



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare		
ACADEMIC YEAR	2016/2017		
BACHELOR'S DEGREE (BSC)	GEOLOGY		
SUBJECT	PETROGRAPHY WITH LABORATORY		
TYPE OF EDUCATIONAL ACTIVITY	B		
AMBIT	50189-Ambito mineralogico-petrografico-geochimico		
CODE	05674		
SCIENTIFIC SECTOR(S)	GEO/07		
HEAD PROFESSOR(S)	ROTOLO SILVIO GIUSEPPE	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	9		
INDIVIDUAL STUDY (Hrs)	137		
COURSE ACTIVITY (Hrs)	88		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	ROTOLO SILVIO GIUSEPPE Wednesday 12:30 14:30 Studio Prof. Rotolo Thursday 12:30 14:30 Studio Prof Rotolo		

DOCENTE: Prof. SILVIO GIUSEPPE ROTOLO

PREREQUISITES	Knowledge and familiarity with the contents of the courses of Chemistry, Mineralogy and Geology 1
LEARNING OUTCOMES	1) KNOWLEDGE AND UNDERSTANDING Knowledge of the composition of the Earth's interior and rocks of inaccessible Earth. Classification of igneous and metamorphic rocks on the basis of their structural, textural and mineralogical characters. 2) APPLYING KNOWLEDGE AND UNDERSTANDING Ability to encircle macro and microscopic observation in a common mainframe inclusive of familiarity with rock analyses and their geodynamic context. 3) MAKING JUDGEMENTS. capacity to assign a specific geologic environment the given rock and to interpret the geological inferences 4) COMMUNICATION SKILLS ability to explain geological implications and the connection between observations (micro and macroscopic) even to an audience without geological background. 5) LIFELONG LEARNING SKILLS ability to link in an unique mainframe, theory, technology and practice .
ASSESSMENT METHODS	Oral examination, including: 1)microscopic identification of 2 thin sections of rocks: optical characteristics of minerals, classification, petrogenesis 2)identification of 2-3 macroscopic rock samples and related petrogenetic inferences. 3)In depth discussion about arguments developed throughout the course. Will be positively evaluated the comprehension of processes and the capacity to present them in an unique mainframe. The examination consists of a minimum number of 6 open questions aimed to ascertain the correct use of technical language, capacity of autonomous thinking and critical perspective. The requirements for minimum evaluation are as follows: classification and positioning in a geological-petrographic context the macro and micro scopic rock samples; easiness of the linkages among the arguments of the course. The higher the degree of interconnection among the arguments of the course , the higher the evaluation ranking.
EDUCATIONAL OBJECTIVES	The principal educational aim of the course is the acquisition integrated view of theoretical aspects with those involving rock observation-classification-interpretation. The first part of the course, by far dominant, studies the interior of the Earth, magma production and magma evolution. All will be set in a global geological frame. A short part of the course is dedicated to clays and their technical aspects,. Lastly the course focuses on metamorphic rocks their significance, and geological inferences. Special focus on the capacity to translate in a TP ambientation for metamorphic rocks and also in a P-T-t path. The laboratory work is based upon microscopic study of 17 thin sections of igneous metamorphic and sedimentary rocks and 70 macroscopic rock samples, with the final aim to interpret their history, geological significance and classification.
TEACHING METHODS	frontal lessons; laboratory of macroscopic and microscopic petrography, focused on igneous and metamorphic rocks (classification, petrogenesis)
SUGGESTED BIBLIOGRAPHY	- lesson files supplied online. Microscopic Atlases - Peccerillo, Perugini (2004) - Introduzione alla microscopia ottica, Ed. Morlacchi -Mackenzie Donaldson, Guildford (1982). Atlas of igneous rocks and their textures. (Ed Zanichelli) Hypertexts: http:// alexstrekeisen.it

SYLLABUS

Hrs	Frontal teaching
20	Structure of the Earth on the basis of experimental petrology, from pioneering studies to present day achievements Upper and lower mantle. Experimental methods: piston-cylinder and multi-anvil . The beta and gamma Mg₂SiO₄. The D" discontinuity , the diamond anvil cell and the discovery of post-perovskite. The machines for investigation of outer and inner core: DAC cell and shock tube. Classification of igneous rocks (TAS, CIPW norm), ultramafic and gabbroid rocks classification. Partial melting in lherzolitic mantle. The mantle adiabat. Komatiites and picrites. Structure of silicate melts. H₂O and CO₂ dissolution in silicate melts and their influence on crystallization and undercooling. Wet and dry solidus . Crystallization tied to decompression, and to cooling. Influence of oxygen fugacity on crystallization. Thermodynamics of crystallization. The phase rule . Binary and ternary phase diagrams. Simulation of crystallization and partial melting paths. The Clapeyron equation.

SYLLABUS

Hrs	Frontal teaching
10	Magma differentiation processes: fractional crystallization, immiscibility, assimilation. Compatible and incompatible elements (LILE and HFSE), distribution coefficients. Modeling partial melting and fractional crystallization using trace elements. The isotopic system Rb/Sr in igneous petrology: depleted and enriched mantle. The AFC process
10	Igneous bodies and pyroclastic rocks. Magmatic series and their relationships with plate tectonics, Discriminating diagrams. . Magmatism in convergent margins petrogenesis of andesites. The transport of H ₂ O in the deep mantle. Magmatism in extensional settings, MORB and OIB. Continental flood basalts. Peralkaline magmas and pantellerites. Kimberlites, carbonatites and their geological significance . Meteorites, classification and their usefulness. Petrographic characters of Moon rocks.
4	Granites and their petrogenesis. Plio quaternary magmatism in and around Sicily (Etna, Ustica, Hyblean Plateau, Sicily Channel)
2	Classification of arenaceous rocks. Bauxites and laterites. Clays and clay minerals.
10	Metamorphic processes. Relationships between crystallization and deformation. Mylonites. Metamorphic facies. Metamorphic reactions. Application of the phase rule to metamorphic reactions Metamorphism of pelitic rocks; very low grade metamorphism, the Illite crystallinity index. Anatexis of pelitic rocks and migmatites. Metamorphism of mafic rocks. High pressure metamorphism: blueschists and eclogites. Metamorphism of calcareous rocks. The importance of fluid composition (XCO ₂): internally and externally buffered systems. Tracking PTt paths.
Hrs	Workshops
32	Electron microscopy and X-ray diffractometry, basic instrumental principles. Macroscopic study, classification and geological-petrographic description of more than 70 igneous and metamorphic rocks. Magmatic rocks: petrogenesis, crystallization history. ; metamorphic rocks: protolith, metamorphic facies. Microscopic study, classification and geological-petrographic description of 17 thin sections of igneous , metamorphic and sedimentary rocks. Magmatic rocks: petrogenesis, crystallization history. ;metamorphic rocks: protolith, metamorphic facies and whenever possible the PTt path.