

Academic Year/course: 2021/22

60376 - Analysis, visualization and modelling of geological data

Syllabus Information

Academic Year: 2021/22

Subject: 60376 - Analysis, visualization and modelling of geological data

Faculty / School: 100 - Facultad de Ciencias

Degree: 624 - Master's in Geology: Techniques and Applications

ECTS: 9.0

Year: 1

Semester: First semester

Subject Type: Compulsory

Module:

1. General information

2. Learning goals

2.3. Importance of learning goals

Scientists and private-sector professionals in Geology make interpretations by using and combining many different types of data coming from a large variety of research methods. An especially appealing aspect for students of Earth Sciences is the ability to examine phenomena at different scales, ranging from global observations by satellites to atomic-scale material research. The geological investigations are based on a synthesis of both qualitative and quantitative information from fieldwork, experimental research and model construction of processes operating over a huge range of spatial and temporal scales. Computer simulations, using innovative numerical methods, are increasingly employed to integrate different types of data and to test hypotheses quantitatively.

This course is designed to enable students to handle complex real-world problems and to develop a wide range of skills. A well-founded knowledge in diverse areas of data analysis, visualization and modelling will turn MSc students into appealing candidates for recruitment in research, private industry, or governmental institutions.

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

This course (9 ECTS: 90 hours of sessions and 132 hours of autonomous work and study) is taught during the first semester. It is organised into three core modules (topics) that combine theory and practice sessions using personal computers.

Four different teaching activities integrate the course:

1. Lectures (40 hours). Participative lectures with the aid of ICTs.
2. Problem solving and case studies (50 hours). Statement and solution of real world problems using specific or general purpose computer programs.
3. Personal work (132 hours).
4. Time for examinations (3 hours).

4.2. Learning tasks

The teaching and assessment activities will be carried out on-site (face-to-face) unless, due to the exceptional health situation, the provisions issued by the competent authorities and by the University of Zaragoza provide for them to be carried out off-site (telematically), except for field practices.

Although the course is divided into 2.5-hour teaching session mixing lectures and laboratory practice, each of the two basic learning tasks has an allocated number of credits:

1. Lectures (40 hours). Time dedicated to the introduction of the theoretical background of each topic.
2. Practice sessions (50 hours), where the concepts and techniques explained during the lectures are put into practice.

4.3. Syllabus

The course will address the following topics:

Topic 1 (2 ECTS): Principles of modelling in Geology

- Modelling and scientific method in the natural sciences
- Types de models and modelling
- Models and modelling: applications to geological problems

Topic 2: (2 ECTS): Digital analysis of geological data

- Digital terrain models
- Global Positioning System (GPS)
- Geographic Information System (GIS)
- Software and utilities (Google Earth, ArcGIS, QGis,?)

Topic 3 (5 ECTS): Advanced statistical methods for the management of geological data

- Database applications and management
- Experimental design and exploratory analysis in geology
- Use of multivariate methods in geological data analysis
- Morphometrics
- Constructing and processing geological time series
- Geostatistics

4.4. Course planning and calendar

This course has 9 ECTS (90 hours of classroom sessions and 132 hours of autonomous work and study) and is taught during the first semester in 2.5-hour sessions (Monday to Thursday).

The starting and finishing dates of the classes can be found in the website of the Faculty of Science.

During the first session, the coordinator of the course will hand out a detailed schedule of the coursework, including deadlines and assessments (workload, percentage of the grades). The date of the exam for those students who did not pass the assessments during the term can be found in the website of the Faculty of Science.

This course will have a Moodle page where all course material will be uploaded and through which most of the communication between students and teachers will be conducted.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=60376>