COURSE SYLLABUS

Environmental Monitoring and Management

2324-2-F9102Q011

Aims

The aim of this course is to provide students with an understanding of environmental monitoring techniques, with management practices in view. Students will learn the principles of environmental monitoring, the techniques used for collecting data, and the processes involved in managing and analysing the collected data. The course will focus on spaceborne and in situ data with special regards to radar and sensor networks. By the end of the course, students will be able to critically evaluate different approaches to environmental monitoring and management and develop effective strategies to collect environmental data.

Contents

This course provides students with an understanding of how to monitor and manage the environment using radar remote sensing and in-situ sensor networks. In this course, students will learn the principles and techniques of environmental monitoring and management, including the processes involved in collecting, analysing, and interpreting environmental data.

In lab activities, students will have the opportunity to work on a group project where they will design and implement an environmental monitoring and management project using radar remote sensing and in-situ sensor networks.

Detailed program

Introduction to Environmental Monitoring and Management:
? Defining environmental monitoring and management
? Importance of monitoring and managing the environment
? Overview of radar remote sensing and in-situ sensor networks

Radar Remote Sensing:
? Principles of radar remote sensing
? Types of radar sensors and their applications
? Data collection, processing, and interpretation
? Case studies on the use of radar remote sensing in environmental monitoring and management
? Copernicus and its Data Hub

In-Situ Sensor Networks:
? Introduction to in-situ sensor networks
? Types of sensors used in in-situ networks
? Protocols and technologies for in-situ networks
? Data collection, processing, and interpretation
? Case studies on the use of in-situ sensor networks in environmental monitoring and management

Integration of Radar Remote Sensing and In-Situ Sensor Networks:
? Principles of data fusion and integration
? Techniques for integrating radar remote sensing and in-situ sensor network data
? Applications of integrated data in environmental monitoring and management
? Case studies on the use of integrated data for environmental monitoring and management

Group Projects (Laboratory activities):
? The students will work in groups to design and implement an environmental monitoring and management project using radar remote sensing and in-situ sensor networks
? The students will present their projects and findings to the class

Note: The order and content of topics may be adjusted to better fit the background of students and to keep the information current.

Prerequisites

Students should have acquired some background from previous courses in environmental science, geospatial analysis, remote sensing, or a related field before enrolling in this course. Basic proficiency in relevant software such as GIS (Geographic Information Systems) software and remote sensing software may also be useful. Knowledge of the basics of computer programming is not required but strongly recommended.

Teaching form

The course will include traditional lectures, where the instructor presents the course material and engages students in discussions and debates, and lab sessions, where students get hands-on experience working with radar remote sensing and in-situ sensor networks.

Textbook and teaching resource

• Moreira, A., P. Prats-Iraola, M. Younis, G. Krieger, I. Hajnsek and K. P. Papathanassiou, "A tutorial on synthetic aperture radar," in IEEE Geoscience and Remote Sensing Magazine, vol. 1, no. 1, pp. 6-43, March 2013, doi: 10.1109/MGRS.2013.2248301.

• Massonnet, D. and Souyris, J.C., "Imaging with Synthetic Aperture Radar" in Engineering Sciences series, EPFL Press, 2008. ISBN 978-0849382390

• Fahmy, Hossam Mahmoud Ahmad, "Wireless sensor networks: concepts, applications, experimentation and analysis". Springer, 2016.

• Slides of the lessons published on the course site

Semester

1st semester

Assessment method

Oral exam

Office hours

By video- or audio-conference on appointments set via email.
Office: University of Pavia, Department of Electrical, Computer, Biomedical Engineering, via Adolfo Ferrata 5, 27100 Pavia – floor H, by appointment. Weekly availability will be published once weekly schedule is settled.
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Sustainable Development Goals

SUSTAINABLE CITIES AND COMMUNITIES | CLIMATE ACTION