RG-723: Advanced Spatial Databases (FALL 2016)

http://grel.ist.edu.pk/lms/course/view.php?id=55

Instructors			
Teacher	**Dr. Rizwan Bulbul** Assistant Professor Geospatial Research and Education Lab Department of Space Science Institute of Space Technology	**Assistant**	Announced later
Contact	Room No. 227, First Floor Block-II **Email:** bulbul@grel.ist.edu.pk	**Contact**	

Course Outline			
Department	Department of Space Science	**Program**	MS in RS and GISc
Type	Elective	**Credit Hrs**	3
Pre-Req	Introduction to Databases	**Level**	Graduate
Description	Geographic information systems (GIS) by definition are specialized information systems providing special functionality for efficiently capturing, storing, accessing and analyzing spatial data. The highlighted terms emphasize "**spatial is special**", thus needing specialized treatment for spatial data storage, management and retrieval than having conventional database management systems (DBMS) as used by some legacy GI systems. Understanding spatial database core theoretical concepts is thus of prime importance for designing efficient GIS based applications. The course will provide in-depth understanding and knowledge of spatial database theory. The students will implement some data structures and algorithms for spatial data modeling, access methods and indexing for getting insight into the spatial database core concepts. Theoretical knowledge will be supplemented with practical training of designing and implementing spatial databases through lab sessions. The usability of spatial databases will be demonstrated using POSTGIS. In addition to the reference books, the students will read research papers both classic and state of the art for respective topics as the course moves on.		

Course Outcome

By the end of this course students should be able to achieve and demonstrate the ability to;

- Understand the limitations of relational databases in handling spatial data.
- Understand spatial data representation and storage models.
- Understand fundamental and core theoratical database concepts in the context of GIS.
- Implement and utilize spatial access methods.
- Use Structured Query Language (SQL) for spatial data handling
- Implement a spatial database using PostGIS /Geodatabase/Oracle Spatial.
- Find research problems for MS thesis.

Teacher Expectations

The students enrolled for RG723 are expected to;

1. have basic database concepts (as is the prerequisite),
2. contribute actively in the class by constructive discussions,
3. frequent quizzes and assignments almost everyday,
4. perform well in quizzes and submit assignments on time,
5. do labs properly and as instructed, and
6. find an idea for your final thesis.

Warning: **Plagiarism in deliverables is highly discouraged and will be dealt strictly.**

Course Outline

The major topics to be covered in the course are;

1. Introduction to the course
2. Recall: Database basics, ER Modeling, and RDBMS
3. Introduction to spatial databases
4. Spatial data modeling/representation
5. Spatial access methods
6. Query processing
7. Overview of SDBMS implementations: Open source and Industry
8. Spatial data mining and warehousing
9. Research trends in spatial databases

Weekly Course Distribution*

1. Introduction to the course	Week-1
2. Recall: Database basics, ER Modeling, and RDBMS	Weeks 2- 4
3. Introduction to spatial databases	Week 5
4. Spatial data modeling	Weeks 6 -7
5. Spatial access methods	Weeks 8-9
6. Query processing	Weeks 10-11
7. Spatial indexing	Weeks 11-12

8. SDBMS implementations, PostGIS and Geodatabase/Oracle	Weeks 12 -15
9. Spatial data mining and warehousing	Weeks 16 -17
10. Research trends in spatial databases	Week 18

Lab Outline

The lab exercises will cover following topics;

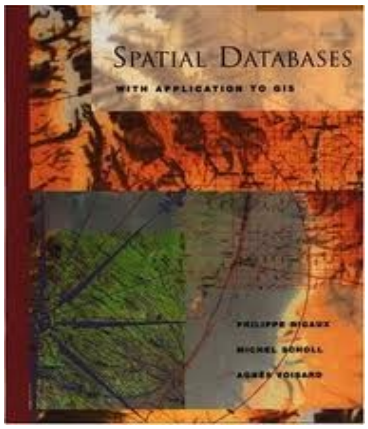
1. Introduction to RDBMS and ER Modeling with MS Access
2. Introduction to SQL with MS Access
3. Implementation of spatial data with RDBMS
4. POSTGIS
   - ✓ Working with vector data
   - ✓ Working with raster data
   - ✓ Working with pgRouting
   - ✓ 3D data handling
   - ✓ PostGIS programming (Python and R)

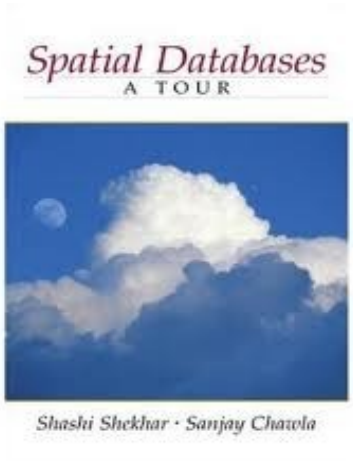
Assessment*

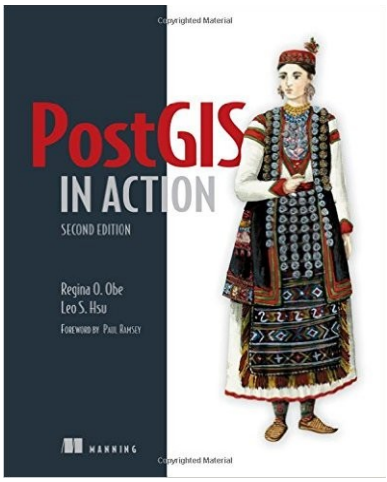
Quizzes	10%
Assignments	15%
OHTs/Midterm	15%
Project	30%
Final Exam	30%

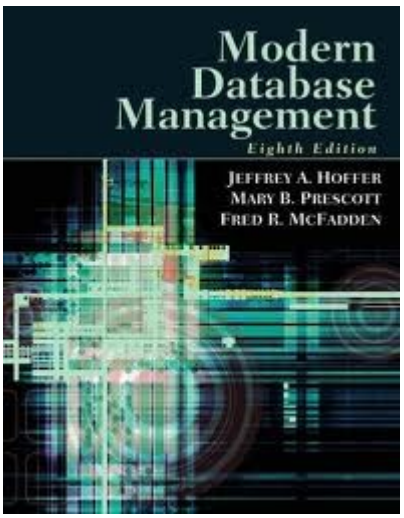
*tentative and may subject to change

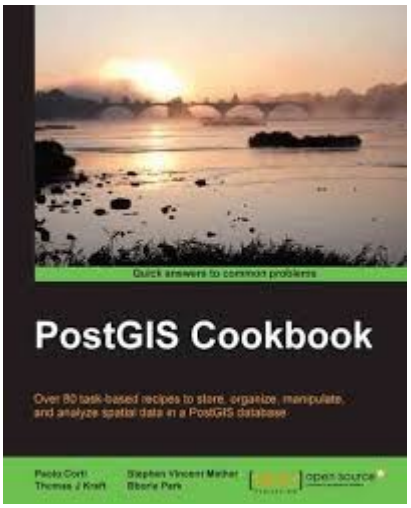
Books











Document Code		**Written By**	**Name**	**Dr. Rizwan Bulbul**
			Date	**Sep 23, 16**
Course Code	**RG-723**	**Reviewed By**	**Name**	
			Date	
Course Title	**Advanced Spatial Databases**	**Approved By**	**Name**	
			Date	