COURSE DETAILS

"GIS AND REMOTE SENSING"

SSD AGR/08

* *In case of an integrated course, the SSD (scientific disciplinary sector) should be written above only if all modules of the course belong to the same SSD, otherwise the SSD is to be written alongside the MODULE (see below).*

DEGREE PROGRAMME: ENVIRONM. AND FORESTRY SCIENCES

ACADEMIC YEAR 2021-2022

GENERAL INFORMATION – TEACHER REFERENCES

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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE (IF APPLICABLE):	
MODULE (IF APPLICABLE):	
CHANNEL (IF APPLICABLE):	
YEAR OF THE DEGREE PROGRAMME (I, II, III):	I
SEMESTER (I, II):	I
CFU:	6

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "ORDINAMENTO")

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PREREQUISITES (IF APPLICABLE)

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LEARNING GOALS

Expected learning outcomes refer to the overall learning aims of the subject in relationship with the degree structure.

The course aims to develop basic skills in the analysis and interpretation of remote sensing data in different region of the electromagnetic spectrum and their integration within Geographical Information Systems for the monitoring of agro-forestry resources. Lectures are focused on the physical principles of remote sensing acquisition and elaboration, with special emphasis to passive sensors in the solar domain. Attention is focused on techniques for the evaluation and characterisation of vegetation parameters for agro-forestry applications. Hands-on software tools for image processing and GIS as well as field practice are intensively scheduled during the course.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Learning outcomes are statements of what students, endowed with adequate initial background, are expected to know, understand and/or be able to demonstrate or have acquired on successful completion of their studies (knowledge and abilties).
Descriptors such as "Knowledge and understanding" and "Applying knowledge and understanding" refer to disciplinary knowledge and should be used to designate peculiar capabilities conferred by the specific degree. The content of these sections should be relevant to what is mentioned in the course structure "ordinamento".

Knowledge and understanding

This descriptor refers to disciplinary knowledge and describes how the student can elaborate on what has learnt to convert notions in more complex and partially original reflections.

The course provides students with knowledge and basic methodological tools needed to analyze satellite remote sensing data in different regions of the electromagnetic spectrum. Such tools may allow the student to understand and analyze the information available from remote sensing to describe natural and antropic processes on the Earth surface with implications for the management of agro-forestry resources.Furthermore, the student will be able to read and interpreter maps and cartographic documents representing the territory of interest, by combining different sources of data and ground observations, lso with the support of Global Position Systems (GPS).

Applying knowledge and understanding

This descriptor refers to disciplinary competence (knowing how to do something) that students need to acquire and describes how and at what level the student is able to apply in practice knowledge to solve problems in a variety of settings.

The student needs to show ability to infer decision about the most suitable typology of data needed for creating a thematic map (i.e. land use map), to elaborate data for producing thematic maps for monitoring and characterizing vegetation cover (i.e. LAI maps) by means of open-source software packages. This background information will be useful for several applications in the field of agricultural practices and forestry. The students will also have the capability of deepening his technological knowledge by accessing to other sources (Internet, text books) and to familiarize with computing and software tools and hardware. These skills will improve the future professional capabilities.

COURSE CONTENT/SYLLABUS

Describe the study program listing arguments and, if applicable, allocate CFU of the course among different headlines.
In case of integrated course, please specify the course content within the modules that constitute the course.

1. Introductory concepts of Geographical Information Systems and Remote Sensing. Raster and vector data format. Main operations for creating, editing and querng GIS data.
2. Geographic Reference Systems. Geographic projections. Global satellite positioning systems.

3. Definition, origins and history of remote sensing. Physical principles of remote sensing: electromagnetic radiation and fundamental laws. Reflection and transmission mechanism.
4. Systems for Earth Observation from space. Orbits and orbiting platforms. Active and passive sensors. Main characteristics of observation systems. Resolutions. Interaction between solar radiation, atmosphere and Earth surface.
5. Spectral signatures of soils, vegetation and water.
6. Visualisation techniques. Digital data formats. Image processing systems. Statistical information and parameters of raster images.
7. Geometrical and radiometric corrections of images obtained by means of optical sensors.
8. Vegetation indices.
9. Image classification methods.
10. Semi-empirical models for deriving geophysical and environmental variables of land surfaces. Integration between remote sensing, GIS and environmental analysis models.

READINGS/BIBLIOGRAPHY

Please list here textbooks or other readings.
Software and reading material available from the web-site
Text-books:
- *P. A.Brivo, G. M.Lechi, E. Zilioli. Principi e metodi di Telerilevamento, Ed. Città Studi, Milano*
- *T.M. Lillesand R.W. Kiefer. Remote sensing and image interpretation. J.Wiley & S., New York*

TEACHING METHODS

Describe how teaching activities are deployed: lectures, classes, exercises, laboratory, stages, seminars, others.
If applicable also list tools for teaching delivery (recorded lectures, multimedia, software, on line material, etc.)

Example:
Teacher will use: a) lectures for approx. 60 % of total hours; b) practical exercises for approx. 40 % of total hours. The entire course is done in the Informatic Lab for a continuous use of software aiming at the immediate application of the theoretical concepts given.

EXAMINATION/EVALUATION CRITERIA

a) Exam type:

Exam type	
written and oral	
only written	
only oral	X
project discussion	X
other	

b) Evaluation pattern:
[this field needs to be filled in only when there are different weights among written and oral exams, or among modules if this refers to an integrated course]

The project discussion is encouraged but not mandatory. The evaluation will aim at: i) evaluating the student' understanding of the theoretical concepts of the course and its applications; ii) the level of knowledge of the tools available for analysing the agricultural and forestry systems by means of remote sensing and GIS.