

GIS-802 GIS & Remote Sensing Application for Civil Engineering

Code	Credit Hours	Category
GIS 802	3	Elective

Course Description:

GIS is a computerized database management and analysis system to deal with spatial data. Currently, the utilization of Geographical Information Systems (GIS) and Remote Sensing (RS) technology is rapidly increasing in the civil engineering sector, but its academic aspect is slower to respond. There exists a consequent need for civil engineers well versed in GIS and RS to be able to apply this knowledge and related tools to solve civil engineering problems in innovative ways. This course is an initiative to explore techniques for integrating knowledge and training in GIS and RS into existing Civil Engineering graduate programs. Remotely sensed data and GIS have great potential for impacting civil engineers learning to plan, manage, and convert data into value-added products for better visualizations and decision making. This is evident from the fact that GIS & RS is playing an increasingly important role in planning, execution, management, and monitoring of civil engineering projects.

Course Objectives

- Introduce the basic and advance level topics in GIS and RS and its applications in civil engineering
- Encourage students to integrate fundamental civil engineering knowledge with GIS and RS Techniques/tools to apply it for solving comprehensive civil engineering problems with special emphasis on:
 - Surveying
 - Water resource management
 - Transportation Engineering
 - Geotechnical Engineering

Course Outcomes:

- Students will be able to apply the gained knowledge in research in the field with GIS and RS Techniques/tools to apply it for solving comprehensive civil engineering problems
- Students will be able to apply various GIS techniques and methods in the field

Reference Books:

- Lillesand, T. and Kieffer, R.W. (2004) Remote Sensing and Image Interpretation, (5th edition), (London, John Wiley & Sons)
- James B. Campbell (2006). Introduction to Remote Sensing, Taylor and Francis

- John R. Jensen (2000), Remote Sensing of the Environment, Pearson Education
- Jan Van Sickle (2001). GPS for Land Surveyors. Longman: Taylor and Francis
- Jie Shan and Charles K. Toth (Editors) (2009). Topographic Laser ranging and Scanning, Principles and Processing, CRC Press
- Kang-Tsung Chang, Introduction to Geographic Information systems fourth edition
- Getting to Know ArcGIS Desktop, Second Edition, Updated for ArcGIS 10 by ESRI press

Prerequisites:

Nil

Assessment System

Component	Percentage Range
Quizzes	10-15%
Assignments	10-15%
Mid Terms	20-30%
ESE	40-50%
Project (optional)	10-15%

Teaching Plan:

Week No	Topic	Learning Outcomes
1	Introduction to GIS & Remote Sensing	Understand the basics of GIS and remote sensing and their applications in civil engineering.
2	Geographic Data	Learn about different types of geographic data and their sources.
3	Preprocessing and Integrating Data	Understand the preprocessing and integration of data collected from different sources.
4	GIS Functionalities	Learn about various GIS functionalities and their applications in civil engineering projects.
5	Remote Sensing Data	Understand the use of remote sensing data for analysis, planning, management, and monitoring of

		civil engineering projects.
6	GIS and RS Software	Practice using widely used GIS and RS software for conducting common GIS analyses related to civil engineering applications.
7	Surveying	Learn about the applications of GIS and RS in surveying.
8	Water Resource Management	Understand the applications of GIS and RS in water resource management.
9	Mid Term Exam/ OHT, (As per NUST Exam Policy)	
10	Transportation Engineering	Learn about the applications of GIS and RS in transportation engineering.
11	Geotechnical Engineering	Understand the applications of GIS and RS in geotechnical engineering.
12	Advanced Topics in GIS and RS	Explore advanced topics in GIS and remote sensing and their applications in civil engineering.
13-14	Practical/project/research work	Work on a term project involving GIS and RS applications in civil engineering.
15	Review of all topics	Review all topics covered in the course.
16	Final project presentation	Present the final project involving GIS and RS applications in civil engineering.
17	Advanced Topics in GIS and RS	Explore advanced topics in GIS and remote sensing and their applications in civil engineering.
18	ESE	