# GGS 664 Spatial Data Structure

Instructor: Dr. Chaowei (Phil) Yang

Time: Mondays, 4:30-7:10 pm. Place: Exploratory Hall 2310

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**Course Description**
This course explores object models and % structures used to effectively represent, store and index geographic data. Emphasis is on core data structures and modeling concepts rather than domain-specific models. Specific topics include database theory, computational geometry, spatial indexing, semantics & ontology.

**Prerequisite**

GEOG 650 or a working knowledge of any programming language.

**References**

The following books will serve as references:
Worboys & Duckham 2004. *GIS: A Computing Perspective (2nd ed.)*. CRC Press. *(required)*
A Programming Language reference book of your choice

**Grading:**
The components of the final grade are as follows:
Class Participation:10%
Homeworks: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 structures and algorithms during class.

*Homework Assignments*
Four homeworks will entail creation or handling of specific data structures or related algorithms. A working software implementation is required for at least one of these assignments (student's choice). Pseudocode may be used for the remaining three assignments.

*Project*
Each student must complete an original research project that involves a complex geographic data structure or modeling technique. Past projects have addressed issues such as topology, spatial indexing and spatial search, semantics, uncertainty and interoperability.

All assignments should be submitted before class on the due date.

4 Homework (60%)
Project (25%) and Presentation (5%)
Class Activity and Participation (10%)

**Computer Hardware and Software**
Please take papers/notebook for class exercises

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*.You may also work on your own computer.

**Grading Policy**

1. Documentation
   You should document your solution to each assignment as if you were providing a product to software development company. This means providing:
   a) A description of the general purpose of the programming class structure that is developed
   b) A description of how to use the programming class structure
   c) Detailed documentation within your code or pseudo-code
   d) Evaluation of efficiency, robustness, or other characteristics as presented in the assignment instructions
2. Assignment Grading
   Each assignment will be graded on:
   a) Logical correctness of the code

b) Robustness in handling special cases
c) Clarity of documentation
d) Accurate evaluation of efficiency, robustness, or other characteristics as presented in the assignment instructions

3. Late Assignments

   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.

4. Working with Other Students

   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.

5. Programming Languages

   You may use any programming language you wish for your modeling assignment and final project. No programming assistant will be given.

6. Working with Existing Data Structures

   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.

**Schedule**

| Class | Topic | Readings |
|---|---|---|
| 1/26 | Introduction | Worboys & Duckham: Chapter 1 |
| 2/2 (hw#1 given) | Background & conceptual models | Chapter 1 & 2 |
| **2/9** | Conceptual models: DB | Chapter 2 |
| 2/16(hw#1 due) | Conceptual models: Spatial | Chapter 3 |
| 2/23 | Conceptual models: Spatial Models | Chapter 4 |
| 3/2(hw#2 given) | Data models: Representation & Algorithms I | Chapter 5 |
| **3/9** | **Spring Break** | **Review Chapter 1-5** |
| 3/16 (hw#3 given, hw#2 due) | Data models: Representation & Algorithms II | Chapter 5 |
| 3/23 | Data structures I | Chapter 6 |
| 3/30 (hw#3 due, hw#4 given) | Data structures II | Chapter 6 |
| 4/6 (project given) | Data structures III | Chapter 6 |
| 4/13(hw#4 due) | Distributed & Communication | Chapter 7, 8 |
| **4/20** | **AAG meeting** | **Review Chapters 5-8** |
| 4/27 | Uncertainty/Time | Chapter 9, 10 |
| 5/4 (project due) | Project presentation | |

**Contact Information**

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| **Instructor** | Chaowei (Phil) Yang |
| **Office** | Exploratory Hall 2211 |
| **Phone** | 703-993-4742 |
| **Email** | cyang3@gmu.edu |

**Time**
Mondays: 1:30-3:30pm

**Teaching Assistant**

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|---|---|
| **Teaching Assistant** | Jizhe Michael Xia |
| **Office** | Student Cubicle ( Floor, 255b,Research Hall 2nd floor) |
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| **Phone#** | 703-606-5755 |

**Time**
Tuesdays: 5-6pm; Fridays: 5-6pm

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