| **TITOLO DEL CORSO**<br>GEOPHYSICAL DATA MODELLING | | | |
|---|---|---|---|
| **Settore Scientifico - Disciplinare: GEO/11** | | **CFU: 6** (4 LF + 2 LAB) | **Ore: 56** |
| **Ore di studio per attività**: | **Lezioni frontali:**<br>2 | **Laboratorio:**<br>1 | **Attività di campo:**<br>0 |
| **Tipologia di attività formativa:** affine ed integrativo | | | |

## SYLLABUS

**Prerequisiti**:
Mathematic Analysis, Algebra, Geophysics, Applied Geophysics, Basic Geology.

| **Lezioni frontali** | |
|---|---|
| numero di ore<br>4 | Argomento:<br>MATLAB fundamentals. |
| numero di ore<br>4 | Argomento:<br>Stationary signals; trend and non-stationary signals;<br>Polynomial regression and ANOVA Test. |
| numero di ore<br>6 | Argomento:<br>Fourier and Wavelet Transforms; Spectral Analysis; Convolution, Autocorrelation and Cross-correlation. |
| numero di ore<br>6 | Argomento:<br>Functional Trasformations: Low-pass and High-pass filter;<br>upward and downward continuation; 3D differentiation; pole and pseudogravity reduction. |
| numero di ore<br>6 | Argomento:<br>Inverse problem in geophysics; forward problem; existence, Uniqueness, construction and stability of the solution; linear problems. |
| numero di ore<br>6 | Argomento:<br>Generalized inverse; resolution matrix and error propagation, trade-off; singular value decomposition; regularization. |
| **Laboratorio** | |
| numero di ore<br>6 | Attività:<br>Examples and exercises of codes in MATLAB. |
| numero di ore<br>18 | Attività:<br>MATLAB codes on geophysical applications: regression; Fourier analysis; simple functional transformations; inverse methods. |

**Risultati di apprendimento attesi**

| **Knowledge and understanding** |
|---|
| The student must have basic knowledge of programming, analysis and inversion of data in geo-sciences and in geophysics in particular**.** |
| **Applying knowledge and understanding** |
| The student must be able to apply the knowledge acquired on basic topics of analysis and inversion of data in the geo-sciences, and in geophysics in particular, so as to process and interpret the data |

| |
|---|
| correctly in a geological framework. |
| **Making judgements** |
| The student must be able to autonomously evaluate the characteristics of the data analysis software and choose the most suitable, as well as evaluate the possibility of writing an own algorithm, in order to interpret the data in an optimal way. |
| **Communication** |
| The student must be able to explain to non-expert people the validity and significance of the numerical approach used. In the discussion of papers, the basic principles of the methods and their application to specific cases must be communicated with appropriate language. He must also illustrate the limitations related to the performed study. |
| **Learning skills** |
| The student must be able to broaden his/her knowledge by independently drawing on texts, scientific articles and research on material available on websites. He must gradually acquire the ability to attend specialist seminars, conferences and masters, in the field of geophysical methodologies and case studies. |
| **Modalità di verifica dell'apprendimento** |
| **Esame finale:**<br>Oral exam. |