

Optional course – main information	
Academic subject	GEOFYSICS
ECTS credits (CFU)	4
Compulsory attendance	Strongly recommended
Teaching language	Italian
Accademic Year	2019/2020

Professor/Lecturer	
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Tutorial time/day	Every day by appointment via email

Course details	Pass-fail exam/Exam with mark out of 30	SSD code	Type of class
	Eligibility	GEO/10	Lecture/workshop

Teaching schedule	Semester	day and time (afternoon)	room
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Lesson type	CFU/ECTS	Lessons (hours)	CFU/ECTS lab	Lab hours	CFU/ECTS tutorial/workshop	Tutorial/workshop hours	CFU/ECTS field trip	Field trip Hours
		4	32	0	0	0	0	0

Time management	Total hours	Teaching hours	Self-study hours
	100	32	68

Academic Calendar	First lesson	Final lesson
	OCTOBER	DECEMBER

Syllabus	
Course entry requirements	Basic knowledge of Earth Sciences, Mathematics and Physics.
Expected learning outcomes (according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	
<i>Knowledge and understanding</i>	Knowledge of the main geophysical characteristics of the Earth (seismic wave velocity, density, gravity, gravimetric field, magnetic field); acquisition of the basics about the location of earthquakes and the determination of their magnitude. This knowledge will be acquired through theoretical lessons. The level of knowledge achieved and the mastery of the fundamental concepts will be verified through the discussion of the topics being studied during an oral exam. Students will be guided by the teacher to analyze and understand the proposed themes. Much time will be devoted to clarifications that may be required to facilitate a real and profitable understanding.
<i>Applying knowledge and understanding</i>	Ability to apply the knowledge acquired during the course necessary for the description of the main seismological, gravimetric and magnetic features of the Earth. The verification of the acquired competences will be carried out through exercises carried out in the classroom.
<i>Making informed judgements and choices</i>	Acquisition of the ability to: locate earthquake sources, determine their magnitude; know the difference between forecasting and prevention; to calculate Bouguer anomalies, and to know how to read gravimetric and magnetic maps. The achievement of these objectives will be verified based on the discussion during the oral examination.
<i>Communicating knowledge and understanding</i>	Ability to show the fundamental concepts of the topics of study and ability to describe the main geophysical methods; ability to process and interpret data with clarity and language properties; ability to work independently and / or in teams. The verification of these abilities will be assessed on the basis of the display methods shown during the

	oral examination.
<i>Capacities to continue learning</i>	Acquisition of the ability to grasp the links between the various teaching topics and those of other subjects in the course of study. The acquisition of an adequate learning capacity is also stimulated by participation in seminars and internships. The level reached in this capacity will be verified by discussing the topics of study during the exam.

## Syllabus

Course content	<p>The course consists of 4 credits. The topics covered during the lectures can be grouped into 3 main parts, the first relating to seismology, the second to gravimetry and the third to geomagnetism.</p> <p style="text-align: center;"><b>SEISMOLOGY</b></p> <p><b>DISTRIBUTION OF EARTHQUAKES ON THE EARTH:</b> in the world, in the Mediterranean area, in Italy. Seismic history and geography. "Seismic Eruption" software.</p> <p><b>SEISMIC CATALOGS:</b> Italian and world catalogs, historical and instrumental catalogs. Selection programs.</p> <p><b>LOCALIZATION OF THE EARTHQUAKE:</b> the analogical and digital seismogram. Reading of a seismogram. Outline of the main types of seismic waves. Graphical and numerical localization methods. Epicentral distance calculation and azimuth.</p> <p><b>POWER OF EARTHQUAKE:</b> macroseismic intensity, magnitude, seismic moment, PGA. Overview of spectral analysis.</p> <p><b>VIRTUAL EARTHQUAKE</b></p> <p><b>EFFECTS OF EARTHQUAKE:</b> liquefaction, landslides, tsunamis.</p> <p style="text-align: center;"><b>GRAVIMETRY</b></p> <p><b>THE GRAVITY OF THE EARTH.</b> Newton's law of universal gravitation. Earth rotation. Non-inertial systems. Centrifugal force. Force of gravity. Field and gravity potential.</p> <p><b>FORM AND DIMENSIONS OF THE EARTH.</b> Real form of the Earth. Geoid, spheroid, ellipsoid. Spheroid equation. Crushing of the spheroid. Gravity on the spheroid. Normal gravity. International Gravity Reference Formula.</p> <p><b>REDUCTION AND INTERPRETATION OF GRAVITY OBSERVATIONS.</b> Free air reduction. Bouguer correction. Topographic correction. Bouguer anomalies: definition and physical meaning.</p> <p><b>ISOSTASIA THEORY.</b> The discovery of isostasia. Airy hypothesis and Pratt hypothesis. Isostatic anomalies. Isostatic compensation and vertical crustal movements.</p> <p><b>TERRESTRIAL TIDES.</b> Tidal force. Tidal friction and its effects.</p> <p style="text-align: center;"><b>TERRESTRIAL MAGNETISM</b></p> <p><b>THE TERRESTRIAL MAGNETIC FIELD.</b> Generality. Elements of the earth's magnetic field. Dipolar field and non-dipolar field. Secular variation and drift to the west. Temporal variations of the earth's magnetic field. Notes on the origin of the earth's magnetic field.</p> <p><b>PALEOMAGNETISM.</b> Rock magnetization. Paleomagnetic poles and hypothesis of the axial dipole. Inversions of the earth's magnetic field. Migration of the poles and continental drift. Marine magnetic anomalies and expansion of ocean bottoms: the Vine-Matthews hypothesis.</p>
Course books/Bibliography	Slides illustrated during the lessons. Reading of scientific articles. W. LOWRIE: Fundamentals of Geophysics. Cambridge University Press. Second Edition, 2007
Notes	The slides will be proposed in Italian. Articles in Italian or English.
Teaching methods	Lectures and exercises
Assessment methods (indicate at least the type written, oral, other)	Dissertation concerning the thematic areas of the program. Oral
Evaluation criteria (Explain for each expected learning	In the evaluation of the exam the determination of the final grade will take into account the following elements:

outcome what a student has to know, or is able to do, and how many levels of achievement there are	<ul style="list-style-type: none"><li>- mastery of the topics covered during the lessons</li><li>- correct use of scientific language</li><li>- ability to correlate the acquired knowledge with the characteristics of the regional territory</li><li>- active participation in the lessons</li></ul>
Further information	Possibility to download the slides illustrated during the lessons and the proposed scientific articles from the teacher's personal page