GTECH 38519
Geospatial Databases
HN 1090B-2, Fall 2022, Monday 5:30 - 8:20 PM

Instructor: Shipeng Sun   **Mailbox (Dept. Office)**: HN 1006
Office: 1043, Hunter North   **Office hours**: M , W 4-5pm
Email: shipeng.sun@hunter.cuny.edu

Course Description and Objectives

Geospatial data, including their acquisition, cleaning, formatting, management, maintenance, update, and dissemination, are at the core of most real-world GIS, serving as the foundation for further visualization and analysis. On average, eighty percent of the cost of a GIS project is on geospatial data. Learning to design, create, populate, optimize, and maintain geospatial databases, therefore, is critical and essential to GIS users and geospatial professionals. This course is intended for students who want to learn the knowledge and skills of creating, querying, and managing spatial databases. More specifically, students will learn general relational databases and SQL (Structured Query Language) first. Then, spatial databases, particularly the open-source Postgres/PostGIS, will be introduced along with ST-SQL that allows spatial queries and analyses. Related to these spatial database operations, students will also learn the methods of cleaning spatial data, checking their qualities, and loading them into a spatial database. The course has eight required task-oriented lab assignments, one mid-term exam, and one final course project. Students are encouraged to work with each other and/or graduate students in groups on the project.

Learning Outcomes

At the end of the semester, students should be able to
- describe the basic concepts of general and spatial databases
- compose SQL statements to interact with (object-)relational databases
- pre-process spatial data and import data into PostGIS to build spatial databases
- perform basic spatial query, data manipulation, data export, and spatial analysis using spatial-type SQL

Pre-requisite

GTECH 20100: Introduction to Geographic Information Science, preferably also GTECH 36100: GIS Analysis.

Course Materials

Recommended Books:
- Obe, Regina O., and Leo S. Hsu. ***PostGIS in Action*** (3rd ed.): Manning, 2021.
    Strongly recommended. Also check out the PostgreSQL book below by the authors.
- Obe, Regina O., and Leo S. Hsu. **PostgreSQL: Up and Running**: A Practical Guide to the Advanced Open Source Database. " O'Reilly Media, Inc.", 2017.
- Mikiewicz, D., M. Mackiewicz, and T. Nycz. 2017. *Mastering PostGIS*: Packt Publishing.
- Lembo, A.J. 2015. *How Do I Do That in PostGIS: Illustrating Classic GIS Tasks*: CreateSpace Independent Publishing Platform.

Course Calendar & Content

This is a hybrid class with about half being online and synchronous. Options to zoom in for in-person sessions are available upon request.

Week	Session	Date	Topic	Deliverables
1	1	8/29	Introduction: Relational, Object-Relational, and Spatial Databases (Chapter 1)	
2		9/5	*No Classes – Labor Day*	
3	2	9/12	SQL Primer with PostgreSQL: pgAdmin, Query, SQL SELECT, JOIN, GROUP BY (Appendix C)	
4	3	9/19	SQL with PostgreSQL: Update, Insert, Delete, Schema, Database, View, (Appendix C, B, D, Chapter 1)	Lab1 SQL Basics I
5	4	9/29	Spatial Databases and PostGIS: extensions, geometry, geography, geometry types and functions, reference systems (Chapter 1, 2, 3)	Lab2 SQL Basics II
6	5	10/3	Data Cleaning and Spatial Database Construction: import, export, load, clean, quality-check (Chapter 4)	Lab 3 PostGIS I
7		10/10	*No Classes – College Closed*	
8	6	10/17	Spatial Functions for geometry and geography data types (Ch. 6)	Lab 4 PostGIS II
9	7	10/24	Spatial SQL I: Basics (Chapter 9, 10)	Lab 5 PostGIS: Spatial Functions
10	8	10/31	Spatial SQL II: Spatial Query (Chapter 10, 11)	Lab 6 ST-SQL I
11	9	11/7	Spatial SQL III: Spatial Analysis (Chapter 11)	Lab 7 ST-SQL II
12	10	11/14	Desktop GIS and Spatial Databases: Connect to PostGIS from QGIS and ArcGIS (Chapter 5)	Lab 8 ST-SQL III
13	11	11/21	*Exam*	Course Project Planning
14	12	11/28	Database Management and Performance Tuning (Chapter 14, 15)	Course Project Proposal
15	13	12/5	Spatial Database for Raster (Chapter 12)	Lab 9 ST-SQL for Raster (Optional)
16	14	12/12	Synthesis and Project Development	
17	15	12/19	Project Presentations	Project Presentation

Software

- PostgreSQL and PostGIS (Free and Open Source)
- QGIS (Free and Open Source) or
- ArcGIS Pro 2.x or ArcGIS 10.6 and above (available in the Geography Lab and for all CUNY students)

Grading Method & Scale

Evaluation of academic performance is based on the following components and breakdowns.

Lab exercises	40%
Exam	30%
Participation	15%
Project Proposal	5%
Project Presentation	10%

Students must meet deadlines for assignments. In general, incomplete grades and time extensions are not an option for this course. There are no "extra-credit" assignments. Unless otherwise instructed, you will submit assignments in electronic forms through Blackboard.

Incomplete (IN) and Credit

The instructor cannot accommodate students who are late in their work or do not show up for the exam or presentation. And, unless you produce a medical certificate or letter from the Office of Accessibility, the instructor will not give the final grade of IN (incomplete). Undergraduate students can choose Credit/No Credit as a final grade.

Policies

Course Website

Web-enhancement in the context of this course means that everything pertaining to this course will be communicated through Blackboard. You are required to check the Blackboard course site on a daily basis. All changes to the syllabus will be announced on the course home page. All lecture and lab materials are accessible through Blackboard, and Blackboard is also the place where you upload your assignments. Your exams and lab assignments will be graded based on what you have uploaded to Blackboard and that is where you will find your grades and may access course statistics that help you to assess your standing at any given time.

Communication

All email messages about this course should be signed with your full name as it appears in CUNYfirst. Professionalism and "*netiquette*" are expected in the communication through emails (check out those links). If your emails are not replied to in a timely fashion, please consider rewriting your emails in a better way.

Hunter College Policy on Academic Integrity

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

ADA Policy

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, located in Room E1214B, to secure necessary academic accommodations. For further information and assistance, please call: (212) 772-4857 or (212) 650-3230.

Hunter College Policy on Sexual Misconduct

In compliance with the [CUNY Policy on Sexual Misconduct](), Hunter College reaffirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationships. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

a. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444).

b. All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or-212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice. Changes will be announced in class and on Blackboard, which students are expected to check regularly during the semester.