



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2017/2018
BACHELOR'S DEGREE (BSC)	GEOLOGY
SUBJECT	GEORESOURCES
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10707-Attività formative affini o integrative
CODE	16171
SCIENTIFIC SECTOR(S)	GEO/09
HEAD PROFESSOR(S)	MONTANA GIUSEPPE Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	1° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	MONTANA GIUSEPPE Monday 15:00 17:00 Studio docente in Via Archirafi 26 (piano 3)

PREREQUISITES	Students have to know all the topics covered in the basic courses of the three-year degree program (Mathematics, Physics and Chemistry) and some characterizing courses (Mineralogy, Petrography, Geology I).
LEARNING OUTCOMES	<p>KNOWLEDGE AND CAPACITY OF COMPREHENSION Acquire basic knowledge (geodynamic context and genesis, morphology and position, composition) on mineral and rock deposits of economic interest. Knowledge and ability in describing the peculiar minero/lithogenetic processes and contexts in which the studied geomaterials form, including fossil fuels (petroleum and coal). Acquire knowledge on research methods, cultivation and purification of geomaterials. Basic knowledge on the ethical and financial aspects that have influenced and currently direct the exploitation strategies of earth resources. Acquire basic knowledge about the negative effects on environment and human health, related to the exploitation of earth resources and possible solutions.</p> <p>CAPACITY TO APPLY KNOWLEDGE AND UNDERSTANDING Ability to be able to describe the major deposits of metal ores as well as minerals or rocks of industrial interest (industrial minerals/rocks), according to the corresponding structural, textural, compositional, and physical characteristics. Capacity to understand and apply the most significant data from some simple analyzes or laboratory tests useful for the characterization of specific geo-resources. To be able to suggest the application of analysis methods designed to compositional and physical characterization of georesources specifications.</p> <p>AUTHONOMY IN JUDGEMENT Capacity to organize a data collection on specific geo-resources. Ability to assess the greater or lesser importance of the chemical-physical or physical/mechanical data. Capacity to judge simple hypothesis of methodological approach.</p> <p>COMMUNICATION SKILLS Acquiring a skill level adequate to a bachelor's degree in understanding the geological context and the economic importance of specific geo-resources . Being able to evaluate data from characterization studies at a level of prior knowledge.</p> <p>LEARNING SKILLS Ability to update knowledge obtained after attending the course by consulting texts and/or specialized scientific paper in the field of geo-resources and mining research.</p>
ASSESSMENT METHODS	<p>Oral examination. The examination is based on a minimum of 4-5 open questions elaborated for testing the student's level of learning (both qualitative and quantitative /notional). The evaluation of the examination will be based on the student's skills in expressing the topics of the followed course through an adequate technical language. The aptitude to critically examine any conceptual content through reasoning by relevant and interdisciplinary links will be appreciated. Timeliness in centering the topic and predisposition to make synthesis will be positively evaluated as well. Consequently, the minimum requirements for passing the examination are: (1) basic knowledge of chemistry, mineralogy, petrography, geochemistry and geodynamics; (2) a proper and sufficiently detailed description of the main processes leading to the formation of 'mineral ores', fossil fuels and 'industrial minerals' taken into account during the course (3) a description of the links between the genetic processes of specific ore minerals and petrological and / or geodynamic contexts. Quantity and quality of the learned notions will be positively considered in incremental way, as well as the fluency of expression, the level of technical language, the ability to reasoning linking various subjects, the synthesis skills. The maximum number of votes will be given for fulfilling in the best way all the above described conditions.</p>
EDUCATIONAL OBJECTIVES	<p>The course will provide basic knowledge suitable for the undergraduate level on the parameters that contribute to the formation of ore mineral deposits as well as mineral and/or rocks used in various sectors of the manufacturing industry or in building practice. It will be further investigated the most important lithogenetic and minerogegenetic mechanisms, the classification criteria of the mineral resources (involved formation processes and composition). The student will improve his geological glossary with specific terms, definitions, acronyms and/ or concepts involving this subject, that is to say: ore mineral, gangue, industrial mineral, base metal, PGM, VMS, reserve, resource. It will be carried out a concise review of the main 'base metals', 'precious metal' and minerals or rocks of particular industrial interest. The considered geo-resources will be selected following an objective criterion of historical and economic importance according to the current market's demand . The processes of formation and classification of fossil fuels (coal, natural gas, oil), as well as major socio-economic issues related to their exploitation, will be examined in a concise and essential form. The environmental impacts derived from mining activity and the damage caused to man will be also faced at large scale and with specific examples. A concise overview of the main mining districts in Italy and Sicily will be made. The course might include a visit to a mine/quarry, or, alternatively, to laboratories</p>

	specialized in the compositional and performance characterization of natural or processed geomaterials.
TEACHING METHODS	Frontal lessons; laboratory activity focused on the techniques for the recognition and characterization of ore minerals and industrial minerals (XRPD, PLM, SEM/EDS).
SUGGESTED BIBLIOGRAPHY	1) Dispense fornite dal docente. 2) G. Tanelli, Georisorse e Ambiente. Aracne Editore, Roma, 2009. 3) P. Zuffardi, Giacimentologia, Prospezione mineraria, problemi geo-ambientali. 2002. Pitagora Editrice, Bologna. 4) J. Craig, D. Vaughan, B. Skinner, Resources of the Earth. Prentice Hall (NJ), 2001. 5) A.M. Evans, Ore geology and industrial minerals. An introduction. Blackwell Scientific Publication, Oxford, 1993. 6) S.E. Kesler & A.C. Simon, Mineral resources economics and the environment. Cambridge University Press, 2015.

SYLLABUS

Hrs	Frontal teaching
2	Definitions and introductory concepts: resources, reserves, mineral ore, source. Examination of the main models of classification of mineral deposits (position, processes, composition).
4	Review of chemistry/geochemistry, mineralogy and petrography introductory to the course
2	Geological location of mineral resources: Basic notions. Review of minerogenetic systems: orthomagmatic; transitional (pegmatitic-pneumatolitic); hydrothermal.
3	Review of minerogenetic systems: sedimentary; supragenetic; detrital (alluvial placers); metamorphic. Outline of mining research methods.
2	Geological contexts and processes that originate aluminum deposits. Remarks on industrial extraction and purification procedures.
2	Geological contexts and processes that originate copper deposits. Remarks on industrial extraction and purification procedures.
2	Geological contexts and processes that originate iron deposits. Remarks on industrial extraction and purification procedures.
4	Geological contexts and processes that originate gold, silver, PGE and diamonds deposits. Remarks on industrial extraction and purification procedures.
3	Fossil Fuels - Coal: basic notions on geological constraints, genetic processes, methods of exploitation and economic aspects.
3	Fossil fuels - oil, asphalt and natural gas: basic notions concerning the geological contexts, formation processes, methods of exploitation and economic aspects.
4	Deposits of industrial minerals and rocks. General notions. Examples on the use of minerals for agriculture and industry: phosphates, nitrates, borates, zeolites, asbestos.
3	Clays for industrial use: brick and ceramics, kaolinitic clays, bentonite. Minerals used in the production of glass. Building materials: raw materials for quicklime and cement, marble and ornamental stones.
2	The environmental impacts of mining activities: examples of damage to the natural environment and the man. Parameters influencing geomaterials supply (availability, geological and economic aspects). Recycling of raw materials.
2	Georesources in Sicily: the current regional framework. Extraction of sulfur and alkaline salts: past, present and future.
2	Review of significant examples of mining districts in Italy. Mining and geo-tourism. Industrial archaeology: some examples
Hrs	Workshops
3	Review of the main methods for the compositional and microstructural analysis of mineral ores and geomaterials for building use: reflected light microscopy and transmitted light microscopy (RLM, PLM).
6	Review of the main methods for the compositional and microstructural analysis of mineral ores and geomaterials for building use: X-ray powder diffraction (XRPD).
3	Review of the main methods for the compositional and microstructural analysis of mineral ores and geomaterials for building use: X-ray fluorescence spectrometry (XRFS).