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**COURSE:** Geomathematics and Geostatistics

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**ACADEMIC YEAR:** 2017-2018

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**TYPE OF EDUCATIONAL ACTIVITY:** Affine

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**TEACHER:** Sandra Saliani

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phone: 0971205867

mobile (optional): **3393615658**

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Language: **Italian**

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ECTS: 6 (4 lessons and 2 tutorials/practice)

n. of hours: 56 (lessons and 24 tutorials/practice)

Campus: **Potenza**  
Dept./School: **Dipartimento di Scienze**  
Program: **Geological Sciences**Semester I:  
(date 03/10/2017-30/01/2018)

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**EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES**

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An introduction to mathematical and statistical tools useful for the development of mathematical and statistical methods for studying and analyzing data in earth sciences: differential calculus for functions of multiple variables, ordinary differential equations, foundations of descriptive statistics, the basics of inferential statistics.

Students learn how to synthesize data using statistical software as well. They learn the main concepts of probability and statistics and the main statistical methodologies.

They will be able to apply the most important useful statistical tools in the field of geology, in particular the study of historical series and the spatial distribution of points.

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**PRE-REQUIREMENTS**

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Mathematics

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**SYLLABUS**

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**Real functions of two variables (12 + 8 hours).** The structure of  $\mathbb{R}^2$  as a space of vectors. Topology of  $\mathbb{R}^2$ . Real functions of two real variables. Limit of a real function of two real variables. Continuity. Differential calculus for real functions of two real variables. Partial and directional derivatives. Differentiation, geometric mean of the differential. Relationships between differentiation, derivability, directional derivatives, continuity. Optimization for real functions of two real variables. Gradient, rotor, divergence.

**Ordinary differential equations (8 hours).** First order differential equations, first order linear differential equations, second order linear differential equation with constant coefficients. Cauchy's problem.

**Descriptive statistics (10 hours):** data organization, graphic representation and synthetic indexes. Probability Theory: probability space, finite patterns, random variables and their distributions.

**Inferential statistics (16 hours):** estimators, confidence intervals, statistical hypothesis tests.

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**TEACHING METHODS**

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Theoretical lectures, classroom tutorials and laboratory tutorials.

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**EVALUATION METHODS**

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The aim of examination is to verify the level of the achievement of the above educational goals.

The final test consists of a written examination which requires both numerical exercises and theoretical ones. The time for the written examination is 3 hours. In order to overcome the exam it is necessary to achieve at least 18/30. The student that wants to improve the grade may require to do also an oral examination.

The student that achieves 16/30 or 17/30 to the written examination, has to do also an oral examination in order to overcome the final test.

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There will also be two optional tests the overcoming of which "exempt" students from the oral test. In these tests are included both the exercises and the questions related to theoretical knowledge.  
Each test is overcome with 16/30 and the final grade is the average grade of all two tests plus 2 points (bonus).

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

[1] N. Fusco, P. Marcellini, C. Sbordone

Elementi di analisi matematica 2. Versione semplificata per i nuovi corsi di laurea  
Liguori Editore.

[2] Esercizi di Analisi Matematica (vol 2), S. Salsa, A. Squellati , Zanichelli.

[3] M.R. Middleton, Analisi statistica con Excel, Apogeo

[4] J. C. Davis, "Statistics and Data Analysis in Geology", Wiley.

[5] Classroom notes

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#### INTERACTION WITH STUDENTS

At the beginning of the course, the teacher describes the objectives, program and methods of verification.

Office hours: Wednesdays 15:00-19:00 and Thursdays 11:30-13:30.

In addition to weekly reception, the instructor is available at all times for a contact with the students, through her e-mail.

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#### EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

21/02/2018- 08/05/2018- 20/06/2018- 18/07/2018-19/09/2018-10/10/2018- 12/12/2018

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SEMINARS BY EXTERNAL EXPERTS      YES ☐    X NO

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#### FURTHER INFORMATION

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<sup>1</sup>Subject to possible changes: check the web site of the Teacher or the Department/School for updates.