COURSE OF STUDY *Physics (LM-17)*

ACADEMIC YEAR *2024-2025*

ACADEMIC SUBJECT *Earth Observation and GIS Data Analysis*

General information	
Year of the course	2nd
Academic calendar (starting and ending date)	1st semester: September - December 2024
Credits (CFU/ECTS):	3
SSD	FIS/06
Language	English
Mode of attendance	Recommended, not compulsory

Professor/ Lecturer	
Name and Surname	Maria Adamo
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Department and address	Telephone +39 0805443408
Virtual room	
Office Hours (and modalities: e.g., by appointment, on line, etc.)	3 p.m. to 5 p.m. (booking required); at the Physics Department, 2nd floor, room no. 258 on Monday and Wednesday

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	16	15	44
CFU/ECTS			
3	2	1	

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 perspectives and professional opportunities*
Course prerequisites	

Teaching strategie	*Lectures, Training on Satellite image processing software and GIS systems*
Expected learning outcomes in terms of	
Knowledge and understanding on:	o Analytical knowledge in the field of remote sensing o Interdisciplinary view o Knowledge of the Earth Observation scenario, 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 o project
Syllabus	
Content knowledge	*- 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)*
Texts and readings	*o Course's Slides* *o E. Chuvieco, Fundamentals of Satellite Remote Sensing: An Environmental Approach, Third Edition. Taylor & Francis Ltd, 2020.* *o Links to "open access" remote sensing journals* *o Links to software and tools documentation/tutorials*
Notes, additional materials	
Repository	*Teams Classroom*

Assessment	
Assessment methods	*Research project with final report (written and oral) on the activity carried out to show the acquired skills*

Assessment 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 ● *Communicating knowledge and understanding* o Critically review the activity carried out 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
Final exam and grading criteria	*The final mark will be expressed in thirtieths*
Further information	
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