DIPARTIMENTO DI SCIENZE

COURSE: **Advanced Field Geology**			
ACADEMIC YEAR: **2019-2020**			
TYPE OF EDUCATIONAL ACTIVITY: **Characterizing**			
TEACHER: **Giacomo Prosser**			
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phone: **0971206180**		mobile (optional): **3404891057**	
Language: English			
ECTS: 6 (lessons **2**; tutorials **2** e practice **2**)	n. of hours: 64 (lessons **16,** tutorials **24** e practice **24**)	Campus: **Potenza** Dept./School: **Dipartimento di Scienze** Program: Geosciences and Georisources **(LM74)**	Semester: **second (March 2nd, 2020 to May 31st – June 20th, 2020)**

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course will provide advanced information on the interpretation of geological structures based in field, map and subsurface data.

The students will acquire the ability required for obtaining quantitative information (thickness, attitude, 3D geometry, kinematics, etc..) from field data through a workflow that includes mapping, processing of geological data, cross section construction, integration with subsurface data and 3D modelling.

PRE-REQUIREMENTS

Topics treated in the Structural Geology and Basic geological mapping courses.

SYLLABUS

The main topic of the course is to introduce some advanced techniques in mapping and analysing the geological structures, including structural analysis of folded/faulted areas and reconstruction of 2D/3D models of the subsurface by using field and subsurface data. Collecting and processing map-scale data will be regarded as a tool for obtaining quantitative geometrical and kinematic information from the distribution and the deformation features shown by rock units cropping out in a specific area. The specific topics treated by the course are listed below:

1. Statistical handling of orientation data. Representation of structural elements by direction cosines. Contouring and interpolation of poles by cylindrical and conical best fit. Eigenvalues of an axial distribution. Simple rotations of structural elements. Interpretation of attitude data by means of the Statistical Curvature Analysis Technique (SCAT). Exercises.

2. Data that can be used in the 3D reconstruction of the subsurface. Analysis of well-logs. Thickness calculations. Analysis of seismic reflection profiles. Correction of artifacts in seismic sections.

3. Structure contouring of geological surfaces, by using map and subsurface data; different contouring techniques; analysis of fault surfaces and faulted horizons. Exercise.

4. Depth-extrapolated cross-sections; fold construction and down-plunge projection; depth-to-detachment calculations; integration of subsurface (seismic and well) data within a depth-extrapolated cross-section; principles of line-length and area restoration; restoration of listric faults. Exercise.

5. Mapping exercise in a structurally complex domain within the Apennine-Alpine area. The exercise will be preceded by a seminar illustrating the geodynamic, tectonic and stratigraphic features of the studied area. A GIS-based geological map will be constructed after fieldwork. Interpretation of outcrop data will be performed by quantitatively tracing stratigraphic and tectonic contacts. A series of cross sections will be traced to obtain a 3D grid that will be capable of illustrating the geological features of the area. This will allow the interpretation of fault/fold patterns, detachment horizons, linkage processes, etc.

TEACHING METHODS

Theoretical lessons, Classroom tutorials, Laboratory tutorials carried out in the field.

The first part of the course will include lectures and practical training. 3 days of field activity in a specific area of the Apennines will represent the central part of the course. The final part of the course will be dedicated to practical activities, such as processing of the collected field data and their integration with subsurface information available in the area. This part will include the use of GIS and other specific software.

EVALUATION METHODS

Evaluation methods will be based on a written examination, which may include a multiple choice test and the solution of simple exercises. A final report about the mapping exercise, including a geological map, a geological cross-section and processing of the collected attitude data, will be also evaluated.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Mc Clay K. The mapping of geological structures. Geological Society of London handbook.
- Richard R. Groshong Jr., 2008, 3-D Structural Geology, Springer, 400 pp.
- R.W. Allmendinger, N. Cardozo and D.M. Fisher, 2012, Structural geology algorithms, vectors and tensors. Cambridge University Press, 289 pp.

INTERACTION WITH STUDENTS

The teacher may answer to questions on the course and provide teaching material in the following days:

	from	*to*	*Where:*
MONDAY			
TUESDAY	*9:30*	*11:30*	*Cartography laboratory or Giacomo Prosser's room – Campus Macchia Romana*
WEDNESDAY			
THURSDAY	*15:30*	*17:30*	*Cartography laboratory or Giacomo Prosser's room – Campus Macchia Romana*
FRIDAY			

Students may ask for further appointments by phone and/or e-mail

EXAMINATION SESSIONS (FORECAST)[1]

22/01/2020, 12/02/2020, 11/03/2020, 08/04/2020, 13/05/2020, 17/06/2020, 15/07/2020, 09/09/2020, 07/10/2020, 18/11/2020

SEMINARS BY EXTERNAL EXPERTS YES □ NO X

FURTHER INFORMATION

[1]Subject to possible changes: check the web site of the Teacher or the Department/School for updates.