



## Islamabad Campus

### summerCamp

## Exploring the Earth from Space using Satellites and Drones

### Executive Summary

To introduce students and beginners to the exciting world of geospatial technologies, The Department of Meteorology of COMSATS is offering 6-week training workshop titled “Exploring the Earth from Space using Satellites and Drones” with intensive sessions designed to equip participants with the latest knowledge and skills in the field of Remote Sensing and GIS.

The primary objective of these workshops is to provide hands-on experience with cutting-edge geospatial tools and techniques, and to explore their practical applications in various fields such as climate science, urban planning, environmental management, transportation, and disaster management. The workshops are divided into several modules, each focusing on a specific aspect of geospatial technology. Each module is designed to be interactive and application-oriented, with a balance of theoretical knowledge and practical exercises.

Participants will have the opportunity to work on real-world projects, which will allow them to apply the skills they learned in a practical context. They are encouraged to collaborate and share their ideas, fostering a vibrant learning community. Upon successful completion, participants will receive certificates from the respective departments at COMSATS University Islamabad. The launch of these training workshops underscores the university's commitment to fostering a culture of lifelong learning and skill enhancement, thereby propelling individuals towards success and societal impact in an ever-evolving world.

### Objectives

- To develop practical skills in RS and GIS among students from diverse academic backgrounds.
- To introduce modern spatial analysis techniques and their applications.
- To encourage the use of geospatial technologies for solving real-world problems.
- To build a foundation for academic and professional growth in geospatial sciences.

### Training Modules

The list of Training Modules in the 6-Week Workshop is tabulated in Table 1.

**Table 1:** Summary of Training Modules.

Sr#	Field	Module	Duration
1	Geospatial Science	Introduction to Remote Sensing & GIS	1-Week

2	Remote Sensing	Image Acquisition, Preprocessing, and Enhancement	1-Week
3	Spatial Analysis	Spatial Data Analysis and Visualization	1-Week
4	Environmental RS	Remote Sensing for Environmental Monitoring	1-Week
5	Urban Planning	Geospatial Urban Analysis	1-Week
6	Advanced Techniques	Data Integration and Final Project Presentation	1-Week

## Infrastructure

### **Week 1: Introduction to Remote Sensing & GIS**

Day 1 (Lecture): Understand basic concepts and applications of Remote Sensing and GIS.

- What is Remote Sensing?
- Electromagnetic Spectrum and Spectral Signatures
- Platforms and Sensors (Satellites, UAVs, etc.)
- Introduction to GIS and its Components
- Spatial Data Types (Vector, Raster)
- GIS Software Overview (e.g., ArcGIS, QGIS)

Day 2 (Hands on activity): Remote Sensing & GIS Fundamentals

- Learn to read and interpret different types of topographic and thematic maps
- Real-world Applications of RS & GIS
- Visualizing Satellite Images in QGIS

Day 3 (Hands on activity): HTML, CSS, JavaScript basics

### **Week 2: Image Acquisition and Preprocessing**

Day 1 (Lecture): Learn how to acquire, preprocess, and enhance satellite imagery.

- Satellite Data Sources (e.g., Landsat, Sentinel)
- Data Acquisition Techniques
- Data Formats and Metadata

Day 2 (Hands on activity): Image Preprocessing & Enhancement

- Radiometric and Geometric Corrections
- Image Enhancement Techniques (Contrast Stretching, Filtering)

Day 3 (Hands on activity): Databases

- Postgres (basic knowledge database download and explore)

### **Week 3: Spatial Data Analysis and Visualization**

Day 1 (Lecture): Explore spatial analysis techniques and visualize geospatial data

- Spatial Data Analysis Basics
- Overlay Analysis (Intersection, Union)
- Buffering and Proximity Analysis
- Thematic Mapping and Symbolization

- 3D Visualization and Terrain Modeling

Day 2 (Hands on activity): Visualization Techniques

- Creating Thematic Maps
- Visualization of Elevation Data

Day 3 (Hands on activity): Web development basics

#### ***Week 4: Remote Sensing for Environmental Monitoring***

Day 1 (Lecture): Remote sensing techniques for environmental and land cover analysis.

Day 2 (Hands on activity): Environmental Monitoring Applications

- Supervised and Unsupervised Classification
- Change Detection Techniques

Day 3 (Hands on activity): Backend frameworks (node js/express js, sequelize)

#### ***Week 5: Geospatial Urban Analysis***

Day 1 (Lecture): Utilization of geospatial data for urban analysis and sustainable planning.

Day 2 (Hands on activity): Urban Planning & mapping

- Urban Sprawl and Land Use Mapping
- Network Analysis (Shortest Path, Service Area)

Day 3 (Hands on activity): Database Management System (postgres) with geoserver and map services

#### ***Week 6: Advanced Techniques and Final Project Presentation***

**Objective:** Integrate skills from previous weeks to complete a final project.

- Day 1: Advanced Data Integration
  - Combining RS and GIS for Multi-Criteria Analysis
- Day 2: Project Development
  - Integrating Field Data with Satellite Data
- Day 3: Final Presentations and Feedback
  - Project Presentations
  - Collaborative Group Work on Real-Life Problem