Course guide
310622 - 310622 - Remote Sensing

Last modified: 28/12/2023

Unit in charge: Barcelona School of Building Construction
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN GEOINFORMATION AND GEOMATICS ENGINEERING (Syllabus 2016). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: Puig Polo, Carolina

Others: Prades Valls, Albert

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge, application and analysis of the processes of treatment of digital images and special information, proceding from airborne and satelite sensors.
2. Knowledge, use and application of the treatment techinques. Analysis of special data. Study of models applied to the engineering and architecture.

Transversal:
3. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
4. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

TEACHING METHODOLOGY

The teaching methodology is based on a practical and immediate application of the concepts developed in theory classes.

LEARNING OBJECTIVES OF THE SUBJECT

Basic knowledge of Remote Sensing
Treatment of efficient space and airborne images

STUDY LOAD

Type	Hours	Percentage
Hours medium group	27,0	24.00
Self study	67,5	60.00
Hours large group	18,0	16.00

Total learning time: 112.5 h

CONTENTS

1. Introduction to remote sensing

Description:
History of remote sensing
Remote sensing active-passive
Aerotransported remote sensing and by satellite
Orbits

Related activities:
LABORATORY 1

Full-or-part-time: 2h
Theory classes: 1h
Self study : 1h

2. Physic principles of remote sensing in the optic

Description:
Remote sensing in the optic (visible, proximus infrared)
Reflectance and spacial signature.
Macroscopics effects: reflection, refraction, absortion, diffusion and transmision.
Spacial resolution, radiometry, spectral and temporal

Full-or-part-time: 4h
Theory classes: 2h
Self study : 2h

3. Platforms and sensors

Description:
Types of sensors.
Satellites and sensors of terrestrial observation, meteorologics, naval and other type of sensors.

Full-or-part-time: 2h
Theory classes: 1h
Self study : 1h

4. Geometry correction and image radiometry

Description:
Methods of geometric correction and image radiometry by satellite

Full-or-part-time: 4h
Theory classes: 2h
Self study : 2h

5. Interpretation and analysis of the images

Description:
Transformation (indexs of water, snow, vagetation,...)
Supervised classification
Non supervised classification
Validation of a classification

Full-or-part-time: 12h
Theory classes: 6h
Self study : 6h

6. Remote sensing by microwaves

Description:
Radar
Effects of the frequence, polarization, angle of incidence and humidity
Radar section, equation of the radar, speckle
Radar of real opening
Geometric effects of the radar images
The Opening Synthetic Radar OPR
Radial resolution. Slant-range and ground-range
Doppler effect
Radar of real amplitude

Full-or-part-time: 6h
Theory classes: 3h
Self study : 3h

ACTIVITIES

LAB1: Visualization and interpretation of satellite images. Tools of work

Material:
Optic and radar images

Delivery:
Descriptive report

Related competencies :
CEM10. Knowledge, application and analysis of the processes of treatment of digital images and special information, proceding from airborne and satelite sensors.

Full-or-part-time: 12h
Laboratory classes: 4h
Self study: 8h

LAB2: Preprocessingt I: Geometric corrections of optic images

Description:
Application of the rectification and register of image processing through the control points, obtaining the transformation by polinomic adjustment and sampling. Evaluation of the applied transformation.

Material:
Optic images

Delivery:
Geometric correction of a multispectral image

Full-or-part-time: 6h
Practical classes: 2h
Self study: 4h

LAB3: Preprocessing II: Radiometric corrections optic

Description:
Application of radiometric correction techniques: correction of atmospheric dispersion, correction, conversion to reflectivities

Material:
Optic images

Delivery:
Radiometric correction of a multispectral image

Full-or-part-time: 6h
Practical classes: 2h
Self study: 4h

LAB 4: Transformations and highlighting

Description:
Knowledge of techniques to extract information of a satelite image, spcetral indexs (vegetation, water,...). Highlitghting of images through compositions of color, contrast adjustment, filters.

Material:
Optic images

Delivery:
Extraction of water sheets, vegetal cobers of different tipologies of multispectral images with improvements of visualization.

Full-or-part-time: 12h
Practical classes: 4h
Self study: 8h

LAB 5: Supervised and non supervised classification

Description:
Application of the classification methodology of multispectral images for the obtention of a qualitative o theme image. Familiarization with the use of tools for the definition of learning areas, selection of the classification method and evaluation by confusion matrix.

Material:
Optic images

Delivery:
Classification of a multispectral image by different methods, comparation and evaluation of the results.

Full-or-part-time: 24h
Laboratory classes: 8h
Self study: 16h

LAB 6: Remote sensing by microwaves

Full-or-part-time: 18h
Practical classes: 6h
Self study: 12h

LAB7: Applications of remote sensing

Full-or-part-time: 8h
Practical classes: 4h
Self study: 4h

GRADING SYSTEM

The subject has a thoretical and practical component. The part of practices of the subject has an important weight by the number of hours and also by its significance in order to assimilate correctly the concepts explained in the theoretical classes.
To be evaluated the student must deliver, in the established schedules, all the projects that are proposed.
The final mark of the subject (FM) will be calculated like:
FM= 30% theoretical mark + 70% practices mark
The theoretical mark (30%) will be evaluated by written exams.
The practices mark (70%) will be evaluated with the delivery of the practices (40%) and a practical exam (60%).

EXAMINATION RULES.

To be able to carry out the exams of the subject the student must have delivered in the established schedule the proposed projects.

BIBLIOGRAPHY

Basic:
- Campbell, James B. Introduction to remote sensing. 4th. New York: The Guilford Press, 2007. ISBN 9781593853198.
- Woodhouse, Iain H.. Introduction to microwave remote sensing [on line]. Boca Raton: Taylor & Francis, 2006Available on: https://discovery.upc.edu/permalink/34CSUC_UPC/5rq1ap/alma991005083779906711. ISBN 0415271231.