National and Kapodistrian University of Athens
THIRD TERM
PANGEA TRACK/PROFILE: 3A - GEOCONSERVATION

TITLE OF UNIT: Applied and karstic geomorphology

NUMBER of ECTS: 8

OPTIONAL or COMPULSORY (if applicable):

PREREQUISITES (in term of either skills or knowledge or units to be validated before registration to this course):

MODE OF TEACHING (distance education, webinar, workshops, seminars, lectures, supervised projects, etc): **Lectures, Practical exercises**

Number of hours dedicated to lectures, practices, field-excursions, etc: **52 hours**

Personal workload (hours expected to be dedicated to, including supervised projects): **148 hours**

Description of the course

General aims

This course is focused in the applications of Geomorphology and particularly in topics related to the changes of the geomorphological environment due to human interventions. It aims to a better understanding of the changes in the geomorphology due to natural and human activities. The course deals with the estimation and management of natural disasters such as floods, landslides, coastal and runoff erosion, as well as changes in sea level. Additionally it deals with subjects of karstic geomorphology, with particular focus to the methods of basic and applied karst research.

Expected outcomes (knowledge)

Upon the completion of this course students will be able to:

- estimate and understand the methods of analysing and managing natural hazards such as floods, landslides, erosion
- understand sea level changes
- understand, distinguish and interpret the impacts of urbanisation and human intervention to the changes of the geomorphological environment, changes in relief and their impacts on triggering natural disasters such as floods, landslides, subsidence, erosion etc.
- calculate physical parameters for the design of geotechnical projects as torrent management, dams, roads, dwellings
- Apply methods of applied geomorphology for the design of geotechnical projects and the estimation of geomorphological hazards.
- Collect and analyse relevant bibliography as well as applying and composing studies in Greece and in international level.
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- Explain, collect, compare and evaluate data in order to solve problems, such as geological setting of urban areas, management of surface waters, estimation of natural hazards (floods, landslides, subsidence, and erosion), the development and management of urban areas.
- Understanding karstic processes through the karstic landforms
- Apply methods of basic and applied karstic research

Expected outcomes (skills)

The skills acquired by the students with this course include:

- Theoretical thinking and ability to turn theory into practice
- Problem solving ability through application of knowledge
- Search, analysis and composition of data and information by using the necessary technologies
- Decision making
- Independent work
- Team work
- Work in interdisciplinary environment
- Respect of the natural environment
- Promote free, creative and inductive thinking

Content summary

- Changes in the geomorphological environment – human intervention.
- Estimation and management of natural hazards (floods, landslides, subsidence, coastal and soil erosion).
- Sea level changes.
- Urbanization and human intervention- impacts on geomorphological environment, relief changes and the impacts on natural hazards such as floods, landslides, erosion, etc.
- Physical parameters for the design of technical projects such as torrent management, dams, roads, dwellings.
- Methods of applied geomorphology for the development of technical projects and the estimation of natural hazards.
- Management of surface waters.
- Technical and environmental topics of urban areas, such as the geological setting of urban areas, management of surface water, development, design and management of urban areas.
- Karstic processes, Karstic landforms, Methods of basic and applied Karstic research.

Person in charge of the unit (first and last name, e-mail)
Niki Evelpidou, evelpidou@geol.uoa.gr

EVALUATION MODE (final exam, oral defence, report...)	Ratio of the final grade
Lectures and laboratory exercises	**50%**
Oral defence of a selected topic	**50%**

TITLE OF UNIT: Natural disasters and human intervention to the environment

NUMBER of ECTS: 8

OPTIONAL or COMPULSORY (if applicable):

PREREQUISITES (in term of either skills or knowledge or units to be validated before registration to this course):

MODE OF TEACHING

- **Face to face (lectures and seminars)**
- **Use of PC, tablets, smartphones and specialized software**
- **Access to databases and scientific libraries**
- **Demonstration of method and techniques used in Meteorology, Climatology and Hydrology**

Number of hours dedicated to lectures, practices, field-excursions, etc: **102**

Personal workload (hours expected to be dedicated to, including supervised projects): **75**

Description of the course

General aims

The aim of the course is to understand the spatio-temporal variability of natural disasters and the anthropogenic interventions on the environment that contribute to the development and intensification of natural hazards and maximize the risk of phenomena.

Expected outcomes (knowledge)

Upon successful completion of the course, the students will be able to understand and explain:

- Extreme weather and climatic phenomena (tornadoes, storms, heat waves, cold waves, frost and snow, droughts), river floods, sudden urban floods
- Landslide Risk Assessment / Sedimentation Risk Assessment / Scree Flows / Scree Flow Risk and Soil Vulnerability / Land Movements
- Erosion risk, flood risk assessment, fires, coastal erosion (vulnerability indicators)
- Land use planning in relation to natural hazards and
- Current scientific knowledge related to the natural hazards by natural and man-made causes.

Expected outcomes (skills)

Students will be able to:

- Identify and discuss the natural and man-made causes that affect natural hazards
- Assess the risk of floods, erosion, fires and other hydrometeorological phenomena; and
- Understand the new techniques and methodologies for mitigating natural hazards and adaptation measures on climate change that enhance natural hazards

Content summary

The content of the course is structured in the following thematic sections:

- Extreme meteorological and climatic phenomena (tornadoes, storms, heat waves, cold waves, frost and snow, drought). Spatiotemporal variation, causes and impacts
- Flash urban floods and river floods (causes and effects)

- Climate change and extreme hydrometeorological phenomena
- Landslides, sedimentation, earth movements, soil vulnerability, fires, coastal erosion. Causes, physical processes and vulnerability indicators
- Risk of erosion, flood and use planning in relation to natural hazards, and
- Impact of natural hazards on the built environment and ecosystems
- Adaptation and methods for mitigating the effects of natural hazards

Person in charge of the unit (first and last name, e-mail):
Professor Panagiotis Nastos, nastos@geol.uoa.gr

EVALUATION MODE (final exam, oral defence, report,)	Ratio of the final grade
Examination through short essays / exercises during semester	**0.3**
Final essay on a topic chosen by the students with teacher guidance	**0.7**

TITLE OF UNIT: Geohazards and Sedimentation

NUMBER of ECTS: 7

OPTIONAL or COMPULSORY (if applicable,):

PREREQUISITES (either in term of skills or knowledge or units to be validated before registration to this course):

MODE OF TEACHING
- **Face to face (lectures and seminars)**

- **Use of PC, tablets, smartphones and specialized software**
- **Access to databases and scientific libraries**
- **Laboratory of methods and techniques used in Geohazards and Sedimentation**

Number of hours dedicated to lectures, practicals, field-excrusions, etc: 100

Personal workload (hours expected to be dedicated to, including supervised projects): 100

Description of the course

General aims

The content of this course provides graduate students with a working knowledge of geohazard risk in present day active sedimentation environments.

Expected outcomes (knowledge): Upon successful completion of the course the students will be able to understand and explain:

- the complete range of geohazard risks that are developing in the complete range of sedimentary environments, during the transport and deposition of sediments, especially during extreme events
- Pending on the position of the infrastructure and social development sites, as related to active sediment movement paths and potential deposition areas, the geohazard risks will be identified and classified
- Understand the relations between climate variations and sedimentation geohazards especially during extreme events
- Develop critical thinking and communication skills

Expected outcomes (skills)

- Theoretical thinking and ability to convert theory into practice
- Ability to apply knowledge to solve problems
- Search, analysis and synthesis of data and information, using the necessary technologies
- Decision making
- Autonomous work
- Teamwork
- Working in an interdisciplinary environment
- Respect for the natural environment
- Promote free, creative and inductive thinking

Content summary

The content of the course is structured in the following thematic sections:

- Introduction - Basic concepts and principles of sediment dynamics on the earth’s surface.
- Developing geohazards during sedimentation in:
- Glacial
- Alluvial-lake-riverine-deltaic-fan
- Coastal
- Marine

- Volcanic environments
- Sedimetary gravity flows and environmental setting. Association to geohazards.
- Gravity waves, sedimentation and geohazards.
- Geohazard Seabed mapping
- Hazard impact assessment in present day dominant sedimentation environments.
- Synthetic exercise (3 weeks)
- Synthetic exercise presentation
    - ***Content:***
        - Sedimentary transport processes on present day sedimentary environments, Geohazards associated with sedimentation processes in: Glacial, Aeolian, Alluvial-river-deltaic, fan, lake, coastal, marine environments.
        - Volcaniclastic sedimentation and geohazards. Sedimentary gravity flows on the continents- under the sea and geohazard potential. Dominant present day sedimentation environments in and around Greece and associated local geohazard potential.
        - Case studies.

Person in charge of the unit (first and last name, e-mail): Professor Georgios Anastasakis, anastasakis@geol.uoa.gr

EVALUATION MODE (final exam, oral defense, report,)	Ratio of the final grade
• Examination through short essays / exercises during semester • Practical/Laboratory reports	**0.3** **0.3**
• Final essay on a topic chosen by the students with Akademic guidance	**0.4**

TITLE OF UNIT: Submarine Geomorphology - Management of coastal zones

NUMBER of ECTS: 7

OPTIONAL or COMPULSORY (if applicable):

PREREQUISITES (in term of either skills or knowledge or units to be validated before registration to this course): **There are no prerequisite courses.**

MODE OF TEACHING (distance education, webinar, workshops, seminars, lectures, supervised projects, etc): **lectures, distance education, webinar, seminars, supervised projects**

Number of hours dedicated to lectures, practices, field-excursions, etc: **72**h: Lectures (**52**), Fieldwork (**20**)

Personal workload (hours expected to be dedicated to, including supervised projects): **100h**: Non-Guided study (**50**), Final easy writing (**50**)

Description of the course

General aims: The aim of the course is to understand the processes involved in the formation and evolution of submarine geomorphs, the natural processes to which they are due, with special emphasis on coastal management, including human interventions and climate change.

Expected outcomes (knowledge)

Upon successful completion of the course, the students will be able to understand and explain:

- The recent geomorphological evolution of subamrine gemorphological relief
- The evolution of submarine and coastal relief in relation to the change in sea level (climate change)
- The relationship between submarine geomorphs and geodynamics
- The geomorphlogical characteristics and the evolution of submarine volcanoes
- Management terms and management models
- Examples of coastal zone management
- Coastal zone and climate change

Expected outcomes (skills)

Students will be able to:

- recognize submarine geomorphs and their relation to the geodynamic evolution of the region
- perform descriptive mapping on a subamrine environment
- associate geomorphological evolution with altered sea level
- understand the management terms
- understand the impact of anthropogenic interventions and climate change on coastal zone management.

Content summary

The shape of the seafloor and sub-seafloor stratigraphic horizons preserve a wealth of information that reflects the time-integrated effects of tectonic, sedimentary, oceanographic and volcanic processes. Many such processes are hazards to coastal populations and offshore installations, and they constitute key objectives of national research programmes and IODP expeditions, notably in climatically and tectonically sensitive regions. High quality bathymetry, especially when combined with sub-seafloor and/or seabed measurements, provides an exciting opportunity to integrate the approaches of geomorphology and geophysics and to extend quantitative geomorphology offshore. Issues of climate refer to offshore and nearshore change in hydrodynamics (e.g. waves, nearshore currents) and anticipated sea level rise and their relation to coastal evolution, while costal managemnet incldes management of low-lying landforms (e.g. beaches, laggons, deltas), marine sediments (e.g. beach nourishment, pollution), exploitation of coastal resources (e.g. marine aggregates, electric power, coastal).

Person in charge of the unit (first and last name, e-mail):
Nomikou Paraskevi, evinom@geol.uoa.gr

EVALUATION MODE (final exam, oral defence, report...)*	Ratio of the final grade

Final exam	**50%**
Oral defence	**25%**
Report	**25%**

* The evaluation process is in English and includes:

- Examination through short essays / exercises during semester
- Final essay on a topic chosen by the students with teacher guidance