

ETE 811 - Environmental Physical Chemistry-Materials Technology (Special Topics of Environmental Chemistry)

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE811	SEMESTER	9
COURSE TITLE	Environmental Physical Chemistry-Materials Technology (Special Topics of Environmental Chemistry)		
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	CREDITS	
Lectures/Labs	3	3	
<i>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialized general knowledge, skills development</i>	Specialized general knowledge		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	http://www.materials.uoi.gr/en/0,02,01.php		

(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*

The course presents the basic principles and modern technology of Geoenvironmental Engineering in waste disposal, protection from the extension of pollution and decontamination of soils and underground aquifers. Among other things, students are exploring the nature of geo-environmental problems, their impacts and ways of improving the quality of the geoenvironment, as well as enhancing terrain as a means of building civil engineering projects.

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, analyze and synthesize data and information, using the necessary technologies.
- *Working in an interdisciplinary environment*
- *Project planning and management*
- *Respect for the natural environment*

(3) SYLLABUS

- Purpose and objectives of the course. Program and course content. Protection of geo-environment. Forms and causes of pollution.
- Pollution and rehabilitation of geo-environment in Greece and abroad.
- Institutional framework and case law on environmental protection. Environmental impact assessment. Legislative status of environmental protection in Greece today and in the past, in Europe and America.
- Soil and hydrogeology data. Minerals - rocks. Categories of soils. Movement of groundwater into soils. Estimation of hydraulic parameters of aquifers. Exploitation of aquifers by pumping.
- The role of plants and vegetation in civil engineering works. Hydrological and mechanical mechanisms of protection and stabilization of slopes in the presence of vegetation. The role of vegetation as a measure of protection against erosion.
- Territorial erosion. Types of corrosion and factors that cause it. Classification of corrosion. Consequences. Hydraulic corrosion. Surface erosion. Internal corrosion. Principles and measures to protect soil from erosion
- Soil pollution. Pollutant characteristics. Sources and acceptable limits of pollution. Polluted and contaminated soils. Related terms. Interaction of soil with soil. The phases of soil and pollutants and the balance between them.
- Pollution evolution mechanisms and simulation of pollutant transport. Geotechnical research and control techniques in contaminated sites and disposal sites. Methods and techniques for restoration of contaminated soils.
- Categories of solid waste. Municipal waste. Management techniques. Solid waste disposal. Sorting in Source. Collection Centers of recyclable materials - Mechanical Recycling.
- Thermal processing methods. Biological processing methods. Engineering and Biological Processing Units. Landfill. Institutional framework. Compost making from home disposals.
- Construction and Demolitions Waste materials. Removal and management. Geotechnical research. Purpose. Institutional framework. Methods of geotechnical research. Sample boreholes and excavations. In-field field trials.
- Laboratory tests. Classification and soil resistance tests. The triaxial test. Modern methods of determining basic physical and mechanical properties of soils. Permeability tests, chemical identification tests and rheological properties of fluids and viscosity measurement tests Soil filters: role, importance and design.
- Improvement and reinforcement of soils. Preload, consolidation, dynamic consolidation, vibratory consolidation, vibratory replacement, reinforcement, reinforcing with injections, thermal action. Recent methods of improvement: passive stabilization, stabilization with bio-materials (bacteria), artificial cementing.
- Summary. Key Issues and Basic Principles.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face-to-face teaching in the classroom	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	NO	
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 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</i>	Activity	Semester workload
	Lectures	39
	Non-directed study for surveying the literature (selection of an article and thorough study of it, which will be tested in the final examination)	18
	Non-directed study for final exams preparation	18
	Course total (25 working hours per ECTS)	75h
STUDENT PERFORMANCE EVALUATION <i>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.</i>	LANGUAGE OF EVALUATION: Greek METHOD OF EVALUATION: Final written examination	

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

1. M. Kavadas & M. Pantazidou, 2013. Environmental Geotechnology, NTUA (in Greek).
2. University Notes of the teaching staff-professor (in Greek)
3. Sharma, H.D. & Reddy, K.R., 2004. Geoenvironmental Engineering: site remediation, waste containment and emerging waste management technologies, Wiley.
4. Sarsby RW, 2000. Environmental Geotechnics, Thomas Telford ed.
5. Reddi, Lakshmi, Inyang & Hillary, 2000. Geoenvironmental Engineering: Principles and applications, Marcel Pecker inc.
6. LaGrega, M., Buckingham P.L. & Evans, J.C., 2001. Hazardous Waste Management, McGraw Hill.

-Related academic journals:

There is plenty of available (to the students) literature in books and scientific journals (either hard copies or in electronic form) provided by the professors who teach this discipline, like

- Geotechnical and Geological Engineering
- Journal of Geotechnical and Geo-environmental Engineering