COURSE OUTLINE

1. GENERAL

SCHOOL	ENVIRONMENT AND AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	NATURAL RESOURCES AND AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	193	**SEMESTER**	7th
COURSE TITLE	ENVIRONMENTAL GEOLOGY – NATURAL CATASTROPHES		

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	2	2
	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, Specialised general knowledge Skills development
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 purpose of the course is to understand the natural processes and mechanisms that shape the earth and govern the geoenvironment and the natural hazards. Students will be able to assess the environmental hazards and risks and proceed with environmental and natural hazards planning and prevention measures.

The students will comprehend that the geoenviroment of Greece is characterized by high geodiversity due to the intense relief, the variability of rocks and the tectonic deformation that result in different rock, soil and water properties even at short distances. These geodynamic and geological processes that produced this complex and variable geoenvironment incorporated by the climate cycles of the Quaternary have influenced the excessive biodiversity of Greece and the great number of endemic species of the Hellenic Area. The Quaternary period is associated with major climate and environmental changes (glacial - interglacial periods and their relation with glacio eustatic sea level changes) in relation with the living world and mankind which have been imprinted on younger sediments and rock formations as well as the present day's surface. Major agricultural and human activities are founded on rock formations or sediments of the Quaternary period. Quaternary formations constitute a wide variety of marine, terrestrial, riverine or deltaic deposits.

Students will be able to assess when a natural process, becomes a catastrophe. In addition, they will study several natural hazards such as earthquakes, floods, landslides, volcanic eruptions and tsunami. Particular emphasis will be given to seismic hazard, since Greece is the most seismogenic country in Europe where almost 40% of the total seismic energy is released. Students will learn how to identify active faults, how they relate to earthquake recurrence and their importance for planning and the seismic code regulations.

In this course students will synthesize the knowledge obtained from previous courses (Mineralogy – Petrology, Geology-Geomorphology) to understand the evolution of the landscape and identify the environmental changes

due to natural or human causes. Moreover through the laboratory exercises, the study of geological maps and the construction of cross sections, they will understand the 3D subsurface structures and how they govern water, pollutants and the vulnerability from natural hazards.

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
Production of new research ideas
Production of free, creative and inductive thinking
Showing social, professional and ethical responsibility
Adapting to new situations

3. SYLLABUS

1. Environmental Changes, Natural Catastrophes and the Geological Time Scale

Geology, Humans and Geological time scale, Geochronology, Natural catastrophes – evolution of species, Quaternary, Olocene and agriculture, Cimatic cycles in Quaternary, Biodiversity, Anthropocene,

2. Natural Catastrophes

Natural processes- Natural Catastrophes, Economic costs, vulnerability, losses per hazard, Insurance and Reinsurance, Major natural catastrophes in Europe and Greece, Disaster management and Earthquake Catastrophe models.

3. Geodymanic processes and Seismic Landscape,

Tectonic Geomorphology, Seismic landscape, Migration of the Hellenic volcanic arc and consequences for the geoenviroment,

4. Postalpine sediments and Quaternary geological formations in Greece – Impacts on the agriculture and the environment

Postalpine and Quaternary basins in Greece, Geology-Natural Resources-Crops, , the case study of Santorini vineyard, Evaporites and the Messinian salinity crisis, Carbonates, karstic structures, dolines, polges, the case study of Kopais, Organic soils and the peat development in Philippi, Carbonates and calcrete horizons, Geological formations and soils,

5. 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

6. Earthquakes

Earthquake types, Seismicity distribution in Greece, active faults, seismogenic layer and surface ruptures, empirical relationships among fault length, fault type and displacement, slip-rates and recurrence intervals, damage distribution around faults, Differential Interferometric synthetic-aperture radar and deformation mapping (DInSAR), Earthquake geology and paleoseismology, seismic cycle and probabilities (time independent, time dependent and conditional), Seismic code and Eurocode 8, Neotectonic maps, microzonation studies and planning against geological hazards

7. Volcanoes

Volcanic eruptions, Climate, Volcanic Explosivity Index, Hellenic Volcanic

8. Floods

Damages and water depth, Flood types and flood hazard in Greece, Nature-based Solutions- NbS, Floods and Holocene deposits, Alluvial fans

9. Tsunami

Tsunami sources, wave propagation and bathymetry, study and tracing paleotsunami in recent geological sediments

Laboratory exercises

Lab 1	Marine terraces- Sea level changes, uplift/subsidence rates
Lab 2	Topographic cross-section, Geological cross-section in horizontal strata, lithostratigraphic column
Lab 3	Geological cross-section in inclined strata - Geological history from geological maps and cross-sections
Lab 4	Geological cross-sections and 3D visualization, True and Apparent dip
Lab 5	Geological cross-section and angular unconformity
Lab 6	Geological cross-section in faults
Lab 7	Geological cross-section in folds
Lab 8	Seismic hazard assessment, fault recurrence intervals, time independent and time dependent conditional probabilities
Lab 9	Landslide hazard assessment and mapping
Lab 10	Flood hazard assessment and mapping
Lab 11	Frost hazard assessment and mapping
Lab 12	Forest fire hazard assessment and mapping

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to Face contact in classroom One day fieldtrip
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	PowerPoint presentations Using internet 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*	

Activity	*Semester workload*
Lectures	36
Laboratory exercises	24
Fieldtrip	8
Homework	57
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.*	I. Written theory exams (50%) including: - short-answer questions - open-ended questions II. Written Laboratory exams (50%) - Laboratory exercises and problem solving

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Quaternary Geology and the Environment (2002). Riser, J. (Ed.) ISBN 978-3-540-42646-2 Publisher Springer-Verlag Berlin Heidelberg.

- *Related academic journals:*

1) Natural Hazards and Earth System Sciences
2) Natural Hazards
3) Tectonophysics
4) Geomorhology
5) Quaternary International
6) Science of the Total Environment
7) Environmental Earth Sciences
8) Catena
9) Geoderma