

## Geospatial Techniques in Civil Engineering

**01CI0721**

### Objective of the Course:

- To Understand about GIS, Data Models, Data Formats and Data Quality.
- To Analyze Advanced spatial data analysis techniques.
- To apply the spatial analysis technique for real problem solving.

**Credit Earned: 03**

**Prerequisite:** Surveying, Fundamentals of GIS

### Student's learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Identify spatial data formats and standards.
2. Analyze and connect various concepts of Geographic Information System.
3. Interpret the data models and apply the spatial analysis for real problems.
4. Evaluate the role of GIS in real world problems.

### Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	00	00	03	50	30	20	25	25	150

### Detailed Syllabus

Sr. No	Topic name	Hours
<b>1</b>	<b>Introduction to GIS</b>	<b>06</b>
	1.1 GIS definition, Components, Functionalities, Coordinate systems, Datum, Projection, Maps – Types.	4
	1.2 Cartography – generalization – Symbolization, Spatial – Non-spatial data	2
<b>2</b>	<b>Data Representation and Data Quality</b>	<b>09</b>
	2.1 Vector data and Raster data format, Data Quality, Topology, Data Sources, Input methods	5
	2.2 Data Accuracy, data standards, Vector data model – Georelational	4

	model – coverage data model – shape file – TIN	
<b>3</b>	<b>Data Structure</b>	<b>10</b>
	3.1 Raster data model - Elements, Raster data structure – Run length encoding	6
	3.2 Cell by cell encoding – Block Encoding – QuadTree, DEM – Types, Sources- DTM - DSM	4
<b>4</b>	<b>Spatial Data Analysis</b>	<b>10</b>
	4.1 Terrain Analysis – Slope – Aspect – Shaded relief maps - Contour	4
	4.2 Viewshed analysis, Query – Types- spatial query – attribute query, Buffering,	3
	4.3 Vector Overlay Operations- point on polygon, line on polygon, polygon on polygon, Raster Overlay.	3
<b>5</b>	<b>Advanced Techniques and Case Study</b>	<b>07</b>
	5.1 Reclassification, Measurements - vector and raster, Interpolation – Local – Global, Spatial Models – Cartographic models – Spatio-temporal models - Cell based Models, Multi-Criteria analysis case study, Site suitability case study, Change detection study	7
	<b>TOTAL</b>	<b>42</b>

### Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	10%	25%	30%	20%	10%

### Instructional Method and Pedagogy:

- 1 Prerequisite of the course and its pattern shall be discussed on the commencement of the course.
- 2 Lectures shall be conducted in class room using various teaching aids.
- 3 Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.
- 4 At the end of each unit/topic an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.

### Recommended Study Material

1. Paul Bolstad," GIS Fundamentals: A First Text on Geographic Information Systems" 5th Edition, Eider Press, Minnesota 2016.
2. Burrough. P.A, "Principles of Geographical Information System for Land Resources Assessment", Oxford Publications, | ISBN-13: 978-0198545927, 1986.

3. Kang Tsung Chang, “Introduction to Geographical Information System”, Tata McGraw Hill, 9th edition, 2019.
4. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, “Geographic Information Science & Systems”, Fourth Edition, John Wiley & Sons, Inc., 2015.
5. Chandra. A. M. and Ghosh S. K, “Remote Sensing and GIS”, Narosa Publishing House, New Delhi, 2000.
6. Michael N. DeMers, “Fundamentals of Geographic Information Systems”, 2008

#### **Web Links**

1. <https://archive.nptel.ac.in/courses/105/107/105107206/>
2. [https://onlinecourses.nptel.ac.in/noc20\\_ce58/preview](https://onlinecourses.nptel.ac.in/noc20_ce58/preview)