

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	ENVIRONMENT AND AGRICULTURAL ENGINEERING		
<b>ACADEMIC UNIT</b>	NATURAL RESOURCES AND AGRICULTURAL ENGINEERING		
<b>LEVEL OF STUDIES</b>	UNDERGRADUATE		
<b>COURSE CODE</b>	173	<b>SEMESTER</b>	6th
<b>COURSE TITLE</b>	QUATERNARY GEOLOGY		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <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>		<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>
	lectures	3	3
	Laboratory exercises	2	2
		5	5
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
<b>COURSE TYPE</b> <i>general background, special background, specialised general knowledge, skills development</i>	Special background, Specialised general knowledge Skills development		
<b>PREREQUISITE COURSES:</b>	No		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	Greek		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEBSITE (URL)</b>			

### 2. LEARNING OUTCOMES

<p><b>Learning outcomes</b></p> <p><i>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.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> <li>• <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i></li> <li>• <i>Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i></li> <li>• <i>Guidelines for writing Learning Outcomes</i></li> </ul>
<p>The purpose of the course is to understand the natural processes which have shaped the surface of the earth and the geological formations over the last 2.6 million years during the Quaternary geological period. These processes 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.</p> <p>Students will have the opportunity to understand that the distribution and the characteristics of the Quaternary formations are determined directly by geodynamic and paleoclimate characteristics. In particular, students will be familiar with:</p> <ol style="list-style-type: none"> <li>a) Quaternary deposits of the Greek area and their main features,</li> <li>b) The role of glacioeustatic movements, Holocene sea level rise and marine flooding and its impact on the coastal environment,</li> <li>c) Recent geodynamic conditions, active tectonic structures of Greece and the deformation of recent sediments and their impact on the current geo-environment.</li> <li>d) the relation between the soil and water properties with the bedrock geology</li> </ol>

e) the fact that the geodiversity supports the biodiversity

f) hydrogeological parameters, the water drills and the salinization mechanism and prevention measures

This knowledge is essential for the proper management of the environment.

In this course students will synthesize the knowledge of the geomorphological analysis which they received from previous courses (Mineralogy – Petrology, Geology-Geomorphology) to understand the evolution of the surface and identify environmental changes in relation to erosion or deposition processes. Moreover through the laboratory exercises and the study of geological maps, lithostratigraphic columns and cross sections, they will understand the geological deformation, the tectonic structures and recent geological history of each study area.

Finally, students will be guided to methodologies for solving issues related to the geo-environment of an area with emphasis on the 3D subsurface structures.

### 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...*

*.....*

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

### 3. SYLLABUS

- 1 Quaternary Time Scale, Pleistocene, Holocene, Anthropocene, Holocene and the development of Agriculture
2. Climate Change and Quaternary – Causes, Astronomical observations and the Milankovitch cycles, Asteroid Impact, Volcanic eruptions and climate, paleoclimatology and methods
3. Geodynamic processes, Seismic landscape, Tectonic Geomorphology, Migration of the Hellenic volcanic Arc, Geology, Geomorphology and climate
4. Postalpine sediments and Quaternary deposits in Greece- Their impact on agriculture, natural resources and the environmental studies, Holocene sediments, alluvial fans, 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. Quaternary sediments and water – Hydrogeology, Water drills, salinization mechanisms and prevention measures.

#### Laboratory exercises

Lab 1	Topographic cross-section, Geological cross-section in horizontal strata, lithostratigraphic column
Lab 2	Quaternary rocks in Greece (Site visit to the museum of minerals and rocks of Prof. Davis in the AUA campus)
Lab 3	Marine terraces- Sea level changes, uplift/subsidence rates

Lab 4	Geological cross-section in inclined strata
Lab 5	Geological cross-sections and 3D visualization, True and Apparent dip
Lab 6	Geological cross-section and angular unconformity
Lab 7	Geological cross-section in faults
Lab 8	Geological history from geological maps and cross-sections
Lab 9	Assessing hydrogeological parameters in unconfined aquifer (Dupuit)
Lab 10	Water Drilling – pumping and critical discharge
Lab 11	Salinization processes in coastal aquifers
Lab 12	Concluding lab

#### 4. TEACHING and LEARNING METHODS - EVALUATION

<p style="text-align: center;"><b>DELIVERY</b></p> <p style="text-align: center;"><i>Face-to-face, Distance learning, etc.</i></p>	<p>Face to Face contact in classroom A lesson will be held at the Agricultural Museum of AUA and more specifically to the minerals and rocks of Greece's Collection of professor Eleftheria Davi with emphasis on the Quaternary Rocks of Greece (lake sediments, Lignites, Sedimentary fossils, volcanic of Santorini and Nisyros) Fieldtrip for studying Quaternary formations</p>	
<p style="text-align: center;"><b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b></p> <p style="text-align: center;"><i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<p>PowerPoint presentations Using internet applications</p>	
<p style="text-align: center;"><b>TEACHING METHODS</b></p> <p><i>The manner and methods of teaching are described in detail.</i></p> <p><i>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.</i></p> <p><i>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></p>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	36
	Laboratory exercises	24
	Museum visit	3
	Homework	62
		125
<p style="text-align: center;"><b>STUDENT PERFORMANCE EVALUATION</b></p> <p><i>Description of the evaluation procedure</i></p> <p><i>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</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p>I. Written theory exams (50%) including:</p> <ul style="list-style-type: none"> <li>- short-answer questions</li> <li>- open-ended questions</li> </ul> <p>II. Written Laboratory exams (50%)</p> <ul style="list-style-type: none"> <li>- Laboratory exercises and problem solving</li> </ul>	

#### 5. ATTACHED BIBLIOGRAPHY

<p><i>- Suggested bibliography:</i></p> <p>Quaternary Geology and the Environment (2002). Riser, J. (Ed.) ISBN 978-3-540-42646-2 Publisher Springer-Verlag Berlin Heidelberg.</p> <p>Quaternary and Glacial Geology (1996). Ehlers J. and Gibbard, P., Publisher: John Wiley &amp; Sons Inc , ISBN-10: 0471955760, ISBN-13: 978-0471955764, 590p.</p> <p>Quaternary geology for scientists and engineers (1988, 2009). J. A. Catt. Publisher: E. Horwood ISBN: 0470211350, 9780470211359. 340p.</p> <p><i>- Related academic journals:</i></p> <ol style="list-style-type: none"> <li>1) Quaternary Science Reviews</li> <li>2) Quaternary International</li> <li>3) Quaternary Research</li> <li>4) Holocene</li> <li>5) Anthropocene</li> </ol>
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