

Y0105. PHYSICAL GEOGRAPHY AND THE ENVIRONMENT

Lectures (3 hours per week): T. Gournelos, Professor – E. Verykiou, Assist. Professor

Practicals (3 hours per week): T. Gournelos, Professor – E. Verykiou, Assist. Professor

6 credit units

Content: Formation of the Earth. The Earth in Space. Creation and evolution of Earth's atmosphere. The hydrological cycle, surface water, rivers, lakes, glaciers, geological structure and topography, soil, frost – isostatic movements. Weathering and erosion. Relief formation processes. Types of relief. Relief and climate (frost - desert - karst). Features of underground terrain - coastal processes - fjords - coral - reefs. Exogenous forces - relief - land - vegetation and environmental change. Topographical maps. Study and interpretation of Aerial Photography. Physical Geography and the Environment. Atmosphere and climate - air pollution. Hydrosphere, coastal and river pollution. Lithosphere-soil degradation and pollution - erosion processes. Biosphere - climate and urban pollution. Pollution in Greece. Identifying, mapping and managing environmental change. Physical Geography of Greece. Field exercise.

Y0106. GEOGRAPHIC INFORMATION SYSTEMS AND PRINCIPLES OF REMOTE SENSING

Lectures (2 hours per week): G. Skianis, Assist. Prof. - N. Evelpidou, Assist. Prof.

Practicals (4 hours per week): G. Skianis, Assist. Prof. - N. Evelpidou, Assist. Prof.

6 credit units

Content: Operational systems-Flow Charts and Programming Languages-Computer applications of Numerical and Statistical Analysis in Geological Sciences. Mapping principles-Geographical Projections and Cartesian Coordinates-Transforming coordinates-Data types-Spatial Dimension and Data Analysis-Data input-Topology-Thematic layers-Planning a GIS-Databases-Mapping data (maps, graphs etc.)-analyzing three variable parameters-methods of cartographic analysis-correlating thematic layers. The digital image and its use in remote sensing. Introduction to the methodology of processing and interpreting aerial photos and satellite images.

Web page: <http://eclass.uoa.gr/courses/GEOL123>

Y0109. CLIMATOLOGY- GLOBAL CHANGE

Lectures (4 hours per week): P. Nastos, Assoc. Professor

4 credit units

Content: History and objectives of Climatology. Composition and structure of the atmosphere. The radiation and the energy balance. Air temperature on the earth's surface. The water in the atmosphere. Movements in the atmosphere - General circulation of the atmosphere - Winds. Atmospheric disturbances. Classification, description and configuration of the climates of the earth. Climatic and bioclimatic indices. Climate change (climate change theories, changes during the instrumental period, changes in historical times, paleoclimatology methods, feedback mechanisms and impacts on climate). Introduction to climate models. Climate of Greece (climatic factors, climatic parameters, climate change).

Y0115. OCEANOGRAPHY- MARINE GEOLOGY

Lectures (3 hours per week): G. Gaki, Prof.- S. Poulos, Assoc. Prof.

Practicals (2 hours per week): G. Gaki, Prof.- S. Poulos, Assoc. Prof.

5 credit units

Content: Introduction to the science of Oceanography (history, current status in Greece, facilities, etc). Physicochemical properties of sea water (temperature, salinity, density, dissolved gasses, solar radiation/light, sound). Ocean dynamics (waves, currents, tide) in relation to coastal and subaqueous morphology. Exchange of energy between atmosphere and ocean (e.g. heat budget) and between land and ocean (water cycle, sediment influx). Principles of sedimentation (sediment origin, shape, size etc) and spatial distribution of sediments in the ocean floor. Introduction to the seismic (acoustic) tomography of the seafloor and its substrate (methodology, apparatus). Geodynamic formation and evolution of subaqueous relief (margins, mid-ocean ridges, abyssal plains, volcanic arcs) with emphasis on continental margins (shelf, slope, rise, trench). The relationship between terrestrial (e.g. river catchment) and marine (receiving basins) systems with respect to their geological origin and geomorphological characteristics. Coasts and their classification (e.g. primary, secondary, tectonic, volcanic, formed by terrestrial and/or marine factors). Coastal sedimentary environments (e.g. deltas, beaches, cusped forelands, spits, barrier islands). Issues of coastal and offshore engineering, e.g. nearshore works (ports, groynes, breakwaters, nourishment), submarine cables and pipes. An introduction to the management of the marine resources and the protection of the marine environment.

Y0124. GEOMORPHOLOGY

Lectures (3 hours per week): H. Maroukian, Professor – K. Gaki, Professor- K. Papadopoulou, Assoc. Prof.

Practicals (3 hours per week): H. Maroukian, Professor – K. Gaki, Professor- K. Papadopoulou, Assoc. Prof.- N. Evelpidou, Assist. Prof.

6 credit units

Content: The scope of geomorphology. Historical notes on geomorphology. Terrestrial relief. Endogenic - exogenic processes. Landforms and agents that control them. Recent trends in geomorphology. Geomorphological maps. Research problems in geomorphology. Structural landforms (sedimentary, horizontal, monochinal, folded, crystalline). Landforms of metamorphic rocks. Volcanoes. Faulted structures (fault scarps, fault – line scarps, composite scarps). Tectonic geomorphology. Geomorphic processes. Weathering. Mass wasting. The theory of morphogenetic regions. Soils. The Hydrologic Cycle, The Fluvial Cycle, drainage systems. Base level. Graded streams. Rejuvenation. Fluvial (alluvial) landforms. Stages of development of the hydrographic (drainage, erosion) cycle. Types of drainage systems. Karst. Coasts. Glacial – periglacial landforms. Aeolian landforms. Biogenic landforms.

A0105. PHOTOGEOLOGY

Lectures (2 hours per week): Th. Gournelos, Prof. –N. Evelpidou, Assist. Prof.

Practicals (2 hours per week): Th. Gournelos, Prof. –N. Evelpidou, Assist. Prof.

4 credit units

Content: Introduction. General concepts. Instrumentation (types of receivers, cameras, lenses, photosensitive surfaces, examination methods, stereoscopes). Quantitative information (Scales, measurements of lengths and angles). Qualitative information (Lithological, tectonic, geomorphological). Photo-geological mapping. Photo-geomorphic mapping.

Webpage: <http://eclass.uoa.gr/modules/auth/opencourses.php?fc=55>

A0101. ATMOSPHERIC POLLUTION

Lectures (2 hours per week): P. Nastos, Assoc. Professor

Practicals (2 hours per week): P. Nastos, Assoc. Professor

4 credit units

Content: Sources and Mechanisms that pose atmospheric pollution. Types of atmospheric pollution. Properties of specific air pollutants. Particulate matter. Meteorological, and other factors that exacerbate the atmospheric pollution (inversions, calculation of stability/instability of the atmosphere using tephigram, etc.). Impacts on human health. Acid rain. Saharan dust episodes. Urbanization and atmospheric pollution. Cleaning up techniques and European Union directives for air pollution thresholds.

A0102. COASTAL AND SUBMARINE GEOMORPHOLOGY AND COASTAL ZONE MANAGEMENT

Lectures (2 hours per week): H. Maroukian, Professor – K. Gaki, Professor- E. Verykiou, Assist. Prof.

Practicals (2 hours per week): H. Maroukian, Professor – K. Gaki, Professor- E. Verykiou, Assist. Prof.

4 credit units

Content: Coastal and shore types, coastal sediment budget, seasonal changes of coastal profile and littoral microrelief. Coastal (marine) terraces: characteristics, shaping factors. Coasts: tectonic, volcanic, rias, fjords, deltas, karstic. Coastal landforms: beaches, spits, barrier islands, cusped forelands, coastal cliffs and platforms (processes and shaping factors). River Deltas: processes of formation and evolution, classification, the deltas of Greece. Dunes: classification, formation and evolution (stable and/or active dunes), protection measures, dune management. Subaqueous relief of the Greek inner shelf. Sea level changes during the Quaternary: effects of the geoid, glacio – isostatic and hydro – isostatic deformation. Indicators of older sea level stands. Coastal features: marine notches, beachrocks, benches, coastal caves. Dating methods (absolute and relative). Future sea level rise trends. Impact of sea level rise in low-lying coasts, short and long – term coastal protection measures. Human interference in the coastal environment: resources exploitation and sustainable development (problems and management), impact on coastal sediment regime (e.g. artificial constructions). Protection of coastal archaeological sites. Study of the consequences of natural disasters (e.g. coastal floods, tsunamis, sea storms and inundation).

A0108. APPLIED OCEANOGRAPHY AND THE ENVIRONMENT

Lectures (2 hours per week): S. Poulos, Assoc. Prof.

Practicals (2 hours per week): S. Poulos, Assoc. Prof.

4 credit units

Content: An introduction to applied oceanography and protection of marine environment with emphasis on the following subjects: (i) nearshore hydrodynamics (wave breaking, run-up, closure depth, wave induced currents) and sediment dynamics (settling, resuspension, transport) in relation to coastline accretion and/or erosion; (ii) shore (beach zone) formation and evolution (morphological characteristics, processes) in relation to coastal sediment budget; (iii) issues of applied marine geological survey for submarine constructions (e.g. cables, pipes) and coastal works (e.g. beach nourishment); (iv) marine resources including methods of producing renewable power; (v) the use of the ocean, i.e. issues of sea transport, disposal of solids and fluids, army use; (vi) an introduction to marine pollution (categories, occurrence) and its mitigation; (vii) long- and short- term sea level variation due

to climate and meteorological forcing; and (viii) an introduction to the Law of the Sea with emphasis in the territorial waters, continental shelf, exclusive economic zone etc.

B0109. APPLIED GEOMORPHOLOGY

Lectures (2 hours per week): Th. Gournelos, Prof. –N. Evelpidou, Assist. Prof.

Practicals (2 hours per week): Th. Gournelos, Prof. –N. Evelpidou, Assist. Prof.

4 credit units

Content: Introduction to theoretical and applied geomorphology. Applications of geomorphology in hydrological studies (surface water and groundwater, hydrographic Networks, deltaic areas). Geomorphology and land use. Geomorphology and technical projects (stream adjustments, dams, roads, urban planning, various projects, buildings). Geomorphology of Landslide areas. Effect of a landslide in an area (mapping of landslide zone, classification of landslides: frequency, range, analysis of moving material).

Website: <http://eclass.uoa.gr/modules/auth/opencourses.php?fc=55>

F0111. APPLIED KARSTIC GEOMORPHOLOGY

Lectures (2 hours per week): K. Papadopoulou, Assoc. Professor

Practicals (2 hour per week): K. Papadopoulou, Assoc. Professor

4 credit units

Content: Karst refers to areas dominated by soluble rocks which are subject to specific chemical and geological processes due to the unending circulation of water. As a result of these processes the special feature of karstic areas is the creation of surface and subsurface landforms (caves). Given the fact that Karstic areas are widespread around the globe (nearly 17% of the earth's surface) and especially in Greece (more than 40%), the aim of the Applied Karstic Geomorphology module is to introduce students to both the theoretical and applied value of Karst as well as to highlight its scientific and economic importance.

A0114. PHYSICS OF THE ATMOSPHERE

Lectures (2 hours per week): P. Nastos, Assoc. Professor

Practicals (2 hour per week): P. Nastos, Assoc. Professor

4 credit units

Content: Basic concepts with respect to atmospheric physics (radiation laws of black body). Calculation of the mass of the atmosphere. Spectrum of incoming (short wave) and outgoing (long wave) radiation in the atmosphere. Energy balance. Greenhouse effect. Composition and structure of the atmosphere. Production and destruction processes of ozone. Impacts of ozone concentration on life. Types of air temperature inversions. Stability and instability of the atmosphere using radiosondes. Weather systems in the troposphere.

A0116. QUATERNARY GEOLOGY

Lectures (2 hours per week): K. Gaki, Professor- N. Evelpidou, Assist. Prof.

Practicals (2 hours per week): K. Gaki, Professor- N. Evelpidou, Assist. Prof.

4 credit units

Content: General characteristics of the Quaternary. Quaternary, Pleistocene, Holocene objectives. The basis of classical models (the Alpine, Northern Europe, British Isles, Central North America) is critically examined. The oceanic record data (oxygen isotope analysis) on which the new stratigraphic framework relies is considered. The fossil record: pollen analysis, mammalian faunas, hominids, deep sea biostratigraphy. Climatic changes during the Quaternary and their impacts on the sedimentation and the landscape. Factors determining sea level, Pleistocene sea level, Late-glacial and Holocene sea levels. Glaciation: models of glacial and deglaciation; Pleistocene depositional sequences and landforms. Nonglacial environments: Tephrochronology, Paleosols, Periglacial environments (loess, alluvial terraces), Low latitude environments and pluvial lakes. Chronostratigraphy and lithostratigraphy of quaternary deposits. of quaternary deposits.

A0118. GEOMORPHOLOGY OF GREECE – COUNTRY PLANNING – LAND USES

Lectures (2 hours per week): Th. Gournelos, Prof. – K. Papadopoulou, Assoc. Prof - N. Evelpidou, Assist. Prof.

Practicals (2 hours per week): Th. Gournelos, Prof. – K. Papadopoulou, Assoc. Prof - N. Evelpidou, Assist. Prof.

4 credit units

Content: Description and evolution of the simple and complex Greek landforms in relation to the geotectonic zones of Greece. Detailed review of the horizontal and vertical distribution of the land. Geomorphological units of Greece. Land uses in Greece (spatial and temporal changes). Changes in land uses and environmental issues.

Webpage: <http://eclass.uoa.gr/modules/auth/opencourses.php?fc=55>

K0106. APPLIED CLIMATOLOGY

Lectures (2 hours per week): P. Nastos, Assoc. Professor

Practicals (2 hour per week): P. Nastos, Assoc. Professor

4 credit units

Content: Applications of Climatology (water balance, estimation of evapotranspiration etc.). Impacts of climate on humans (health, environmental pollution, air conditioning, leisure, bioclimatic indices of thermal comfort/discomfort, dressing, architecture, etc). Paleoclimatic methods and indices. Climate and soil. Modification of micro climate for agricultural and other purposes. Climate and hydrology. Climate models and sub-scaling methods.

K0107. REMOTE SENSING AND SPACE SCIENCE

Lectures (2 hours per week): G. Skianis, Assist. Prof.

Practicals (2 hours per week): G. Skianis, Assist. Prof.

4 credit units

Content: Artificial satellites around the earth. The EM spectrum and its properties. Instruments and media for data acquisition. Aerial photos. Images at the thermal infrared spectrum. Radar images. The digital image. Image processing techniques. Classification. Remote Sensing and Geographical Information Systems. Applications of Remote Sensing on Geological Sciences. Exploring the solar system.

Web page: <http://eclass.uoa.gr/courses/GEOL126>

A0125. MATHEMATICAL GEOGRAPHY

Lectures (2 hours per week): G. Skianis, Assist. Prof.

Practicals (2 hours per week): G. Skianis, Assist. Prof.

4 credit units

Content: The earth in the solar system. A picture of the universe. Positional Astronomy. The concept of time and its measurement. The theory of gravity (Gauss law of the gravitational field, Poisson and Laplace differential equations). The gravitational field of a rotating earth (approximation models, series expansion of the gravitational field, the International Ellipsoid of Reference). Modeling of the earth tides, precision and notation. Satellite positioning methodology, with emphasis on the GPS. Mathematical cartography (mapping the spheroid earth on a flat surface, deformations, projection systems). Differential equations in natural sciences. Ordinary differential equations of the first order. Ordinary differential equations of second and higher order. Fourier series. Fourier integrals. Tensors, with emphasis on the second order Cartesian tensors. Elements of numerical analysis, with emphasis on numerical integration and solving ordinary differential equations. Applications on various fields of the geological sciences (geomorphology, geophysics, soil and air pollution etc).

Web page: <http://eclass.uoa.gr/courses/GEOL128>

B0116. SEISMOTECTONICS- MORPHOTECTONICS

Lectures (2 hours per week): H. Maroukian, Professor- E. Lekkas, Professor- P. Papadimitriou, Assoc. Professor- N. Voulgaris, Assoc. Professor

Practicals (2 hours per week): H. Maroukian, Professor- E. Lekkas, Professor- P. Papadimitriou, Assoc. Professor- N. Voulgaris, Assoc. Professor- K. Pavlou, SLTS

4 credit units

Content: Seismological data: Correlation of micro seismic activity and strong earthquakes, correlation with geologic, tectonic, geophysical and geodetic data. Faults, seismically active faults, fault dynamics, recurrence periods of strong earthquakes. Fault dimensions and seismic parameters, magnitude of earthquakes and seismic moments. Seismotectonic regions. Plotting of seismotectonic data – seismotectonic maps. Seismotectonic zones and seismotectonics of the broader Greek region. Large scale landforms as a product of Plate Tectonics. Landforms of normal, reverse and strike – slip faults (triangular and trapezoidal slopes, fault scarps, fault – line scarps, domal and depression features, etc. Influence of active tectonism (faults, folds) on drainage systems (drainage network types, gorges, drainage piracy, channel shifts, knickpoints, terraces and base level shifts, alluvial cones and fans, etc. Relief reversal. Influence of active tectonism on the coastal zone (marine terraces and deformation, evolution of coastal cliffs, marine notches, beachrocks, aeolianites).