UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

DIPARTIMENTO INTERUNIVERSITARIO DI FISICA

General information	
Academic subject	EARTH OBSERVATION AND GIS DATA ANALYSIS
Degree course	PHYSICS
Academic Year	2022/2023
European Credit Transfer and Accumulation System (ECTS)	3
Language	English
Academic calendar (starting and ending date)	First semester of the academic year 2022-23
Attendance	

Professor/ Lecturer	
Name and Surname	Maria Adamo
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Telephone	+39 0805443408
Department and address	Department of Physics, Via Amendola 173, 70126 Bari, Italy
Virtual headquarters (Microsoft Teams code)	
Tutoring (time and day)	3 p.m. to 5 p.m. (advance booking required); at the Physics Department, 2nd floor, room no. 258 on Thursdays and Fridays

Syllabus	
Learning Objectives	- *provide the theoretical tools necessary to know and use the data obtainable from remote sensors* - *provide the necessary tools to choose and use apps to manage and process remote sensing images and geo-spatial data* - *demonstrate the potential of the application of mathematical and statistical tools (e.g. pattern recognition, machine learning) for the extraction of environmental parameters from EO data through the presentation of applications* - *present the scenario of Earth Observation activities, future prospects and professional opportunities*
Course prerequisites	

Contents	- *Basic Principles of Remote Sensing*
	    o *Radiometric quantities*
	    o *Interaction of electromagnetic radiation with the Earth's atmosphere and surface*
	    o *Spectral signature*
	- *Acquisition systems and sensors*
	    o *Main acquisition platforms*
	    o *Characteristics of remote sensing satellites and sensors*
	    o *Overview of the main satellites with active and passive sensors*
	- *Automatic image processing*
	    o *Basic image processing concepts: RGB composition, spatial, spectral, radiometric and temporal resolution*
	    o *Sources of errors in images and their correction techniques: radiometric and geometric distortions*
	    o *Georeferencing and image registration*
	    o *The GIS environment*
	    o *Time series management of remotely sensed data*
	- *Main applications of techniques for extracting essential variables for environment from satellite data*
	    o *Monitoring land cover and its changes*
	    o *Extraction of meteorological variables*
	    o *The study of vegetation and carbon flows*
	- *The Earth Observation scenario in the world*
	    o *Space agencies and the Copernicus programme*
	    o *The activities of the Group of Earth Observation (GEO)*

Books and bibliography	o *Course's Slides* o *P.A. Brivio, G.M. Lechi, E. Zilioli, Principles and methods of remote sensing.*

	Grugliasco (TO): CittàStudi Edizioni, 2006. *o Links to "open access" remote sensing journals (e.g.* *http://www.mdpi.com/journal/remotesensing)* *o Links to QGIS documentation/tutorials (e.g. http://www.qgistutorials.com/it/)*
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
31	16	15	
ECTS			
3			

Teaching strategy	
	Lectures, Training on Satellite image processing software and GIS systems

Expected learning outcomes	
Knowledge and understanding on:	o Analytical knowledge in the field of remote sensing o Interdisciplinary view o Knowledge of the Earth Observation scenario, future prospects and professional opportunities
Applying knowledge and understanding on:	o Knowledge of available software tools for managing and processing remotely sensed images and geo-spatial data o Expertise in using software tools for managing and processing remotely sensed images and geo-spatial data
Soft skills	• **Making informed judgments and choices** o Capability to identify mathematical and statistical tools and methods for the extraction of environmental parameters from remote sensing images • **Communicating knowledge and understanding** o Effective communication of the results of the final research project • **Capacities to continue learning** o Learning skills necessary to cope with the further acquisition of information and knowledge as the discipline evolves. o Problem solving skills for the implementation of the final research project

Assessment and feedback	
Methods of assessment	Research project with final report (written and oral) on the activity carried out to show the acquired skills
Evaluation criteria	• **Knowledge and understanding** o ascertaining the acquisition of notions relating to the topics covered during the course and of the correct scientific terminology • **Applying knowledge and understanding** o ascertaining the acquisition of the skills to process the knowledge acquired for carrying out the research project • **Autonomy of judgment** o Assessment of the capability to solve theoretical and implementation problems for the final research project • **Communication skills** o Assessment of the capacity to effectively convey the results obtained during the realisation of the research project • **Capacities to continue learning** o assessment of the ability to access up-to-date bibliographic sources and online resources
Criteria for assessment and attribution of the final mark	The final mark will be expressed in thirtieths
Additional information	