Course Description:

This course introduces the principles and applications of remote sensing and Geographic Information Systems (GIS) in environmental science. Students will learn how to acquire, process, analyze, and interpret remotely sensed data and integrate it within GIS to solve real-world environmental problems, including land use/land cover change detection, habitat mapping, water quality monitoring, and natural hazard assessment.

Course Objectives:

By the end of the course, students will be able to:

- Understand the physical principles behind remote sensing.
- Acquire and pre-process satellite imagery.
- Conduct environmental analysis using remote sensing and GIS techniques.
- Apply geospatial tools for land use change, resource management, and environmental monitoring.
- Communicate spatial data effectively through maps and reports.

Prerequisites:

Basic knowledge of environmental science and introductory statistics; familiarity with computers.

Textbook (Recommended):

- *Remote Sensing and Image Interpretation* by Thomas M. Lillesand, Ralph W. Kiefer, and Jonathan W. Chipman
- *Introduction to Geographic Information Systems* by Kang-tsung Chang

Software and Tools:

- QGIS (open-source GIS)
- ArcGIS Pro (if available)
- Google Earth Engine (for cloud-based remote sensing)
- ENVI/SNAP (optional for advanced processing)
- R or Python (for spatial data analysis)

Weekly Topics:

Week	Topics
1	Introduction to Remote Sensing and GIS
2	Electromagnetic Radiation and Remote Sensing Fundamentals

Week	Topics
3	Satellite Systems and Sensors (Landsat, Sentinel, MODIS, etc.)
4	Image Acquisition, Pre-processing, and Enhancement
5	GIS Basics: Projections, Coordinate Systems, and Spatial Data Types
6	Land Use/Land Cover Classification Techniques
7	Change Detection Analysis
8	Vegetation Indices (NDVI, EVI) and Environmental Monitoring
9	Water Resources and Coastal Applications
10	Natural Hazards Mapping (Floods, Wildfires, Droughts)
11	Accuracy Assessment and Validation Methods
12	Spatial Modeling and Environmental Risk Assessment
13	Web GIS and Cloud Computing Applications (GEE Introduction)
14	Final Project Presentations and Course Wrap-up

Assessment:

- Homework Assignments and Labs (30%)
- Midterm Exam (20%)
- Final Project (35%)
- Participation and Discussion (10%)
- Quizzes (5%)

Final Project:

Students will select an environmental issue (e.g., deforestation, urban sprawl, wetland loss) and conduct a remote sensing/GIS-based analysis, producing a report and a final map product.

Course Policies:

- Attendance and participation are essential.
- Assignments should be turned in on time unless otherwise arranged.
- Academic integrity is expected in all work.

Important Dates:

- Midterm Exam: Week 7
- Final Exam/Project Due: Week 14
- Final Project Presentations: Week 14