Course Description:

This course explores the use of remote sensing technologies in studying, monitoring, and managing marine and coastal environments. Students will learn how different types of remote sensing data (optical, radar, thermal) are applied to assess coastal dynamics, marine ecosystems, water quality, shoreline change, habitat mapping, and disaster impacts like oil spills, hurricanes, and sea-level rise.

Course Objectives:

Upon completion of the course, students will be able to:

- Understand the fundamental principles of remote sensing in marine and coastal contexts.
- Select appropriate remote sensing datasets for different marine/coastal applications.
- Analyze and interpret satellite and airborne data related to oceanographic and coastal processes.
- Apply image processing techniques for water quality assessment, shoreline monitoring, and habitat mapping.
- Critically evaluate case studies and current research in coastal remote sensing.

Prerequisites:

Introductory knowledge of remote sensing and GIS is recommended.

Textbooks and References:

- *Remote Sensing of Coastal Environments* by Yeqiao Wang (recommended)
- *Remote Sensing and GIS for Ecologists: Using Open Source Software* by H. Matthieu and C. Meißner (selected chapters)
- Journal articles and technical reports (provided weekly)
- NASA OceanColor Web and NOAA CoastWatch Resources

Software and Platforms:

- Google Earth Engine
- SNAP (Sentinel Application Platform)
- ENVI or QGIS (optional)
- R or Python (for oceanographic data analysis)

Weekly Topics:

Week	Topics
1	Introduction to Marine and Coastal Remote Sensing
2	Electromagnetic Spectrum Interaction with Water
3	Remote Sensing Platforms: MODIS, VIIRS, Sentinel-2/3, Landsat, SAR (Sentinel-1)
4	Ocean Color Remote Sensing and Chlorophyll-a Estimation
5	Sea Surface Temperature (SST) and Ocean Heat Content
6	Shoreline Detection and Change Monitoring
7	Mapping Mangroves, Seagrasses, and Coral Reefs
8	Case Study 1: Coastal Water Quality Monitoring (e.g., Turbidity, Suspended Sediments)
9	Bathymetry and Shallow Water Mapping using Remote Sensing
10	Oil Spill Detection and Disaster Monitoring (SAR Applications)
11	Coastal Wetlands and Habitat Loss Assessment
12	Sea Level Rise and Coastal Vulnerability Mapping
13	Future Trends: UAVs, CubeSats, Hyperspectral Sensors in Marine Studies
14	Final Project Presentations and Course Wrap-up

Assessment:

- Lab Assignments (30%)
- Midterm Case Study (20%)
- Final Project and Presentation (30%)
- Participation and Weekly Discussions (10%)
- Short Quizzes (10%)

Example Labs/Projects:

- Analyze MODIS ocean color data to map algal blooms.
- Detect shoreline changes using multi-temporal Landsat and Sentinel-2 images.
- Map mangrove extent and assess changes over 20 years using Sentinel-1 SAR data.
- Monitor sediment plumes after a hurricane using satellite imagery.
- Estimate SST trends over a decade and relate them to coral bleaching events.

Course Policies:

- Attendance and active participation are expected.
- Late submissions must be justified and approved in advance.
- Collaboration is allowed for labs but final projects must be individual.

Important Dates:

- Midterm Case Study Due: Week 8
- Final Project Proposal Due: Week 10

- Final Presentation and Report Due: Week 14