



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare		
ACADEMIC YEAR	2016/2017		
MASTER'S DEGREE (MSC)	ENVIRONMENTAL SCIENCES		
INTEGRATED COURSE	GEOCHEMISTRY OF SURFACE PROCESSES - INTEGRATED COURSE		
CODE	18668		
MODULES	Yes		
NUMBER OF MODULES	3		
SCIENTIFIC SECTOR(S)	GEO/08, CHIM/02		
HEAD PROFESSOR(S)	CENSI PAOLO	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	CENSI PAOLO	Professore Associato	Univ. di PALERMO
	MILIOTO STEFANA	Professore Ordinario	Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	Annual		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	CENSI PAOLO Friday 12:00 14:00 Stanza n° 9 Via Archirafi, 36 2° piano MILIOTO STEFANA Monday 14:30 15:30 Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze Wednesday 14:30 15:30 Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze Friday 14:30 15:30 Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze		

DOCENTE: Prof. PAOLO CENSI

PREREQUISITES	chemistry, physics, mathematics, mineralogy and petrology
LEARNING OUTCOMES	Assessment capability of geochemical characters of water bodies and their relationships with human activities. Critical analysis of natural ecosystems with an interdisciplinary approach. Right exploitation of scientific language.
ASSESSMENT METHODS	oral examination of the approximate length of not more than 30 'articulated on questions involving the resolution of simple exercises that relate to concepts learned. During the course, students can take course tests aimed at establishing the lessons learned concepts and data manipulation techniques.
TEACHING METHODS	Lessons, numerical assessments, on-field trips and experiences

MODULE SOLUTION PHASE PROCESSES

Prof. PAOLO CENSI

SUGGESTED BIBLIOGRAPHY

Ottonello G. - Principi di Geochimica - Zanichelli
materiali forniti dal docente (pubblicazioni scientifiche).
Huang, O'Melia and Morgan (1995) - Aquatic chemistry. American Chemical Society (Advance in Chemistry series 244).
Cotton S. - Lanthanide and Actinide chemistry - Wiley

AMBIT	50575-Discipline di Scienze della Terra
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

knowledge of fundamental parameters for the description of geochemical composition in a natural water body. Classification of natural waters according to the natural processes occurring therein and their influence on the Eh-pH variations.

SYLLABUS

Hrs	Frontal teaching
5	Classification of elements in relation with their behavior during primary and aqueous processes
5	dissolved elemental speciation
2	Eh-pH diagrams
10	Lanthanides and yttrium. the REE group. Y/Ho ratio. chemical and geochemical characteristics.
8	REE behavior during magmatic (CHARAC) processes. Dissolved REE behavior (non-CHARAC) processes
10	Geochemistry of Zr-Hf and Nb-Ta isovalent twins. Fractionation processes and the environmental significance of Zr/Hf and Nb/Ta ratios.
Hrs	Others
12	Field trip in interesting natural sites

MODULE FLUID-ROCK REACTIONS

Prof. PAOLO CENSI

SUGGESTED BIBLIOGRAPHY

Ottonello G. - Principi di Geochimica - Zanichelli
Huang, O'Melia and Morgan (1995) - Aquatic chemistry. American Chemical Society (Advance in Chemistry series 244).
Cotton S. - Lanthanide and Actinide chemistry - Wiley

AMBIT	21017-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	51
COURSE ACTIVITY (Hrs)	24

EDUCATIONAL OBJECTIVES OF THE MODULE

Knowledge of the basic parameters that can describe the geochemical composition of natural water. Assess the extent of the changes in Eh, pH, natural water and the nature of the processes that determine it. Determine the mineralogical and textural effects induced by hydrolysis and weathering.

SYLLABUS

Hrs	Frontal teaching
5	Alteration processes of primary minerals and their transformation
5	Alteration of hydrothermal sulphides. Environmental effects of acid mine drainage induced by compositional changes of the surface water.
5	Water-rock interactions as a natural analogue of the leaching of solid waste. dependence their entities' from the mineralogical composition and texture
9	trace element co-precipitation in crystalline solids. A suitable remediation technique for trace elements in the ecosystem.

**MODULE
PHYSICAL CHEMISTRY**

Prof.ssa STEFANA MILIOTO

SUGGESTED BIBLIOGRAPHY

Chemistry of the Solid-Water Interface, W. Stumm, Wiley
Principles of Colloid and Surface Chemistry, P. C. Hiemenz, Marcel Dekker.

AMBIT	21017-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	51
COURSE ACTIVITY (Hrs)	24

EDUCATIONAL OBJECTIVES OF THE MODULE

The aim of module consists into providing physico-chemical insights on the solid/water interphase highlighting the aspects related to surface charge. This will be done with the aim of giving a basis for the understanding of the aspects that will be studied in the other two modules, i.e. "Processes in solubilized phase" and "Reaction fluids-rocks".

SYLLABUS

Hrs	Frontal teaching
1	Importance of the interphase. Surface and Interfacial tension.
4	Hydrated oxides/water interphase. Acid-basic behavior.
6	Surface charge and point of zero charge. Gouy-Chapman theory. Stern layer.
2	Effect of the pH and ionic strength on double electric layer
2	Zeta potential and its experimental determinations
6	Surface charge of silicates, carbonates, phosphates, clays and superficial complexes
3	Thermodynamics of adsorption at the solid/liquid interface. The Traube rule.