UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Advanced Methods in Structural Geology

2122-2-F7401Q096

Aims

To be able to collect, analyse and model, in an integrated and quantitative way, structural geology datasets at different scales.

Contents

The course covers advanced techniques for the collection, analysis and modelling of quantitative structural geology data at different scales in the field and in the lab.

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 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.

Prerequisites

Tectonics and Structural Geology

Teaching form

Lessons, laboratory experiences, and fieldwork. In the Covid-19 emergency period, lectures and practicals will be carried out in mixed form, with both classroom and online activities. Fieldwork will be regularly carried out, monitoring the Covid-19 epidemic evolution. 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 one of the case studies.

Oral examination regarding all the topics and particularly the report.

Office hours

All days in office hours.