Course Description:

This course introduces the concepts, technologies, and applications of big data analytics and cloud computing in geospatial science. Students will learn how to manage, analyze, and visualize large-scale geospatial datasets using cloud platforms such as Google Earth Engine (GEE), Amazon Web Services (AWS), and open-source tools. Emphasis will be placed on remote sensing data processing, machine learning applications, and real-world environmental and societal problem-solving.

Course Objectives:

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

- Understand the fundamentals of geospatial big data and cloud computing concepts.
- Access, preprocess, and analyze satellite data using cloud platforms.
- Apply machine learning techniques to large-scale geospatial datasets.
- Develop scripts and workflows in platforms like Google Earth Engine and AWS.
- Communicate geospatial analysis results effectively through visualizations and reports.

Prerequisites:

Basic knowledge of remote sensing, GIS, and programming (Python or JavaScript) is recommended.

Textbooks and References:

- *Remote Sensing Big Data: Theory and Application* by Guangxing Wang and Qihao Weng (recommended)
- *Cloud-Based Remote Sensing with Google Earth Engine: Fundamentals and Applications* by Tamlin Pavelsky and Alexander S. M. P. Watanabe (recommended)
- Google Earth Engine Documentation
- Selected journal articles and case studies (provided weekly)

Software and Platforms:

- Google Earth Engine (GEE)
- Amazon Web Services (AWS) or Microsoft Azure (introductory level)
- Python (geemap, earthengine-api) and JavaScript (GEE Code Editor)
- QGIS with cloud plugins (optional)

Weekly Topics:

Week	Topics
1	Introduction to Geospatial Big Data
2	Basics of Cloud Computing for Geospatial Analysis
3	Overview of Google Earth Engine and Earth Observation Data
4	GEE JavaScript and Python APIs
5	Data Preprocessing and Visualization in GEE
6	Temporal Analysis: Time-Series and Trend Detection
7	Supervised and Unsupervised Classification in GEE
8	Machine Learning for Land Cover Mapping
9	Change Detection and LULC Monitoring
10	Integration with Cloud Storage and AWS Basics
11	Advanced Topics: Deep Learning with Remote Sensing Data
12	Case Studies: Deforestation, Urbanization, Water Quality
13	Ethics, Privacy, and Challenges in Big Geospatial Data
14	Final Project Presentations and Course Wrap-up

Assessment:

- Homework Assignments and Labs (30%)
- Midterm Project (20%)
- Final Cloud-Based Project (30%)
- Class Participation and Discussion (10%)
- Quizzes (10%)

Final Project Examples:

- Mapping land use change over decades using GEE.
- Monitoring forest degradation using cloud-based platforms.
- Flood mapping and analysis using SAR data on GEE.
- Applying Random Forest or CNNs for large-area classification tasks.

Course Policies:

- Active participation in labs and coding exercises is crucial.
- Collaboration is encouraged but individual projects must be original.
- Late submissions will be penalized unless prior approval is obtained.

Important Dates:

- Midterm Project Submission: Week 8
- Final Project Proposal Due: Week 10
- Final Project Presentation: Week 14