UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applied Remote Sensing

2122-2-F7501Q100

Aims

The aim of the course is to provide expertise in remote sensing applied to the environmental science. The course is organised in a theoretical section and a practical laboratory and field section.

The aim of the course is to teach the basic notions of remote sensing. In particular, the course aims to illustrate the physical methods and techniques for evaluating the spectral characteristics of the investigated surfaces and analyzing their variability in space and time.

In particular, at the end of the course the student will have the necessary elements to:

- understand the concept of direct and inverse modelling and to be able to solve simple problems and exercises for the estimation of bio-geophysical parameters of the earth's surface, starting from multi-source remote sensing data.

- have knowledge of the main Earth Observation satellite missions.

- have the necessary skills to understand which type of data (airborne/satellite, optical/thermal/ adar) should be used in specific case studies for the study of the Environment.

- being able to communicate his knowledge with language properties, using specific scientific terminology, and in a synthetic manner. Acquire autonomy of judgment in the application of the methods learned.

Contents

Basis of remote sensing, processing and interpretation of satellite and aerial imageries for the quantitative analysis

of the environment. The course will include theoretical lessons, field trips with instrumentation and laboratory exercises with dedicated software. Theoretical background, image processing and interpretation of satellite and airborne images for the quantitative study of the environment will be illustrated.

The course includes classical topics of Remote Sensing aimed at the characterization of the main surfaces (e.g. vegetation, snow, soils). The course proposes elements of remote sensing applied with particular attention to the use of field instruments and to the resolution of specific problems (e.g. land use and land cover mapping using satellite data)

Detailed program

1: Introduction to the Course

2: Measurements of reflected and emitted radiance and spectral behavior of natural surfaces.

3: The concept of resolution and remote measuring instruments

4: Digital images and statistical exploration. Major space missions.

5: field measurements of environmental parameters and spectral measurements of calibration / validation

6: Pre-processing techniques. Radiometric distortion, atmospheric correction and calculation of the reflectivity. Geometric correction.

7: Techniques for the generation of thematic maps

8: Estimation of biophysical and biochemical vegetation parameters

9: Phenological cycle of vegetation and climate change

10: Contribution of remote sensing to the carbon balance

11: Estimation of soils parameter by hyperspectral data

12: Remote sensing of the cryosphere

13: Remote sensing of inland waters

14: Remote sensing in urban environment

Prerequisites

Prerequisites are not required. It is advisable to acquire the skills related to Earth Physics, Statistics and Computer Science, as a priority.

Teaching form

- Lessons, 4 credits - 32 hours

- Laboratory, 1.5 credits - 15 hours

- Field activities, 0.5 credits - 5 hours

Textbook and teaching resource

Handouts and slides

Brivio, P.A., Lechi, G., and Zilioli E., 2006. Principi e metodi di Telerilevamento, De Agostini - Città Studi edizioni, Torino (Italy), pp. 525.

Semester

Second semester

Assessment method

The exam consists of a written examination consisting in eight open questions (3 with marks from 0 to 5 and 8 with marks from 0 to 3) related to all the lesson contents and to the field activities. In addition to the theoretical fundamentals given in the course, students' skills and aptitudes are also assessed to adapt the theoretical foundations of remote sensing to practical cases; the expositive ability and adequacy of the student's language is also assessed. The examination is retained positive for an evaluation of 18-30/30.

For the admission to the oral examination a report on the laboratory experiences should be presented. This report should be approved by the professor.

An oral examination can be taken as an integration of the written examination.

Office hours

During working hours with email appointment to roberto.colombo@unimib.it