



# UNIVERSITÀ DEGLI STUDI DI PALERMO

|                              |                                                                                                                                         |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| DEPARTMENT                   | Scienze Agrarie, Alimentari e Forestali                                                                                                 |
| ACADEMIC YEAR                | 2020/2021                                                                                                                               |
| MASTER'S DEGREE (MSC)        | FORESTRY AND AGRO-ENVIRONMENTAL SCIENCE AND TECHNOLOGY                                                                                  |
| SUBJECT                      | REMOTE SENSING AND TERRITORIAL INFORMATION SYSTEMS                                                                                      |
| TYPE OF EDUCATIONAL ACTIVITY | B                                                                                                                                       |
| AMBIT                        | 50565-Discipline dell' ingegneria forestale e della pianificazione                                                                      |
| CODE                         | 15406                                                                                                                                   |
| SCIENTIFIC SECTOR(S)         | AGR/10                                                                                                                                  |
| HEAD PROFESSOR(S)            | DI STEFANO COSTANZA Professore Ordinario Univ. di PALERMO                                                                               |
| OTHER PROFESSOR(S)           |                                                                                                                                         |
| CREDITS                      | 6                                                                                                                                       |
| INDIVIDUAL STUDY (Hrs)       | 98                                                                                                                                      |
| COURSE ACTIVITY (Hrs)        | 52                                                                                                                                      |
| PROPAEDEUTICAL SUBJECTS      |                                                                                                                                         |
| MUTUALIZATION                |                                                                                                                                         |
| YEAR                         | 1                                                                                                                                       |
| TERM (SEMESTER)              | 2° semester                                                                                                                             |
| ATTENDANCE                   | Not mandatory                                                                                                                           |
| EVALUATION                   | Out of 30                                                                                                                               |
| TEACHER OFFICE HOURS         | <b>DI STEFANO COSTANZA</b><br>Monday 09:00 11:00 Dipartimento SAF, stanza 110/A<br>Wednesday 09:00 11:00 Dipartimento SAF, stanza 110/A |

**DOCENTE:** Prof.ssa COSTANZA DI STEFANO

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PREREQUISITES</b>          | Basic knowlege of mathematics, physics and cartography                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>LEARNING OUTCOMES</b>      | <p><b>KNOWLEDGE AND UNDERSTANDING</b><br/>Use and processing of satellite data oriented to the practical applications. Capability to integrate different information (topographic data, satellite, video, etc) in a geographical information system.</p> <p><b>APPLYING KNOWLEDGE AND UNDERSTANDING</b><br/>Capability of both recognizing and self-organizing data and processing required for the design of a GIS integrated with remote sensing data.</p> <p><b>MAKING JUDGEMENTS</b><br/>Capability of evaluating the results of remotely sensed data processing and its using in GIS environment.</p> <p><b>COMMUNICATION</b><br/>Capability of using the specific language typical of this specialized disciplines. Capability of presenting the results of an analysis and processing of remote sensing images and its using in GIS environment, even a non-expert public. Capability of supporting the importance and the environmental impacts of the using a GIS.</p> <p><b>LIFELONG LEARNING SKILLS</b><br/>Capability of self-update by reading scientific papers. Capability to attend Master courses and specialized workshops in the field of remote sensing and GIS.</p> |
| <b>ASSESSMENT METHODS</b>     | <p>A written test can precede the verbal exam. Presentation of the case study developed during the Course. The student will be evaluated taking into account the obtained level of knowdlege, the ability of applying knowledge and the communication on the case study developed during the course.</p> <p>The evaluation (minimum grade is 18 and maximum is 30 cum laude) is stated using the following scheme:</p> <p>1) Knowledge of the topics, capability to apply the learned knowledge, capability to analyze the studied problem, ability to present the topic is judged sufficient (18-21)</p> <p>2) Knowledge of the topics, capability to apply the learned knowledge, capability to analyze the studied problem, ability to present the topic is judged fair (22-25)</p> <p>3) Knowledge of the topics, capability to apply the learned knowledge, capability to analyze the studied problem, ability to present the topic is judged good-high (26-28)</p> <p>4) Knowledge of the topics, capability to apply the learned knowledge, capability to analyze the studied problem, ability to present the topic is judged high-advanced (29-30 cum laude).</p>                |
| <b>EDUCATIONAL OBJECTIVES</b> | <p>The aim of the course is to introduce the students to the use and processing of satellite data oriented to the practical applications. The Course also provides the basic knowledge for selecting the most appropriate satellite data.</p> <p>The students also learn the basic knowledge of geographic information system (GIS), integrating methodological elements with technical ones. The impact assessment that a GIS has in the organization of a public or private authority is also dealt. Applications of Remote Sensing and GIS have been developed with particular reference to the forested hillslopes and the elements of the river network.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>TEACHING METHODS</b>       | Frontal lessons, guided exercises                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>SUGGESTED BIBLIOGRAPHY</b> | <p>GOMARASCA M. Introduzione a telerilevamento e GIS per la gestione delle risorse agricole e ambientali ed. CNR, IRRS, Milano 1997</p> <p>BIALLO G. 2005 Introduzione ai Sistemi Informativi Geografici, I quaderni di MondoGIS</p> <p>Per approfondimenti:</p> <p>LILLESAND T.M., KIEFER R.W. Remote Sensing and Image Interpretation Ed. John Wiley &amp; Sons</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## SYLLABUS

| Hrs | Frontal teaching                                                                                                                                                                                                                                                                                                                                        |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Objectives of the course and its subdivision                                                                                                                                                                                                                                                                                                            |
| 3   | Meaning and Definition of Remote Sensing; Principles of Remote Sensing Electromagnetic Radiation and the Radiation Principles. Spectral Reflectance on Vegetation, Soil and Water                                                                                                                                                                       |
| 4   | I sistemi di osservazione della terra: piattaforma terrestre, aerea e satellitare. Analisi di un sistema di telerilevamento: segmento spaziale e segmento di terra. Tecniche di ripresa di una immagine tele rilevata (tecniche attive e tecniche passive) Risoluzione spaziale, risoluzione temporale, risoluzione radiometrica, risoluzione spettrale |
| 4   | Geostationary orbit and sun – synchronous orbit; Panchromatic imaging system, Multispectral Imaging System, Super - spectral Imaging System and Hyper – spectral Imaging System<br>The main missions of Earth Observation (LANDSAT TM E ETM+, SPOT, NOAA- AVHRR, METEOSAT, IKONOS, QuickBird, the airborne sensors, Mivis, Aviris e Airborne TM )       |
| 2   | Digital images, color theory; images in RGB and False color                                                                                                                                                                                                                                                                                             |
| 2   | Techniques of image enhancement; contrast enhancement; filtering techniques of an image                                                                                                                                                                                                                                                                 |

## SYLLABUS

| Hrs | Frontal teaching                                                                                                                                   |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 2   | Radiometric correction of a digital image. Geometric correction of a digital image. Georeferencing of images (Ground Control Point and resampling) |
| 2   | Map algebra; Vegetation Index (NDVI, PVI, WDI, TC)                                                                                                 |
| 2   | Image classification: supervised and unsupervised classification; Hard and soft classifier. Landcover Thematic map                                 |
| 3   | Close-range photogrammetry by UAV technique                                                                                                        |
| 2   | Definition of Geographic Information System and types of spatial data.                                                                             |
| 2   | Organization of geographic information: the information layer.                                                                                     |
| 2   | GIS and digital cartography.                                                                                                                       |
| 3   | Spatial data models: conceptual, logic and physical models. object-based model and field-based model.                                              |
| 2   | Coverage and topology; The topological primitives; numeric and alphanumeric attributes                                                             |
| 2   | Acquisition of spatial data; digitalization; Manual and automatic vectorization                                                                    |
| 2   | Spatial analysis: query, buffer, overlay. Map Algebra                                                                                              |
| Hrs | Practice                                                                                                                                           |
| 12  | Project of an Geographic Information System and its implementation                                                                                 |