>	<b>150</b>
<b>STUDENT PERFORMANCE EVALUATION</b>	<p>Students' performance is evaluated in the Greek language. The final grade is determined by:</p> <ul style="list-style-type: none"> <li>• An optional written exam (after the end of the semester) which forms 40% of the final score and includes one or more of the following assessment methods: Multiple choice questions, short-answer questions, problem solving.</li> <li>• A written exam (at the end of the semester) that forms at 60% of the final grade (or 100% if the optional exam is not taken) and includes one or more of the following evaluation methods: Multiple choice questions, short-answer questions, problem solving.</li> <li>• Alternatively, instead of taking the optional exam, students may choose to submit a project (in the 2nd half of the semester) that contributes 40% to the final grade. Students may present the project in class.</li> </ul> <p><b>Final Grade = 60% Exam Grade + 40% optional exam Grade or project Grade</b> or <b>Final Grade = 100% Exam Grade</b></p>	

#### (5) ATTACHED BIBLIOGRAPHY

- Kougolos, A., Samaras, P. (2018) *Engineering of liquid waste: treatment and reuse*. Thessaloniki: TZIOLA Publications (in Greek)
- Lymberatos, G., Vagenas, D. (2011) *Liquid Waste Management*. Thessaloniki: TZIOLA Publications (in Greek)
- Markandonatou, G. (1999) *Treatment and Management of Liquid Waste*. Technical Chamber of Greece Publications (in Greek)