

COURSE OUTLINE “WASTE WATER TREATMENT”

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
DEPARTMENT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE	662003	SEMESTER	2 nd
COURSE TITLE	WASTE WATER TREATMENT		
INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>		WEEKLY TEACHING HOURS	ECTS Credits
Lectures		3	6
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Scientific Area		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	http://www.environmentalprotection.gr/?page_id=152		

(2) LEARNING OUTCOMES

<p>Learning outcomes</p> <p><i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i>
<p>Upon successful completion of the course students should be able:</p> <ul style="list-style-type: none"> • To review the basic guidelines of the European and Greek legislation for wastewater treatment and basic concepts of: (a) the qualitative and quantitative characteristics of waste water, (b) the operation of wastewater treatment facilities, (c) the use of treated wastewater for irrigation, (d) specific requirements for the treatment and disposal of wastewater of tourism facilities, (e) the disposal of wastewater effluents. • To illustrate the relevant legislation, wastewater treatment methods, problems and pressures derived from the reuse of wastewater, the complexity of

operation of wastewater treatment plants and the technical, legal, developmental and socio-economic factors related to the installation of the wastewater treatment plant.

- To identify the suitability of the use of treated wastewater for irrigation and to evaluate the optimal method for the management of wastewater.
- To develop the sustainable management of wastewater in order to identify key elements such as the method of wastewater treatment, the selection of the area for installation of the wastewater treatment plant and the site in which the wastewater should be disposed.
- To analyze the key cost components of the wastewater treatment plant and the most important criteria for the selection of the most appropriate site for the plant installation.
- To argue and co-operate with their fellow students to: (a) to explore and present the most important parameters and criteria that control the decision for site selection of the wastewater treatment plant, (b) to compose and propose arguments and opinions whether to install or not the treatment plant, (c) to record and analyze the advantages and disadvantages of the installation, (d) to seek the maximization of the degree of social consensus.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Adapting to new situations

Decision-making

Working independently

Team work

Working in an international environment

Working in an interdisciplinary environment

Production of new research ideas

Project planning and management

Respect for difference and multiculturalism

Respect for the natural environment

Showing social, professional and ethical responsibility and sensitivity to gender issues

Criticism and self-criticism

Production of free, creative and inductive thinking

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Others...

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- Search, analysis and synthesis of data and information, using the necessary technologies. Especially: Systems needs for design of wastewater treatment processes.
- Autonomous work: Knowledge of regulations, protocols and ethical issues when developing innovation.
- Teamwork: Ability for dialog, self-esteem and commitment to reach an agreement.
- Working in an international environment: Communicative ability in international languages, respecting diversity, the environment and the demonstration of professional and ethical responsibility.
- Generate new research ideas: Promoting free, creative and inductive thinking to develop new strategic approaches.

(3) COURSE CONTENT

- Basic concepts. Basic subjects of European and Greek legislation for wastewater treatment.
- Directive 91/271 concerning urban waste water. [Definitions. Quantitative targets for urban wastewater. Sensitive areas. Criteria for the identification of sensitive and less sensitive areas. Industrial waste water. Sewage Sludge. Requirements for urban waste water. Reference methods for the monitoring and assessment of the treatment].
- Quality characteristics of wastewater (sewage, industrial effluent).
- Wastewater Treatment Plants. Basic concepts, estimation of the total wastewater flow, selection of the processing method and selection of the disposal site. Technical, legal, developmental and socio-economic factors controlling the installation of the plants.
- Use of treated wastewater for irrigation (national legislation - minimum requirements, technologies, comparative analysis of the environmental impact, economic cost).
- Special requirements for the treatment and disposal of wastewater of tourism facilities.
- Healthcare legislation E1b / 221/65 for the disposal of waste water or industrial waste. Licensing.
- Study of sewage disposal.

(4) TEACHING & LEARNING METHODS – EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face-to-face, Distance learning	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	<ul style="list-style-type: none"> ▪ Access to data bases and special coding software for search and management of information using ICT. ▪ Electronic communication with students. ▪ Support of teaching through the website. ▪ Presentation in PP, video and linking with specialized websites through the internet. 	
TEACHING METHODS <i>The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art</i>	Activity	Semester workload
	Lectures	30
	Interactive teaching	9

<i>workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i> <i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i>	Study and analysis of bibliography	90
	Writing a very short essay as an output of teamwork	21
	Course total	150
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	Written exams with multiple choice questionnaires (70%) and short-answer questions (15%) Short essay as an output of teamwork (15%)	

(5) ATTACHED BIBLIOGRAPHY

- Alexakis D. (2011), Assessment of water quality in the Messolonghi-Etoliko and Neochorio region (West Greece) using hydrochemical and statistical analysis methods. Environmental Monitoring and Assessment, 182:397-413, DOI 10.1007/s10661-011-1884-2.
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- Ειδική Γραμματεία Υδάτων (2010) Εφαρμογή της Οδηγίας 91/271/ΕΚ στην Ελλάδα. Κατάσταση 2009. Ειδική Γραμματεία Υδάτων, Υπουργείο Περιβάλλοντος, Ενέργειας και Κλιματικής Αλλαγής. Αθήνα, Ιούνιος 2010.
- (<http://www.ypeka.gr/LinkClick.aspx?fileticket=P25AiMwRwdk%3D&tabid=251>)
- Ζανάκη Κ. (2001) Έλεγχος Ποιότητας Νερού. 2^η Έκδοση. Εκδόσεις ΙΩΝ. Αθήνα.
- Καλαβρουζιώτης Ι. (2015) Αειφορική Διαχείριση Εδαφικών Πόρων και Αποβλήτων. 2^η Έκδοση. Εκδόσεις Τζιόλα, Θεσσαλονίκη.
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- Τσόγκας Χ. (2008), Δίκτυα αποχέτευσης και επεξεργασία λυμάτων. Εκδόσεις Ιων. Αθήνα.
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- U.S. Environmental Protection Agency (2006) Land Treatment of Municipal Wastewater Effluents. Process Design Manual. EPA/625/R-06/016, Land Remediation and Pollution Control Division, National Risk Management Research Laboratory, Office of Research and Development, Cincinnati, September 2006.
- Vlachopoulos N., Skordaki E.M., Alexakis D. (2012) Case Study: 16 Years of Optimizing the Performance of Sewage and Water Treatment Plants at Canadian Military Facilities. Protection and Restoration of the Environment XI. Thessaloniki July 3-6, 2012, Greece.

