

# Geog 9015 – Database Design for GIS

**San Francisco State University, Spring 2024**

**Schedule:** Friday and Saturday, 8:30-5:30

**Credit:** 1.6 CEUs (Continuing Education Units)

**Instructor:** Seth Hiatt

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## Course Description

This course focuses on the planning, construction, and administration of a GIS database including spatial and attribute data. The lecture provides a conceptual background, as well as practical guidelines, and is reinforced with exercises using both ESRI software and traditional database design techniques. Topics include data requirements analysis, relational database design, attribute and entity diagramming, table normalization, table creation and population, database optimization, foundational knowledge of enterprise GIS systems, and basic SQL syntax. Class format: approximately 50% lecture, 50% software application.

**Grading:** This course is graded Credit/Non-Credit.

**Prerequisite:** Geog 9003 (Into to GIS) or equivalent

**Software:** ArcGIS Pro 3.x, PGAdmin4, PostgreSQL, and PostGIS

The course is designed around a series of five projects to illustrate themes discussed in lectures. Projects rely on the File Geodatabase primarily, but some exercises will require the use of PostgreSQL and PostGIS. A quiz is assigned at the end of each day to facilitate learning.

## Day 1

### **Lecture 1: An Overview of Databases in GIS**

Desktop database

Client-Server Database

Spatial DB vs GDB

**Project 1:** Creating a Basic Database for Wildlife Interactions

**Lecture 2: Relational Databases**

Database Keys

Relationships and Joins

Documenting and Diagramming

**Project 2:** A Database for Parks and Gardens

**Lecture 3: Design Process**

Stages of Design

Schema Design (normal forms)

Avoiding Common Design Flaws

SQL Language Basics

**Day 1 Quiz**

**Day 2**

**Project 3:** Designing and Building a Tree Management Database in ArcGIS and PostgreSQL

**Lecture 4: Database Optimization**

Indexes

Data Types

More on SQL

**Project 4:** A Database for Frog Surveys – Promoting data integrity using domains, aliases, and triggers.

**Lecture 5: More on the Geodatabase**

Topologies

Versioning

Replication

Archiving

**Project 5:** A Database for Water Quality Testing in Monterey, CA – Keystone project incorporating concepts in previous labs and lectures.

**Day 2 Quiz**