COURSE OUTLINE

1. GENERAL

SCHOOL	ENVIRONMENT AND AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	NATURAL RESOURCES AND AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE	**630015**	**SEMESTER**	**1st**
COURSE TITLE	GEOENVIRONMENT AND PUBLIC WORKS		

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	3	3
Laboratory Exercises	1	1
Essays		1
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	4	5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special Background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek - English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
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 goal of the course is to analyse the importance of the geoenvironment for planning major infrastructure projects and protecting the natural resources. This course will provide key info regarding the Geological and Geomorphological processes of the Earth, focusing also on the natural resources. Students will comprehend the endogenous vs exogenous processes that form the landscape and the geological structures. The geoenvironment defines the way we live and our quality of life. An in-depth knowledge of the earth processes provides a valuable info on the planet's functioning and well-being. It would provide key info on environmental planning and best practices regarding the exploitation of the natural resources and the prevention of natural hazards. The course will emphasize the role of geoenvironment regarding a) land reclamation and infrastructure works, regarding both the design and monitoring against natural hazards (earthquakes, floods, landslides), b) how infrastructure works interact with the environment,
c) the importance of prevention planning, d) Nature based solutions.

The lecture will provide an introduction to the basic rock types and define their geotechnical

and hydrological characteristics. Students will comprehend the role of deformation of rocks and how they define water permeability, erosion rates and rock quality. Students are expected to assess how human activities can degrade the natural environment and estimate their impacts. Students will be able to decode and extract key info from geological maps for constructing thematic maps in the GIS platform (Hydrolithological map, Geological Engineering map, Soil category map according to the Eurocode 8). They will be able to comprehend and construct geological cross-sections with different examples (True and Apparent dip, Geological cross-section in inclined strata, angular unconformity, faults and folds). The course will provide the students with the necessary skills for estimating soil strength under different conditions and assess potential failures in infrastructure works and agricultural buildings, allowing for prevention measures. Students will assess the soil properties and the foundation conditions based on the analysis of the granulometry and humidity factors and particularly assessing for the liquefaction potential. Students are expected to be familiar with the relationship between stress and strain, with the factors that contribute to failure and to assess potential failure from overloads (buildings) or lateral loading (sliding). They will learn key tests and methodologies applied in the field and the labs. Lectures will be focused also on the Hellenic Seismic Code and Eurocode 8, regarding the active faults, the soil categories and the building types. Students will be able to assess the soil categories and the impacts of active faults that define planning regulations per type of building. Students will be introduced to geoenvironment monitoring methodologies involving satellite data, UAV, t-LiDAR and GNSS. They will be informed about the structure of a feasibility study and of a basic design. Finally, several examples of infrastructure works will be displayed including high-pressure gas pipelines, highways, dams.

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…*
	…….

Respect for the natural environment
Working in an interdisciplinary environment
Decision-making
Project planning and management
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Working independently

3. SYLLABUS

Planet Earth, Natural and manmade environment, Geoenvironment and Structure of the Earth. Types of Rocks their geotechnical and hydrogeological characteristics, Endogenous vs Exogenous processes. Landscape analysis, Geomorphology, Erosion and Sedimentation processes, Floods, Stratigraphy, Structural geology, Deformation mechanism, Brittle and plastic deformation, Faults (types and kinematics), Joints, Folds. Geological mapping, thematic mapping, Geological cross-sections - and 3D visualization, True and Apparent dip, Geological cross-section in inclined strata, angular unconformity, faults and folds.

Geological structure and evolution of Greece. Hellenic Orogenic Arc, Volcanism. Geology and Biodiversity – Biodiversity hot-spots, paleobotany, palynology, Natural catastrophes and biodiversity, the role of coastal and offshore geomorphology in the generation of endemic species, Greece, Geodiversity and Biodiversity. Stereograms, Soil and Rock mechanics, soil categories, Hellenic Seismic Code and Eurocode 8, data input and data analysis in GIS , Active Faults and seismicity, Geological hazards and public works focusing on floods, landslides and active faults. Monitoring methodologies (Satellite data, UAV, t-Lidar, GNSS). Feasibility study, Basic Design study, Case studies of Public works in Greece (Hi pressure gas pipelines, Highways, dams). Applications of Nature-based Solutions- NbS.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to Face Usage of Lab equipment
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Powerpoint presentations Web applications
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*	
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.*	I. Final written theory exams (60%) including: - short-answer questions - multiple choice questionnaires - laboratory exercises II. Essays (40%)

Activity	*Semester workload*
Lectures	36
Laboratory excercises	12
Fieldtrip	8
Essays	25
Homework	44
Course total	

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
1) Geological applications (2005). Migiros 280p (in Greek).
2) Geology – The study of Earth (2007). Papanikolaou D. and Sideris Ch. I. ISBN: 9789601620497, 296p. Pataki Publications (in Greek).
3) Geology of Greece (2015), Papanikolaou D. Pataki Publications ISBN: 9789601663432. 448p..

- Related academic journals:

1) Geomorhology
2) Journal of Structural Geology
3) Tectonophysics
4) Engineering Geology
5) Quaternary International
6) Science of the Total Environment
7) Geology
8) Quaternary Science Reviews
9) Earth and Planetary Science Letters
10) Nature Communications, Geoscience, Scientific Reports
11) Remote Sensing
12) Geoderma
13) Journal of Geophysical Research
14) Sedimentology
15) Natural Hazards