UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Advanced Methods in Structural Geology

2425-2-F7401Q096

Aims

To be able to develop general and applied structural geology projects through the collection of data at different scales, their analysis, and the development of quantitative models.

Contents

The course is aimed at developing the ability to collect multiscale structural data, analyze these data and develop quantitative models, and is carried out by addressing some case studies of general and applied structural geology.

Detailed program

During a few modules, dealing with case studies on fold and fault systems in the brittle and ductile deformation regime, the following tasks will be carried out, simulating all the phases of a state-of-the-art general or applied structural geology project:

(1) geological, structural and tectonic setting, based on published data (scientific papers, geological maps, etc.);

(2) collection of base data (topographic maps, digital satellite and aerial images, DM, etc.) and design of a georeferenced database compatible with the project goals;

(3) structural field surveys, carried out at different scales, and high-resolution 3D Digital Outcrop Model surveys, based on drone or terrestrial photogrammetric datasets.

(4) implementation of the database and restitution of all collected data;

(5) microstructural analysis with optical microscopy and possibly SEM, aided by quantitative image analysis techniques, aimed at defining, according to the case study, mechanical and environmental conditions of deformation (brittle vs. ductile, seismogenic vs. creep, etc.), deformation mechanisms at the inter- and intra-granular scale, deformation phases chronology, kinematics, deformation-metamorphism relationships, relationships with veins and fluid flow, textural and hydraulic properties of fault rocks, etc.

(6) quantitative structural analysis: orientation statistics, statistical analysis of fault and fracture networks, balanced cross-sections, reconstruction of time-deformation-temperature paths and paleopiezometers;

(7) quantitative geomechanical modelling with analytical or numerical methods selected based on the deformative processes detected thanks to the previous analyses;

(8) discussion of results and conclusion of the case studies, according to the project goals and aplications.

Prerequisites

Tectonics and Structural Geology (F7401Q101), Corso Sicurezza sul Terreno (E3401Q033).

Teaching form

Lessons, laboratory experiences, and fieldwork. For meteo-climatic reasons, we are considering the possibility to carry out the field trips before the beginning of the semester, or in the first week. We will send further communications on this topic.

Textbook and teaching resource

Slides, scientific papers, references to selected chapters from textbook, presented in a logical order on e-LEARNING.

Semester

First semester

Assessment method

Report on case studies.

Oral examination regarding all the topics and reports.

Office hours

All days in office hours.

Sustainable Development Goals

QUALITY EDUCATION