ENVIRONMENTAL ENGINEERING – WASTE TREATMENT

COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL			
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT			
LEVEL OF STUDIES	UNDER GRADUATE			
COURSE CODE	270 712	**SEMESTER**	7	
COURSE TITLE	ENVIRONMENTAL ENGINEERING – WASTE TREATMENT			
INDEPENDENT TEACHING ACTIVITIES *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*			**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures			2	
Laboratory			2	
Tutorial			1	5 (total)
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).				
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized Knowledge, skills development			
PREREQUISITE COURSES:	ENVIRONMENT AND INDUSTRIAL DEVELOPMENT (not linked)			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek (official)- English (optional)			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://ikaros.teipir.gr/OPS/wastes_en.html			

(2) LEARNING OUTCOMES

Learning outcomes

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.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon completion of the course, students will:

- Have acquired an integrated knowledge for the waste sources and their impacts in the natural resources.
- Be familiar with the waste impacts mitigation measures and, more specifically with the waste treatment techniques and waste management technologies.
- Have acquired practical experience and insight, concerning the construction and operation of waste treatment processes and plants.
- Know the professional prospects emerging from their involvement with the environmental engineering aspects and be able to extend their career horizon in that direction.

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
……
Others…
…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology concerning the technology, projects and installations for environmental protection
Adapting to new situations since the students acquire knowledge for technologies and projects they have never heard before.
Decision-making for the design, the equipment, the technologies of these plants
Working independently as well as in teams for the completion of the Laboratory's Assignments
Production of new research ideas for innovation in the dynamic field of the environment
Project planning and management for the organisation of their Assignment as well as for understanding the management of the corresponding environmental protection projects
Respect for the natural environment since this is the whole idea of the module
Production of free, creative and inductive thinking in the accomplishment of the relevant assigned micro-projects.

(3) SYLLABUS

Basic Concepts

- Introduction- Course organisation and evaluation. The general idea of waste management.
- Waste generation sources. Waste categories.
- The concept and the formal definitions of sustainability.
- Professional interests and field in the Waste Treatment.
- Relevance to the Mechanical Engineering profession.

Solid Wastes

- Basic characteristics of solid wastes. – the solid wastes' management problem.
- Basic methods in solid waste management. Disposal sites.
- Thermal treatment, comparative evaluation of different methods in solid waste management.
- Recycling of solid wastes- special applications.

Water Resources Management - Waste Water Treatment

- The problem of water resources management. Importance of the problem for Greece.
- Basic methods of water supply in isolated areas.
- Comparative evaluation and cost issues.
- Basic characteristics of waste water, properties and specifications.
- Water pollution sources.
- Basic methods and techniques in waste management.
- Municipal waste water treatment plants– industrial waste water.
- The biological treatment plants - Various physical and chemical processes.
- Basic mechanical equipment.
- Basic issues in waste water plant operation. Reasons of malfunctioning.
- Case studies from real (operating) plants.

Special Issues

- Economic data concerning waste management facilities' implementation and operation. Current status in Greece.
- Issues concerning waste management facilities operation and maintenance equipment.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Lectures, laboratories, distance learning methods, Laboratory Education using also the Lab’s infrastructure</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>The Course Notes are offered in the Open Academic Lessons</td></tr>
<tr><td>TEACHING METHODS
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 workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Tutorial</td><td>14</td></tr>
<tr><td>Laboratory practice</td><td>25</td></tr>
<tr><td>Essay writing</td><td>25</td></tr>
<tr><td>Study</td><td>35</td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
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<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

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

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Written examination: 60%
Laboratory exercise: 40%</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

1. Kreith, F. and Tchobanoglous, G. (2002). **Handbook of solid waste management**. New York: McGraw-Hill
2. Eckenfelder, W. (2000). **Industrial water pollution control**. Boston: McGraw-Hill.
3. Tchobanoglous, G. (1979). **Wastewater engineering. Treatment, disposal, reuse**. 2.ed. Rev.by G. Tchobanoglous. New York: McGraw-Hill.
4. Kiely, G. (1998). **Environmental engineering**. London: McGraw-Hill.
5. Feates, F. and Barratt, R. (1995). **Integrated pollution management**. London: McGraw-Hill.
6. Tchobanoglous, G., Burton, F. And Stensel, H. (2003). **Wastewater engineering**. Boston: McGraw-Hill.