

# Environmental Remote Sensing

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**University of Barcelona** 

Senior member of the IEEE Geospatial and Remote Sensing Society

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**Erasmus+ Blended Intensive Program** 

### **Environmental Remote Sensing**



Environmental Remote Sensing is a set of multidisciplinary technology tools that can provide powerful potentiating support to a wide range of disciplines: agriculture, forestry, ecology, water quality, oceanography, urban planning, air pollution monitoring, and climate change.

Recent advancements have further expanded the possible uses of remote sensing technologies with more affordable unmanned airborne platforms, lower cost sensors and more powerful processing capacities. The proposed BIP course aims to discuss concepts, methodologies, and best practices related to the remote sensing of different natural, anthropogenic and hybrid environments, including quantitative measurements related to plants, water, soil, geological, and urban assessments.



Furthermore, knowledge of remote sensing and geographic information systems is highly sought in private industry, governmental, international nonprofit, and research, with strong evidence of mobility between sectors, making it an attractive work market for those students aspiring to enter the workforce soon after their degree.

# To whom is the course addressed?

#### • Requirements

- This course is oriented to senior undergraduate students with background-related fields in plant physiology, environmental sciences, ecology, geography, water quality, geology, urban planning, image processing and informatics, earth observation science, and geographic information systems.
- Students are also encouraged to enroll in support in the development of their undergraduate, masters or even PhD thesis project.



# Course modules

1 Introduction to Remote Sensing - Physical Basis and Concepts	<ul> <li>(Remote Learning Session)</li> </ul>
2 Introduction to Spectroscopy of Plants, Water, Soil, and Geology	<ul> <li>(Remote Learning Session)</li> </ul>
3 Introduction to Spectral Analysis Methods	<ul> <li>(Remote Learning Session)</li> </ul>
4 Remote Sensing Applications in Agriculture and Forestry- Satellites UAVs, and Mobile Phones	<ul> <li>(Intensive in-Person Learning Session)</li> </ul>

## Main topics addressed

Physical basis for optical remote sensing approaches

Interactions of light with plants, soil, geology and water

electromagnetic radiation (EMR)

**Reflected and thermal** 

Methods of spectral analysis

- Image classification methods
  - Spectral feature analysis
- Radiative transfer models

Earth Observation Science resources of the EU and NASA

Proprietary Software for processing ground, UAV and satellite data https://sckefauver.com/softwaredevelopment/

# Overall learning outcomes

An introductory understanding of the physics behind remote sensing and earth observation sciences.

A broad understanding of how remote sensing technologies can provide information about the environment around us and uses for different disciplines.

Skills in the practical use of different sources of remote sensing data using different open-source image processing software.

Development of capacities for piloting your own unmanned aerial platform for the acquisition of remote sensing data according to fit your needs.

Connect with other remote sensing networks internationally for further training, education, collaboration, and job market opportunities.

### Practical Details

• \*Recognition of ECTS depends on your home university.

**Dates:** January through May, June-July

Format: Blended

Location: Barcelona, Spain

Contact: sckefauver@ub.edu

Total workload: 75 hours

ECTS: 3\* (25-30 hours/ECTS)

**Language:** English (B2 minimum but flexible)

### Practical Details

## Virtual mobility

#### ◯ Jan.–Feb.

Course 1 (virtual)

 Introduction to Remote Sensing - Physical Basis and Concepts

#### OMar.–Apr.

Course 3 (virtual)

• Introduction to Spectral Analysis Methods

Course 2 (virtual)

 Introduction to Spectroscopy of Plants, Water, Soil, and Geology

**Feb.**–Mar.

Course 4 (in person)

• Remote Sensing Applications in Agriculture and Forestry- Satellites UAVs, and Mobile Phones

June-July

Practical Details -Physical mobility

- On-site Learning will take place in Barcelona at the University of Barcelona during late June or early July.
- During this week it will be possible to use the lower cost student residences for affordable accommodation.
- The plan is for 5 days of intensive learning experiences focus on field practical exercises, applications, and discussions.
- Visiting professors and experienced technical staff will serve as teaching staff under the supervision of Professor Kefauver to help in the practicality of UAV sensor integration and flight programming.
- UAV safety, flight and pilot training. Students may further sign up with the AESA to acquire a UAV pilot's license from Spain for compact size UAVs, which is valid for all of Europe.
- UAV flight planning and standard operating procedures using the manuals developed by the University of Barcelona.
- UAV flights and demonstrations can be planned at the IRTA Torre Marimon center at Caldes de Montbui.

Shawn C. Kefauver is Chair of COST Action PANGEOS: Pan-European Network of Green Deal Agriculture and Forestry Earth Observation Science (PANGEOS)





About GRSS

Publications

Conferences Community

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#### Geoscience and Remote Sensing Society (GRSS)

The Geoscience and Remote Sensing Society (GRSS) is a community of researchers and practitioners collaborating and designing tools to understand our interaction

Prof. Kefauver is an active Senior Member of the IEEE Geoscience and Remote Sensing Society (GRSS), currently the IEEE GRSS Liaison to the IEEE Society on Social Implications of Technology (SSIT) and member of the IEEE GRSS Inspire, Develop, Empower and Advance committee.

#### Operations & phenotyping //

Manuals



#### Standard operating procedures for UAV phenotyping

- This manual provides an introduction and use guide to the aerial platforms, sensors and data tools involved in unmanned aerial vehicle (UAV) phenotyping applications, with a case study of RGB, multispectral and thermal phenotyping on microplots.
- Published on 01/12/2019

Excellenceinbreeding.org/toolbox/tools/standard-operatingprocedures-uav-phenotyping



# Basic standard operating procedures for UAV phenotyping

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Remote sensing for agriculture monitoring: Sentinel-2 features and precision agriculture Segarra et al., Remote Sensing for Precision Agriculture: Sentinel-2 Improved Features and Applications. https://doi.org/10.3390/agronomy10050641.



Berger et al., 2022. Multi-sensor spectral synergies for crop stress detection and monitoring in the optical domain: A review. https://doi.org/10.1016/j.rse.2022.113198



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