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**COURSE: Environmental Geochemistry**

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**ACADEMIC YEAR: 2017-2018**

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**TYPE OF EDUCATIONAL ACTIVITY: Basic**

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**TEACHER: Dott. Michele Paternoster**

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website:

phone: **0971-205832**mobile (optional): **3477281398**

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Language: **English**

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ECTS: 6 (4 of lesson and  
2 of tutorials/practice)n. of hours: 56 (32 of lesson  
and 24 of tutorials/practice)Campus: Potenza  
Dept./School:  
Department of Sciences  
Program: MASTER COURSE IN  
GEOSCIENCES AND GEORESOURCESSemester: **II**  
(planned dates:  
05/03/2018, start;  
15/06/2018 end)

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**EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES**

The main goal of this course is to provide the know-how useful for studying the geochemical processes occurring in the surface environment. Major achievements: sampling, validation of the geochemical data, and conceptual models. Description of a geochemical system and evaluation of the effect of the anthropogenic and geogenic contributions.

The principal knowledge:

- Natural abundance of the elements;
- Basic principles of geochemical prospecting
- Water geochemistry and hydrologic cycle
- Sedimentary geochemistry;
- Using stable isotopes for environmental issues

The expected learning outcomes:

- The comprehension of the concepts relating to geochemical baselines and anomalies (natural and/or anthropogenic), and the factors constraining the element mobility in the surface environment;
- To understand the main analytical and sampling techniques of different environmental matrices;
- To study the geochemical composition of natural waters and sediments, their analysis and classification;
- To use geochemistry for the solving of problems concerning to: I) surface water and groundwater pollutions; II) sediment pollution;
- Analysis of isotopic tracers in order to understand: I) the water-rock interaction processes; II) the hydrogeology and environmental problems; III) the origin and provenance of waters.

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**PRE-REQUIREMENTS**

Basic knowledge of chemistry (elements, atoms, ions, bonding and reactions, periodic table, acid-base equilibria) and geochemistry (Energy, Entropy and Fundamental Thermodynamic Concepts, geochemical system, units of measurements)

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**SYLLABUS**

- General aspects: Natural abundance of the elements, Geochemical classification of the elements (4 hours).
  - Basic principles of geochemical prospecting: geochemical environment; dispersion patterns, geochemical mobility under conditions of low pressure and temperature; geochemical associations, distribution patterns. Definition of background, anomaly, and threshold value), (6 hours).
  - Geochemical prospecting for environmental issues:  
*Water*: Main sampling and analytical methods. Determination of the physico-chemical parameters in situ; graphical representation and data processing. Evaluation of laboratory data (sampling and analytical errors, accuracy and precision), (8 hours + 12 hours of lab activities).  
*Sediment*: definition of sediment, weathering of rocks and minerals, clay minerals; sampling: points, materials and methods, samples storage; granulometric, mineralogical and chemical analysis: preparation and instruments; graphical representation and data processing, (8 hours + 10 hours of lab activities).
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- Stable isotope geochemistry for environmental issues: General features of isotopes (definitions, terminology, analysis, standards). Isotope fractionation; applications of the stable isotopes ( $\delta D$  and  $\delta^{18}O$ ) in hydrology.

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#### TEACHING METHODS

Teacher intended 32 hours to theoretical lessons and 24 hours to classroom and laboratory tutorials. Field trips are also planned.

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#### EVALUATION METHODS

At the end of the course one final verification will be planned. It will consist of 6 questions, of which 3 open-ended questions and 3 closed-ended. A score between 0 and 6 will be assigned to every question. Grades will be based on performance of the students in the six verifications.

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

##### Textbook:

- Principles of Environmental Geochemistry. G. Nelson Eby. Thomson-Brooks/Cole, 2004.

##### Suggested books:

- Geochemistry, Groundwater and Pollution (2<sup>nd</sup> Edition). Appelo, C.A.J.; Postma, Dieke. AA Balkema Publishers, Netherlands, 2005.
- Environmental and low temperature geochemistry. Peter Ryan. Wiley Blackwell, 2014.
- Principles of Isotope Geology (2<sup>nd</sup> Edition). Gunter Faure. John Wiley & Sons, New York, 1986.
- Using Geochemical Data: Evaluation, Presentation, Interpretation. Hugh R. Rollinson. Harlow, Essex, England : New York : Longman Scientific & Technical ; Copublished in the U.S. with J. Wiley & Sons, 1993.

Lecture notes and learning resources provided by the teacher during the course.

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#### INTERACTION WITH STUDENTS

Lecturer will receive students in his office (on the second floor of the building 3D, room no. 205) on Mondays and Wednesdays from 12:00 to 14:00. The appointment must be agreed by email ([michele.paternoster@unibas.it](mailto:michele.paternoster@unibas.it)).

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

26/06/2018; 03/07/2018; 24/07/2018; 25/09/2018; 23/10/2018; 27/11/2018; 18/12/2018.

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SEMINARS BY EXTERNAL EXPERTS    YES  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.