UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Geomorphology

2526-3-E3401Q057

Aims

Based on the Berlin Descriptors:

1. Knowledge and Understanding:
   Upon completing the course, students will have acquired the necessary knowledge to identify landforms originating from morphogenetic processes in different morphoclimatic systems, including their relationships and associations. They will also gain knowledge of morphodynamics and morphochronology, essential for analyzing and reconstructing the evolution of landforms.

2. Applying Knowledge and Understanding:
   Students will be able to apply the acquired knowledge to analyze and reconstruct the evolution of landforms, based on morphodynamics and morphochronology. They will also be able to interpret the relationships between morphology and soil development, recognize geomorphological elements through photointerpretation of stereoscopic aerial photographs, understand the legend and structure of geomorphological maps and their production phases, and participate in practical field activities for direct knowledge of geomorphological peculiarities.

3. Making Judgements:
   By the end of the course, students must demonstrate their ability to independently approach topics and solve problems. While not explicitly detailed as a separate descriptor in the syllabus, the requirement to "know the basic concepts and topics covered during the course" implies a capacity for judgment in connecting and applying these concepts. Practical exercises and field trips contribute to developing this autonomy in recognizing and interpreting phenomena in the field.

4. Communication Skills:
   Communication skills will be assessed through an oral examination, during which students must demonstrate their knowledge of the concepts and topics covered. This implies the ability to clearly and correctly present their geomorphological knowledge.

5. Learning Skills:
   The course provides the foundations for continuing studies in related disciplines or for applying the acquired knowledge in professional contexts. The availability of online learning materials, in-depth links and videos, combined with recommended texts, supports students in developing autonomy in learning and in-depth study of the subject. Participation in lectures, laboratories, practical exercises, and field trips strengthens the ability to learn from various sources and contexts.

Contents

Principles of geomorphology: basic concepts for the study of landforms with respect to processes that produce and modify them at a variety of scale in space and time. Endogenic landforms originated by processes acting within the Earth; exogenic landforms originated by processes acting at the earth-atmosphere-water interface. Geological, climatic and other factors conditioning landforms origin and their evolution. Spatial and temporal scales in geomorphology; basic principles of geochronology for defining relative- and absolute- age of landform and surficial deposits. Structural geomorphology. Landforms originated by weathering and slope processes; mass wasting; soils and their origin; soil erosion; paleosoils and their relevance for landscape analysis. Karst landforms and speleogenesis. Landforms of fluvial, glacial, periglacial, eolic and marine origin. Models of landscape evolution. Basic principles of photointerpretation. Geomorphological maps and their structure.

Detailed program

Introduction to Geomorphology

Structural, climatic, dynamic, quantitative, regional and historical geomorphology; study methods; endogenous and exogenous processes; geomorphological agents and factors that condition them; zonal, azonal and plurizonal processes; main morphoclimatic systems; theories on the evolution of the survey. Structural geomorphology, Morpholithology, differential and selective erosion; main forms of endogenous origin; reliefs with a horizontal structure and monoclinal reliefs; folded reliefs (Jurassic, Appalachian relief and mountain ranges with complex structure); tectonic activity and geomorphological evidence; relationships between hydrographic network and geological structure; polycyclic reliefs; neotectonics.

Processes and forms of exogenous origin. Meteoric weathering and regolith; soils: notions of pedology, pedogenetic processes, classification; relationships between morphology and soil development; relict, polycyclic and paleosols soils.

The karst phenomenon: solution processes of carbonate rocks; macro and microforms of karst origin; the caves; hints of karst hydrology; karst and speleogenesis; karst landscapes.

Modeling of the slopes and resulting forms; degradation processes; action of gravity; debris cones and aquifers, soliflow and reptation; landslides, mass transport; pediment and glacis; morphology of the slopes.

Action of waterways; the balance profile; riverbeds and river paths; valleys, fans, alluvial plains, fluvial terraces. Evolution of the hydrographic network.

Forms of glacial origin: erosion, transport and deposit processes; forms of glacial erosion; moraines, subglacial and glacial contact deposits, classification; geomorphological evidence of glacial variations.

Periglacial forms: cryoclastic processes, surface and depth action; permafrost and its distribution; structured soils;

pingo and palsa; rock glaciers; snow action: avalanches, nivomorene, niches and nivation steps.

Coastal morphology: shore line and sea level; types of coasts and their evolution; beaches, lagoons and river mouths, cliffs, inherited coasts. Main forms of wind origin.

Dating of the relief shapes. Active, quiescent, inactive forms; relict and fossil forms; morphostratigraphic units: their paleoenvironmental and paleoclimatic significance. The "time" parameter and hints on the dating methods of the relief shapes.

Exercises

Cartography: legend and structure of geomorphological maps; stages of implementation; examples of geomorphological maps. Characteristics of stereoscopic aerial photographs and hints of photointerpretation for the recognition of geomorphological elements.

Field activity

Ground exits are planned for on-site lessons relating to direct knowledge of some geomorphological peculiarities of the territory.

Prerequisites

None

Teaching form

The course includes lectures, laboratory sessions, and practical fieldwork (total 6 ECTS credits).

Course Structure
28 in-person lessons (2 hours each or more) using lectures. These will also be conducted in the field, involving visual descriptions of outcrops and landforms. This will incorporate interactive and innovative teaching methods.

One 5-day in-person geological field trip (6 hours per day) utilizing interactive and innovative teaching. During these excursions, some of the descriptive lectures on landforms and outcrops will be integrated.

Important Note
Should the course be delivered in a blended or distance learning mode, necessary variations may be introduced to the above to adhere to the planned program as outlined in the syllabus.

Textbook and teaching resource

The lessons will be uploaded to the elerning.unimib.it website and will be available to students. There will also be links to specific in-depth sites and, if present, videos.

Books:

- Castiglioni G.B., 1979: *Geomorfologia*. UTET, Torino.

- Selby M.J., 1989: *Earth's Changing Surface*. Clarendon Press, Oxford.

- Summerfield M.A., 1991: *Global Geomorphology*. Longman.

- Bartolini C. Peccerillo A., 2002: *I fattori geologici delle forme del rilievo.* Pitagora, Bologna.

- Ciccacci S., 2010, Le forme del rilievo. Atlante illustrato di Geomorfologia. Mondadori Università.

- NASA – *Geomorphology from space*. Online:

- D'Orefice, Graciotti, 2021, Rilevamento Geomorfologico e Cartografia. Flacovio Editore.

Semester

Seconda Semestre (March - June)

Assessment method

The assessment for the Geomorphology course is based on an oral examination, which will consist of 3 to 5 questions. During the exam, the student must demonstrate full knowledge of the fundamental concepts and all topics covered in the entire syllabus. Of these, 1 or 2 questions will specifically focus on the verification methods and maps produced during the educational field trips, which represent an integral part of the course.

Office hours

Write to the teacher fo define the colloquium (valter.maggi@unimib.it)

Sustainable Development Goals

SUSTAINABLE CITIES AND COMMUNITIES