GGS 664 Spatial Data Structure – Spring 2018

Instructor	Dr. Manzhu Yu	**Classroom**	Exploratory Hall 2103
Office	Exploratory Hall 2208	**Class time**	Tuesdays: 4:30 pm - 7:10 pm
Office Hours	Tuesdays: 1:00 – 3:00 pm	**E-mail**	myu7@gmu.edu

Course Description:

This course explores spatial/spatiotemporal data models and structures used to effectively represent, store and index geospatial data. Emphasis is on core data models, structures and tools. Specific topics include database theory, spatial indexing, and geospatial data examples including shapefiles, social media, climate, land use, and big data. The class will be project-centered and will involve significant programming effort to complete the course project.

Prerequisite:

GGS 650 or a working knowledge of any programming language. This is a high level graduate course introducing research examples, therefore, first-year graduate students are not encouraged to take this course.

References:

There is no required text for this course. Students are encouraged to read at least ***five external sources*** (e.g. journal articles, news articles, blogs, etc.) to enhance the understanding of course contents.

Grading:

The components of the final grade are as follows:

Class Participation:	10%
4 Homework:	60% (15% each)
Individual Project:	30%

Class Participation

All students are expected to keep up with assigned readings, complete in-class exercises and participate in class discussion. You may be asked to demonstrate data models, structures and algorithms during class.

Homework Assignments

Four homework assignments will entail creation or handling of specific spatial/spatiotemporal data models, structures or related algorithms. Pseudocode may be used for the assignments. All assignments should be submitted before class on the due date, and each one is due two weeks after assignment. Late assignment credit will be reduced on a basis of 10% (1st day), 30% (2nd day), 50 % (3rd day), and no credit will be given with more than three days late.

You are encouraged to discuss assignments with other students, but all work must be your own. Violation of this rule will result in both students receiving zero credit.

You may use any programming language for your assignment and final project. No programming assistance will be given.

Project

Each student must complete an original research project that involves a spatial or spatiotemporal data structure or modeling technique. Past projects have addressed issues such as climate, spatial indexing and spatial search, social media, uncertainty and interoperability. You are encouraged to explore existing software libraries and their component object models for your final project. All use of such libraries must be properly documented.

Two types of projects are acceptable:

1) Research oriented: Ph.D. students are encouraged to propose a research project and document the project results in the format of a research article. The objective is to publish the article (either in conference proceedings or peer-reviewed articles) with the help of the instructor.
2) Technique oriented: M.S. students are encouraged to propose a technique-based project and document the manipulation of data structure, analysis, and visualization in the format of a project report. The objective is to utilize the understanding and exploration of spatial/spatiotemporal data structure, model, and algorithms to assist your work or thesis.

Computer Hardware and Software:

Please be sure to transfer all of your work to a portable medium such as a USB Flash Drive at the end of each class. To complete assignments and projects outside of class, you may work in the GIS Lab.

Course Schedule:

Week	Topic	Homework
Jan 23	Course introduction Spatial data structures: raster and vector	
Jan 30	Vector data models and structures	
Feb 6	Raster data models and structures	Homework 1
Feb 13	Indexing structures and performance I	
Feb 20	Indexing structures and performance II	Homework 2
Feb 27	Spatial database with Postgres/PostGIS I	
Mar 6	Spatial database with Postgres/PostGIS II Project introduction: topic discussion	Homework 3
Mar 13	**Spring Break**	
Mar 20	Research example I: Social media analysis	Homework 4
Mar 27	Research example II: Dust storm prediction and analysis	Project proposal due
Apr 3	Research example III: Climate change analysis	

Week	Topic	Homework
Apr 10	Research example IV: Land use land cover analysis	
Apr 17	Big Data: Management, Processing, and Visualization	
Apr 24	Project presentation I	
May 1	Project presentation II	Project report due

Feedback: Throughout the semester you will have plenty of opportunities to give feedback on the topics covered in the class and what you would like covered/changed.