

MSc Specialization in Geography & Environment

During the academic year 2002-03 the Department of Geography & Climatology initiated the postgraduate course "Geography & Environment" (<http://www.geol.uoa.gr/engindex.htm>). This M.Sc course aims to provide postgraduate students with skills appropriate in finding solutions to problems related to environmental geography and geology.

Objectives of the course:

- The scientific understanding of extreme weather events, natural hazards and climate change (e.g. floods, droughts, inundation, erosion, slides).
- The investigation of the various human impacts upon the natural environment, such as forest fires, soil erosion, dam construction, coastal works, changes in land use etc.
- To provide training in the modern field and laboratory methods for environmental assessment, protection and mitigation (e.g. digital mapping, remote sensing, GIS applications).
- To provide knowledge on aspects of the National and European Environmental Law in relation to environmental sustainability.

First year

1st semester

Mandatory courses

1. **Mathematical Geography and Geographical Information (6 ECTS):** Geographic information systems for physical geographers and environmentalists, statistical methods in geosciences, spatial analysis, advanced geostatistics (regional variables and kriging), simulations and environmental applications
2. **Geomorphological Techniques and methods of research (6 ECTS):** It includes geomorphological applications related to human constructions and land uses, a series of morphometric methods, geomorphological survey, photographs, sampling, mapping, regional palaeogeographic analysis, laboratory analyses with respect to physical and mechanical properties of rocks and soil.

Optional courses (two courses are required)

1. **Fluvial Geomorphology (4 ECTS):** It covers the hydrologic cycle, fluvial geomorphologic cycle, fluvial erosion and deposition, analysis of drainage morphometric characteristics, human intervention, time-related evolution of river networks.
2. **Principles of General Meteorology and Environmental Analysis (4 ECTS):** Vertical profile of the atmosphere, Stability/Instability conditions in the atmosphere, Meteorological elements (air temperature, precipitation, relative humidity, atmospheric pressure, wind), Time series analysis, Homogeneity tests.
3. **Management of Aquatic and Terrestrial Ecosystems (4 ECTS):** Aspects related to terrestrial and coastal aquatic environments (e.g. coastal lakes, lagoons, dunes), draining systems, ecosystem sustainability, mitigation of pollution and remediation schemes.
4. **Applied and Urban Geomorphology (4 ECTS):** It deals with issues related to human intervention in the natural environment such as managing of surface water resources, urban development, urban and industrial wastes management, environmental impact of man-made constructions (e.g. marinas, dams, motopways etc), problems related to changes in land use.

2nd semester

Mandatory courses

1. **Environmental Oceanography and Management of the Coastal Zone (10ETCS)**. It includes various environmental aspects concerning the marine environment (physical and dynamic characteristics of sea water, basic marine biology, sea level changes, marine sediment) coast classification and aspects related to coastal zone management related to human activities and natural processes (e.g. tsunamis).
2. **Theoretical and Applied Climatology (10 ETCS)**: Climatic systems and related factors, earth energy balance, greenhouse effect, water (floods, droughts), general circulation of the atmosphere, climatic classifications, climatic change, air-sea interaction (El Nino)), past climates, introduction to climatic models, methods on climatic data processing (e.g Factor/Discriminant/ Cluster/ Time/Spectrum Analysis)

Optional courses (two courses are required)

1. **Geospeleology (4 ECTS)**: The course is focused primarily on geological, physico-geographical and hydrological aspects, on types and geographical distribution (national and international) of caves and on methods of their exploration, management and protection.
2. **Natural Hazards (4ECTS)**: Prognostic methods for extreme weather events (droughts, floods), impacts on natural environment / geomorphologic consequences (earthquakes, volcanic eruptions, landslides, tsunamis, coastal floods and inundation, erosion) and human intervention (forest fires, changes in land use, deforestation, man-made constructions). Spatial and time dependent analysis of selected natural hazards occurring in Greece (e.g. floods, fires, desertification, soil erosion).
3. **Environmental Changes during Quaternary – Archaeo-geomorphology (4 ETCS)**: Climate and sea level changes related to sedimentary sequences and relief evolution. Contribution of the geomorphological analysis in the understanding of relief evolution of the broader area of archaeological sites for identification of environmental and morphological changes within late Quaternary, aspects of prospecting, excavation and protection “exploitation” of archaeological sites
4. **Energy sources, pollution and protection of the atmospheric environment (4 ECTS)**: Energy raw materials, Exploitation techniques of fly ash, sequestration of CO₂ emissions from the lignite-fired power plants, geothermal and hydroelectric works and their environmental impact, aeolian and solar energy, energy policy, issues of atmospheric pollution.

Second year

3rd semester

Mandatory courses

1. **Geomorphological Mapping (6 ETCS):** Types of geomorphological maps, landform mapping (spatial scales, use of symbols). The combined use, extrapolation and incorporation of information derived from topographic maps, aerial photographs and satellite images. Landform morphogenetic analysis, geomorphological mapping contributing to the solution of environmental problems.
2. **Environmental Geomorphology (6 ETCS):** It deals with environmental issues related to human activities (man as geomorphological agent), vulnerability related to geomorphological risk, geomorphological hazards (e.g. soil erosion, landslides, river floods, seismicity, active volcanism) and issues of geomorphologic impact assessment.

Optional courses (two courses are required)

1. **Morphotectonics (4 ETCS):** Large scale landforms as products of plate tectonics, landforms related to normal, reverse and strike-slip faults. The influence of active tectonics(faulting, folding) on drainage systems and coastal environments. Volcanic landforms, effects of tectonism on human activities.
2. **Photo-interpretation, Remote Sensing and Digital Image Processing (4 ETCS):** Sensors and platforms. The electromagnetic spectrum and its properties. Air photos, photogrammetry, photomosaics. Multispectral / Hyperspectral / Radar images and related processing techniques. Remote Sensing and Geographic Information Systems with geological and environmental applications.
3. **Applied Oceanography (4 ETCS):** It focuses primarily upon aspects of beach (shore) zone formation and evolution (including human intervention), coastal erosion and mitigation techniques, sediment quality, marine resources, water pollution, modern sea level fluctuations, Law of the Sea.
4. **Principles of Environmental economics – Environmental Law (4 ECTS):** The course aims on providing an introduction to the theory of environmental economics, applications and case studies, and Environmental law - environmental authorizations. European Directive on Environmental liability in relation to the prevention and remediation of environmental damage.

4st semester:

- Master' s Thesis: **(30 ECTS):** Preparation, presentation and examination.

Seminars and Invited talks