UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	GEORISK AND GEORESOURCES
SUBJECT	PLANETOLOGY AND PLANETARY VOLCANISM
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	21015-Attività formative affini o integrative
CODE	22459
SCIENTIFIC SECTOR(S)	FIS/05
HEAD PROFESSOR(S)	IARIA ROSARIO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**IARIA ROSARIO** Wednesday 15:00 17:00 Dipartimento di Fisica e Chimica - Via Archirafi 36- secondo piano - stanza 204 Friday 15:00 17:00 Dipartimento di Fisica e Chimica - Via Archirafi 36- secondo piano - stanza 204

DOCENTE: Prof. ROSARIO IARIA

PREREQUISITES	This is a second-year teaching in the Master's Degree Program in Georisks and Georisources, so the prerequisites to profitably follow the teaching and achieve its objectives are the knowledge of physics, chemistry, volcanology and petrology required for enrollment in the Master's Degree Program in Georisks and Georisources
LEARNING OUTCOMES	Knowledge and understanding skills: The student should know the motion of celestial bodies and Kepler's laws. The morphology of the solar system. The working method in planetary sciences by adopting the similarities between planetary sciences and geology: (stratigraphy , relative stratigraphy (Steno's principles), terminations and geometries of strata) Planetary exploration tools, imaging, tools for estimating the chemical composition and properties of celestial bodies, tomography and the internal structure of Earth-like celestial bodies will be introduced. Geophysical means of studying the inner regions of terrestrial planets will be discussed: gravitational and magnetic fields, seismology, and probing through active and passive acoustics. Meteorite classifications and impact craters will be studied to estimate the evolution of the solar system. Finally, endogenous geological processes in "terrestrial" planets will be shown: volcanism, one-plate tectonics, magnetism, volcanism and cryovolcanism with the volcanic characterization of solar system bodies: the Moon, Mercury, Venus, Mars, Io, and cold bodies (e.g., Enceladus) Ability to apply knowledge and understanding: The student should know how to use and apply the methods (laid out in the course) so that he or she can characterize the volcanic activity of an Earth-like planet based on its observed proper characteristics. Autonomy of judgment: The student should be able to rigorously and critically analyze the fundamental aspects of a problem concerning planetary volcanism and solve it independently. Communication skills: The student should be able to enucleate, focus and expose the essential aspects of a specific problem concerning planetary volcanism. Learning skills: The student should be able to independently investigate specialized topics concerning planetary volcanism.
ASSESSMENT METHODS	The final examination consists of an oral test. The oral test consists of an examination-interview concerning the enunciation and discussion of one of the topics studied in addition to a presentation with slides prepared by the students on a topic discussed during the teaching and agreed in advance with the lecturer. This test makes it possible to assess, in addition to the candidate's knowledge and ability to apply it, the possession of scientific language properties and clear and direct expository skills. The final assessment, appropriately graded, will be made on the basis of the following conditions: (a) Basic knowledge of the topics and limited ability to apply them independently to situations similar to those studied, sufficient ability to analyze the phenomena presented and exposition of reasoning (grade 18-21); (b) Good knowledge of the topics studied and ability to apply them independently to situations similar to those studied, fair ability to analyze the phenomena presented and exposition of reasoning (grade 22-25); (c) Thorough knowledge of the physical laws studied and ability to apply them to each physical phenomenon proposed, but not always readily and following a linear approach, good ability to analyze the phenomena presented and exposition of reasoning (grade 26-28); (d) Thorough and widespread knowledge of the topics studied and ability to apply them readily and correctly to each proposed physical phenomenon, excellent ability to analyze the phenomena presented and excellent communication skills (grade 29-30L).
EDUCATIONAL OBJECTIVES	The educational objective of teaching is to provide students with an undergraduate-level knowledge of volcanism in Earth-type planets and the chemical composition of them and of major rocky objects in the solar system.
TEACHING METHODS	Teaching is semester-long. The teaching activity is developed through 48 hours of face-to-face lectures in which the lecturer explains the various topics that are part of the teaching program in which students develop the ability to interconnect the different topics covered.
SUGGESTED BIBLIOGRAPHY	BASIC TEXTBOOK ed. A. P. Rossi, S. Van Gasselt Planetary Geology ISBN: 9783319651774

SYLLABUS

Hrs	Frontal teaching
4	Introduction to Kepler's laws and morphology of the solar system
3	Geological Reasoning in Planetary Science: The Problem of Convergence (Equifinality), the Role of Analogies, Terrestrial Analogs in Planetary Geology, examples of Terrestrial Analogues. The Stages of Geological Reasoning, Stratigraphy: the Tool to Order Rocks and Time, Relative Stratigraphy, Unconformities and the Missing Time
4	Exploration Tools. Imaging, Composition and Properties, Topography and Structure, gravitational and magnetic fields, Seismics and Subsurface Sounding, Landing Sites and In-Situ Tools
4	Lander and Rover Exploration: the Moon, Venus, Mars, Small Bodies: Asteroids and Comets, Outer Solar System and Water Worlds
4	Meteorites classification, Chronology of the Solar System as told by Meteorites
3	Radioactive decay and extinct isotopes. Radioactive species, progenitor isotopes, half-lives on the order of tens of Ma. Effects of core formation on Earth's Hf-W isotopic composition and dating the impact that formed the Moon and CAI into chondrites. CAI (calcium and aluminum inclusions) and condensation from primordial plasma of refractory elements
4	Impact Cratering, Ejecta Facies and Ejecta Distribution
8	Landforms of Endogenic Processes. The Tectonic Style of the Earth and the Tectonic Style of One-Plate Planets: The Moon, Mercury, Venus, Mars, Icy Satellites and Kuiper Belt Objects
8	Magmatic activity: Effusive Volcanism and Explosive Volcanism. Environmental Effects, Outgassing, Volcanic Characterization of Solar System Bodies: The Moon, Mercury, Venus, Mars, Io and icy bodies
6	Formation and Interior Structure of Terrestrial Bodies. Convection and Rock Rheology, Thermal and Magmatic Evolution. Magnetic Field Generation: Dynamo generation