



# UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare		
ACADEMIC YEAR	2023/2024		
MASTER'S DEGREE (MSC)	GEORISKS AND GEORESOURCES		
SUBJECT	ISOTOPE GEOCHEMISTRY		
TYPE OF EDUCATIONAL ACTIVITY	C		
AMBIT	21015-Attività formative affini o integrative		
CODE	16881		
SCIENTIFIC SECTOR(S)	GEO/08		
HEAD PROFESSOR(S)	NOGUEIRA LAGES JOAO PEDRO	Ricercatore a tempo determinato	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	6		
INDIVIDUAL STUDY (Hrs)	94		
COURSE ACTIVITY (Hrs)	56		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	<b>NOGUEIRA LAGES</b> <b>JOAO PEDRO</b> Monday 11:00 13:00 Wednesday 11:00 13:00		

**DOCENTE:** Prof. JOAO PEDRO NOGUEIRA LAGES

<b>PREREQUISITES</b>	chemistry, geochemistry, physics, mathematics, mineralogy, petrology
<b>LEARNING OUTCOMES</b>	Acquisition of advanced tools for the evaluation of geochemical characteristics of a natural system through the use of selected items isotopic ratios. Ability 'to use the specific language of those very specialized disciplines. Analysis of the process of radioactive decay for geochronological purpose and in the source studies. Be able to support the importance and highlight the environmental impacts of a geochemical study conducted according to the isotope fractionation theory. Capacity 'upgrade of personal knowledge in relation to the state to be made by consulting their own scientific publications of the Isotope Geochemistry sector.
<b>ASSESSMENT METHODS</b>	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.
<b>EDUCATIONAL OBJECTIVES</b>	Recognise the isotope behavior during the main geological phenomena. The causes of the isotopic fractionation and radioactive decay. As the isotope fractionation is influenced by the temperature and chemistry of the system. The study of isotopic ratios of radiogenic elements for discrimination of magma sources.
<b>TEACHING METHODS</b>	front lessons, field and numerical training as coordinated activities with other courses
<b>SUGGESTED BIBLIOGRAPHY</b>	Allegre C.J. (2008) - ISOTOPE GEOLOGY. Cambridge University Press. Hoefs J. (2012) - Stable Isotope Geochemistry. Springer

### SYLLABUS

<b>Hrs</b>	<b>Frontal teaching</b>
10	Stable isotopes. Isotopic ratios and their modifications. The isotope fractionation. The isotopic equilibrium.
10	Isotopic composition and its measurement. Units of measurement and reference standards. The mass spectrometry IRMS as historical analysis technique. Spectrometry MC-ICP-MS mass as an innovative approach to the study of stable isotope ratios of "heavy" elements
10	Oxygen, hydrogen carbon and sulphur isotopic composition in different geochemical spheres.
10	The radioactive decay. The geochronology based on the decay laws. Main decay patterns: Rb-Sr, Sm-Nd, Lu-Hf. the decay series of U and Th. the decay of K in Ar and Ar in Ar.
<b>Hrs</b>	<b>Workshops</b>
4	Classical units in Isotope Geochemistry and their derivative variables
5	The radioactive decay. Assessment of half-life and of the geochronological age through numerical exercises and examples
7	the geochemical mixing recognised through isotopic evidences