COURSE CODE: **GIE-409**

COURSE NAME: **SPATIAL DATABASES**

CREDIT HOURS:

Theory	= 02
Practical	= 01
Total	= 03

CONTACT HOURS:

Theory	= 32
Practical	= 48
Total	= 80

PREREQUISITE: GIE-321 **(It is a Pre-requisite course for GIE-419 SDSS)**

MODE OF TEACHING:

Instruction:	Two hours of lecture per week	67%
Practical:	Three hours of Lab work per week	33%

COURSE DESCRIPTION:

This course is mainly designed to provide introduction to spatial database concepts, spatial data infrastructure, spatial data value for enterprise, web-architecture, front-end and back-end concepts, interoperability, OGC standards, detailed practical work on PostGIS database including spatial joins and relationships, and applications of spatial databases.

COURSE OBJECTIVES:

The objectives are to enable students to develop thorough understanding and basic principles and techniques of spatial databases. To design and implement spatial data structure and algorithms needed for appropriate spatial data modeling, spatial queries, spatial indexing, and spatial analysis. To explore both commercial and open-source spatial DBMS by providing hands on trainings. Students are expected to understand databases in general and spatial. Students will be able to design and develop spatial databases using open-source spatial DBMS

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students will achieve the PLOs:

1	Engineering Knowledge:	☑	7	Ethics:	☐
2	Problem Analysis:	☐	8	Individual and Collaborative Team Work:	☐
3	Design/Development of Solutions:	☑	9	Communication:	☐
4	Investigation:	☐	10	Project Management:	☐
5	Tool Usage:	☐	11	Lifelong Learning:	☐
6	The Engineer and Society:	☐			

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, the student will demonstrate competency by being able to:

No.	CLO	Domain	Taxonomy Level	PLO
1	Apply advanced level concepts for transformation of database to spatial database.	Cognitive	3	1
2	Design spatial database applications using	Cognitive	5	3

	spatial Database Management System for real world problems			

TOPICS COVERED:

Theory:

Week	Topics
1	Introduction to spatial database, Information modelling, modelling approaches
2	Information levels and frameworks
3	Database system concepts and architecture, Conceptual modelling, ER diagrams
4	Spatial databases, hardware, and software architecture
5-6	Representation of spatial objects, spatial data and spatial database systems, logical models and query language, constraint data model, computational geometry
7-8	Spatial databases concepts, constrain data models
9	Computational geometry, spatial Indexing, spatial operators, spatial relationships, spatial joins
10	Projection w.r.t spatial database implementation
11-12	Arc SDE, Versioning
13	Polygon partitioning, Spatial database algorithms
14	Simple query and complex query processing
15	OpenGeo Suite and its components understanding. PgRouting conceptual framework
16	OGC standards (SFS, WMS, WFS), Spatial database implementation with Web
17-18	**ESE**

Practical:

No.	Topics
1	Spatial database case studies
2	Introduction to QGIS, Connection between PostGIS and QGIS
3	OSM, QGIS, Google Maps API Practical
4	PostGIS workshop- Introduction, installation, creating a spatial database, loading spatial data
5	Simple SQL, Simple SQL Exercise
6	Geometries, Geometry Exercises
7	Spatial Relationships, Spatial Relationships Exercises
8	Spatial Joins, Spatial Joins Exercises, Spatial indexing, Projecting data
9	Postgis Functions, Pgrouting
10	OpenGeo Suite (Geoserver, OpenLayers, JavaScript) & Project

TEXT AND MATERIAL:

Textbook (s):

a. Spatial Database Systems, Design, Implementation and Project Management by A K.W. YEUNG and G. Brent Hall. Springer. 2007

Reference Books:

a. Modeling Our World: The ESRI Guide to Geodatabase Concepts (2nd Edition) by Michael Zeiler. 2010. ISBN: 1589482786
b. Spatial Databases: With Application to GIS by Morgan Kaufmann by Rigaux, P. Scholl, M. and Voisard, A. 2002. ISBN:1-55860-588-6

ASSESMENT SYSTEM:

1. **CLOs Assessment**

Cognitive	**Psychomotor**	**Affective**
Spreadsheet	-	-

2. **Relative Grading**

Theoretical / Instruction			67%
	Assignments 10%		
	Quizzes 10%		
	Mid Semester Exam 30%		
	End Semester Exam 50%		
Practical Work			33%
Laboratory Work		*70%*	
	Laboratory Assignment70%		
	Semester Project30%		
Viva/Quiz		*30%*	
Total			**100%**