# UNIVERSITÀ DEGLI STUDI DI PALERMO

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| **DEPARTMENT** | Scienze della Terra e del Mare |
| **ACADEMIC YEAR** | 2018/2019 |
| **MASTER'S DEGREE (MSC)** | NATURAL SCIENCES |
| **SUBJECT** | VOLCANOLOGY |
| **TYPE OF EDUCATIONAL ACTIVITY** | B |
| **AMBIT** | 50513-Discipline di Scienze della Terra |
| **CODE** | 16168 |
| **SCIENTIFIC SECTOR(S)** | GEO/08 |
| **HEAD PROFESSOR(S)** | PARELLO FRANCESCO Professore Ordinario Univ. di PALERMO |
| **OTHER PROFESSOR(S)** | |
| **CREDITS** | 6 |
| **INDIVIDUAL STUDY (Hrs)** | 102 |
| **COURSE ACTIVITY (Hrs)** | 48 |
| **PROPAEDEUTICAL SUBJECTS** | |
| **MUTUALIZATION** | |
| **YEAR** | 1 |
| **TERM (SEMESTER)** | 1° semester |
| **ATTENDANCE** | Not mandatory |
| **EVALUATION** | Out of 30 |
| **TEACHER OFFICE HOURS** | **PARELLO FRANCESCO**<br>Monday 09:00 10:00 via archirafi 36 terzo piano |

**DOCENTE:** Prof. FRANCESCO PARELLO

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| **PREREQUISITES** | Basic knowledge of mathematics, chemistry and physics. Good knowledge of the disciplines of earth sciences and particularly of Mineralogy Petrology and Geochemistry . |
| **LEARNING OUTCOMES** | Knowledge and understanding. At the end of the course students should be able to describe and illustrate the processes of formation and ascent of magma to the surface of the Earth. Describe the relationship between plate tectonics, volcanic activity and major volcanic landforms. Knowledge of the main case studies related to major geological risks with particular reference to the volcanic one.<br>Students should have acquired a good property of the surveillance methods used (geological, geophysical and geochemical) for the understanding of geological processes in the field of volcanology.<br>Students should have also achieved complete independence of judgment and should have developed a critical consciousness about the issues that concern the volcanology, surveillance of volcanic activity and risk assessment. As regards the communication skills the students should be able to expose the main concepts of the course of Volcanology in different areas, in the form of seminars, lectures etc ... As far as the ability to learn, students should be able to consult the main scientific publications in the field of volcanology<br>The learning outcomes will also be tested during the whole training course that winds through lectures and field activities. |
| **ASSESSMENT METHODS** | The oral test consists in an interview, directs to verify the possession of the competences and the anticipated disciplinary knowledges of the course; the evaluation is expressed in thirtieths. The questions are designed to test the expected learning outcomes and will tend to verify the knowledge the student acquired. The threshold of the sufficiency will be reached when the student shows knowledge and understanding of the matters at least in the general lines. The student will owe equally to possess ability espositive and such argomentative to allow the transmission of his/her knowledges the examiner. Under of such threshold, the examination will be considered insufficient. The rating will tend to grow if verification ensures a good judgment that can represent the unique aspects of the discipline . As regards the verification of expositive capacity, it has a minimum rating in the case where the student demonstrates yes a property of adequate language but not sufficiently articulated, while the maximum rating can be achieved by students that demonstrate full command of the language of the scientific field in object. |
| **EDUCATIONAL OBJECTIVES** | The course provides the instruments to deal with the theoretical and practical study of the processes related to volcanology . It offers a basic preparation which also allows access to the PhD . The course provides for the acquisition of the mastery of scientific methods of investigation used in the monitoring of volcanic activity and the study of risk associated with volcanic eruptions . |
| **TEACHING METHODS** | The course includes frontal theoretical lessons through power-point projection, followed by a trip on active volcanoes, Etna and Aeolian Islands, where the students observe the main landforms of volcanoes and the different types of volcanic activity studied in class. It will also be observed and explained in the field the innovative monitoring techniques for the study of volcanic emissions. |
| **SUGGESTED BIBLIOGRAPHY** | presentazioni in ppt del docente<br>introduzione alla vulcanologia liguori editore |

# SYLLABUS

| Hrs | Frontal teaching |
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| 48 | Properties of magmas.<br>Magma Chemistry: major minor and trace elements; physical properties of magmas: temperature, Density and Viscosity (Newtonian and non-Newtonian liquids). Relationships between magma chemistry and physical properties. Volatile components of magmas. Solubility of H2O and CO2 in magmas. Behavior of volatile components during genesis and evolution of magmas and their effects on the physical properties of magmas.<br>Ascent of magmas.<br>Migration of magmas to shallow magma chambers, cooling and differentiation of magma chambers, Role of exsolved gasses in driving volcanic eruptions.<br>Volcanic eruptions.<br>Different styles of volcanic eruptions: Effusive and explosive eruptions. Icelandic, Hawaiian, Strombolian, Vulcanian, Plinian and Ultraplinian type; lava flows, lava domes, eruption columns, pyroclastic flows, lahars, lateral blasts, landslides. Magnitude of volcanic eruptions. Volcanic Explosivity Index (VEI). Classification of volcanic eruptions. Walker classification. Structure and size of eruptive columns. Phreatic eruptions vs. magmatic eruptions. Nature and size of major historical volcanic eruptions. Pyroclastic flow deposits and ignimbrites.<br>Volcanic morphologies<br>Domes, lava flows, scoria cones, tuff rings, tuff cones. Pyroclastic and lava plateau, shield volcanoes and stratovolcanoes.<br>Global Volcanic Activity<br>Number and geographic distribution of active volcanoes. Major historic volcanic eruptions and their impact on society (e.g. Tambora, Krakatau, Vesuvius, Mount Saint Helens). Active vs. dormant vs. extinct volcanoes.<br>Plate Tectonics and Volcanism<br>Basic idea of plate tectonics, evidence for plate motion, difference between continental and oceanic crust, internal structure of the earth, heat loss and plate tectonics. Creation of oceanic crust at mid ocean ridges, volcanism and hydrothermal activity at mid ocean ridges, cause of melting at mid ocean ridges, types of magmas produced. Destruction of oceanic crust at subduction zones, volcanism associated with subduction zones, cause of melting at subduction zones, types of magmas produced. Hot spots and associated volcanism in oceanic and continental settings, cause of melting, types of magma produced.<br>Volcanic Hazard<br>lava flows, volcanic gases, eruption columns, ash falls, pyroclastic flows, lahars, landslides, lateral blasts. Predicting volcanic eruptions: monitoring precursors (earthquakes, deformation, gas emissions): possible triggers. Case studies of volcanic eruptions including successful (e.g. Mt. Pinatubo) and unsuccessful (e.g. Nevado del Ruiz). Volcanic hazard mapping: identifying hazard zones, evacuation plans.<br>Resources associated with volcanoes<br>Geothermal energy, hot springs, volcanic soils.<br>Global Impacts of Volcanism<br>Climate changes associated with historic eruptions, causes of these changes. Flood basalt volcanism. Possible links between volcanism and mass extinctions. Volcanic degassing as a source of the chemical composition of atmosphere and oceans. |