COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENVIRONMENT AND AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	Natural Resources Management & Agricultural Engineering		
LEVEL OF STUDIES	Postgraduate studies		
COURSE CODE	**630020**	**SEMESTER**	**2nd**
COURSE TITLE	HYDROGEOLOGY- WATER QUALITY		

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/ Laboratory exercises	5	5
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*	Special background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	-

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 "Hydrogeology-Water Quality" is designed as a course primarily for the application of knowledge related to the use of methods for the investigation, exploitation and protection of groundwater.

In particular, the laws governing the development, storage and movement of groundwater, its detection, assessment and exploitation are studied aiming to the sustainable management of all water resources in any hydrological or hydrogeological basin.

Water resources are an integral part of the natural environment and are a social good that requires special and rational treatment to improve living conditions and, more generally, the economic development of a region without adversely affecting the economic and environmental balance.

The course is offered to postgraduate students and aims to introduce students to the basic concepts of the hydrogeological environment and to equip graduates with the necessary tools to be able to respond to hydrogeological issues at the stage of their professional careers or in the continuation of their studies. Students will synthesize their knowledge from the courses of the winter semester (Geoenvironment and Infrastructure works, Geochemistry-Environmental Geology). Students will have an in-depth knowledge of in situ measurements as well as laboratory analyses (AAS, Graphite furnace, ICP-OES). Students will comprehend how geological formations define both the quantity and availability of groundwater (due to the different permeability of rocks) as well as its quality (hydrochemistry) as groundwater dissolves the host rocks. The students will learn and understand the sources and transportation mechanisms of the contaminants and will be able to separate the geogenic from the human origin contaminants. Finally, they will have an in-depth view regarding the vulnerability of the aquifer systems to contamination as well as to protection measures.

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	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

-Working independently
-Teamwork
-Working in an interdisciplinary environment
-Respect for the natural environment
-Project planning and management

3. SYLLABUS

1. Objectives of hydrogeology - Hydrological cycle - Hydrological balance.
2. Hydrogeological behavior of geological formations - Aquifers - Sources and classification of sources.
3. Hydrogeological environments - Granular formations, Karst systems, Fractured rocks.
4. Groundwater movement - Pumping tests - Aquifer types and determination of hydraulic parameters.
5. Effects of the environment on groundwater level changes.
6. Technique of hydrogeological drilling - Identification of aquifers - Geophysical surveys.
7. Groundwater reserves - Artificial recharge.
8. Coastal aquifers - Causes of seawater intrusion - Management of coastal aquifers - Basic techniques to manage seawater intrusion.
9. Hydrochemistry - Methods for the determination of hydrochemical parameters - In situ measurements of physicochemical parameters - Laboratory analyses
10. Qualitative characteristics of groundwater - Hydrochemical classification of waters - Suitability of waters for various uses.
11. Groundwater contamination – Sources of Groundwater contamination- Transport of contaminants- Natural attenuation of groundwater contaminants- Transport of immiscible contaminants (NAPLs) - Mixing models –Susceptibility and vulnerability of aquifer systems to contamination.
12. Measures to protect aquifer systems against pollution and depletion - Protection zones for water abstraction projects.
13. Thermo-metallic and thermal waters

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in the classroom and in the laboratory for the analytical methods of hydrochemical water analysis
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of Power Point / Laboratory education
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*	

Activity	***Semester workload***
Lectures	36
Laboratory practice	24
Field trip	10
Individual practice projects	10
Study/report preparation	45

	Course total	***125***
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.*	- A specific study area is given to each student with the existing general and specific literature to study the hydrogeological-environmental conditions prevailing in the study area. - At the end of the semester, each student is required to submit a fully completed and properly structured written report, with a complete description of the hydrogeological and environmental conditions prevailing in the study area, which is graded accordingly. - Oral presentation of their work, in PowerPoint format, within 15 minutes, which is graded accordingly.	

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Applied-Environmental Hydrogeology, G. Kallergis, TEE Publications
-General Hydrogeology,. G.Soulios, University Studio Press Publications
-Water-Environmental Dimension & Pathway, G. Stournaras, Tziola Publications.
-Environmental Hydrogeology, Groundwater & Environment, K. Voudouris, Tziola Publications.

- Related academic journals:

-Hydrogeology Journal, *International Association of Hydrogeologists*, *Springer*
-Proceedings of Hydrogeological Conferences of the Hellenic Committee of Hydrogeology
-Environmental Monitoring and Assessment