



General information	
Academic subject	GEOFYSICS
Degree course	Science of Nature
Academic Year	2021-2022
European Credit Transfer and Accumulation System (ECTS)	4
Language	Italian
Academic calendar (starting and ending date)	October-December
Attendance	Strongly recommended

Professor/ Lecturer	
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Virtual headquarters	
Tutoring (time and day)	Every day (appointment by email)

Syllabus	
Learning Objectives	Acquisition of fundamental concepts of Geophysics.
Course prerequisites	Knowledge of Mathematics, Physics, Earth Science.
Contents	<p>The course consists of 4 credits of lectures.</p> <p>The topics covered during the lectures can be grouped into 3 main parts, the first seismology, the second to gravimetry and the third to geomagnetism.</p> <p>Attendance to the course is strongly recommended.</p> <p style="text-align: center;">SEISMOLOGY</p> <p>Distribution of earthquakes in the world, Italy and Mediterranean area. "Seismic software.</p> <p>Seismic catalogs: italian and world catalogs, historical and instrumental catalogs. programs.</p> <p>Longitudinal (P) and transversal (S, SV, SH) waves. Propagation velocity of body waves and their relationship with density.</p> <p>Location of an earthquake. Seismographs and seismograms. Graphical and numerical methods of location. Determination of epicentral distance and azimuth.</p> <p>Intensity scales. Magnitude and energy. Gutenberg-Richter law. Origin of earthquakes and seismic mechanism.</p> <p>Effects of earthquakes: liquefaction, landslides, tsunamis.</p> <p style="text-align: center;">GRAVIMETRY</p> <p>The gravity of the Earth. Newton's law of universal gravitation. Earth rotation. Rotational systems. Centrifugal force. Force of gravity. Field and gravity potential.</p> <p>Earth shape and dimensions. Real shape of the Earth. Geoid, spheroid, ellipsoid. Clairaut's equation. Crushing of the spheroid. Moment of inertia with respect to the polar axis. Variation of density with depth. Dynamic ellipticity and flattening of the spheroid.</p>

	<p>the spheroid. Normal gravity. International Reference Formula of gravity. Reduction and interpretation of gravity observations. Free air reduction. Bouguer. Topographical correction. Bouguer anomalies: definition and physical. Gravimetric anomalies separation. Qualitative and quantitative interpretation of anomalies.</p> <p>Theory of isostasy. The discovery of isostasy. Airy hypothesis and Pratt hypothesis anomalies. Isostatic compensation and vertical crustal movements. Tests of isostasy and crustal structure.</p> <p>Terrestrial tides. Tidal force. Tidal friction and its effects.</p> <p style="text-align: center;">GEOMAGNETISM</p> <p>The terrestrial magnetic field. Generality. Elements of the Earth's magnetic field. non-dipolar fields. Secular variation and drift to the west. Temporal variations of magnetic field. Origin of the Earth's magnetic field. The magnetic properties of rocks</p> <p>Paleomagnetism. Rock magnetization: thermoremanent, depositional, chemical magnetization. Archeomagnetism and secular variation. Paleomagnetic poles and hypothesis of dipole. Inversions of the Earth's magnetic field. Poles migration and continent drift. marine anomalies and expansion of ocean bottoms: the Vine-Matthews hypothesis.</p>
Books and bibliography	<p>LOWRIE W.: Fundamentals of Geophysics. Cambridge University Press. Second Edition, 2007.</p> <p>FOWLER C.M.R.: The solid Earth. Cambridge University Press. Second Edition, 2001.</p> <p>GASPARINI P, MANTOVANI M.S.M: Fisica della Terra solida, 1984</p>
Additional materials	The texts must be integrated with the lecture notes and the web pages suggested by the teacher during the lessons

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<i>Hours</i>			
100	32	0	68
ECTS			
4	4	0	
Teaching strategy		Frontal lessons supported by PowerPoint presentations, classroom exercises with problem solving and data interpretation also using computer tools implemented on a laptop	
Expected learning outcomes			
Knowledge and understanding on:		<ul style="list-style-type: none"> The student will have to demonstrate his knowledge of the fundamental concepts of Earth Physics by proving that he has understood the main seismological, gravimetric and magnetic notions of the Earth. The level of knowledge achieved, and the mastery of the fundamental concepts will be verified through the discussion of the topics studied during an oral exam. Evidence of a lack of understanding of the fundamental concepts will imply the interruption of the exam and the referral of the student to a subsequent appeal. 	



Applying knowledge and understanding on:	<ul style="list-style-type: none">○ The student must be able to use the basic acquired knowledge to deal with a seismological problem (e.g. locating an earthquake), gravimetric (e.g. obtaining gravimetric measurements) and magnetic (e.g. determining the position of a magnetic paleo-pole); he must also be able to follow the correct procedures in the acquisition, processing and interpretation of geophysical data. The verification of the skills acquired will be conducted through practical tests performed during the exercises, also assessing the ability of a dialectical interaction with the course colleagues. The ability to succeed in completing the aforementioned tests will be one of the elements that will contribute to defining the overall assessment of the student and the final grade. If the student, at the end of his / her training course, does not demonstrate that he / she has acquired the necessary skills, this gap may result in the failure to pass the exam and the need for the student to return to a subsequent appeal
Soft skills	<ul style="list-style-type: none">• <i>Making informed judgments and choices</i><ul style="list-style-type: none">○ The student must be able to solve a geophysical question relating to the course topics, making the most suitable methodological choices for solving the problem. The achievement of this objective will be verified on the basis of the results achieved in the tests conducted during the exercises and through the proposition, during the oral examination, of seismological, gravimetric and geomagnetic problems, with respect to which the student will have to be able to identify the best procedures to deal with them. Failure to acquire an adequate propositional capacity with respect to the methods to be used in specific problems implies a significant penalty in the final vote.• <i>Communicating knowledge and understanding</i><ul style="list-style-type: none">○ The student must be able to describe clearly and with language properties all the topics covered during the course, which do not give rise to ambiguity or misunderstandings. He must also be able to dialogue and relate to other students. The verification of these skills will be assessed on the basis of the language property shown in the discussion of the cases proposed during the application tests and the display methods shown during the oral exam. The insufficient mastery of language ownership will be reflected in a penalty of the final vote, with foreclosure of the possibility of achieving the maximum mark.• <i>Capacities to continue learning</i><ul style="list-style-type: none">○ The student must be able to independently acquire further knowledge starting from the basis of the contents transmitted during the course and making connections with other subjects of the course of study. The level reached in this capacity will be verified through the discussion of the exam topics. The demonstration of an acquired ability to broaden one's knowledge with an autonomous learning path can have recognition through the attribution of a maximum mark with honors.

Assessment and feedback	
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Methods of assessment	
Evaluation criteria	<ul style="list-style-type: none">• <i>Knowledge and understanding</i><ul style="list-style-type: none">○ xxxx• <i>Applying knowledge and understanding</i><ul style="list-style-type: none">○ xxxxx• <i>Autonomy of judgment</i><ul style="list-style-type: none">○ xxxx• <i>Communicating knowledge and understanding</i><ul style="list-style-type: none">○ xxxxxxxxxxxxxxx• <i>Communication skills</i><ul style="list-style-type: none">○ xxxxxxxxxxxxxxx• <i>Capacities to continue learning</i><ul style="list-style-type: none">○
Criteria for assessment and attribution of the final mark	
Additional information	Possibility to download the slides illustrated during the lessons and the proposed scientific articles from the teacher's personal page.