Syllabus - GEOG 9022 *Data Acquisition for Geographic Information Systems*

This course explores various methods of capturing data for use in GIS, including digitizing from maps, digital photos, and satellite imagery; locating and reformatting existing digital data, Global Positioning Systems (GPS), scanning, image classification and address matching. Topics will include methods of attributing and concepts of data conversion, georeferencing, projections, and coordinate systems. Class format is approximately 50% lecture and 50% lab exercise.

Instructor: **Jerry Davis** jerry@sfsu.edu

Exercises and other course materials developed **Andy Richardson**

Course Objectives: Provide an overview of data acquisition methods for GIS:

- Data capture techniques and methods
- Data editing
- Attributing
- Georeferencing
- Joining maps
- Data conversion

We will use Esri's ArcGIS Pro (Version 2.8) but will focus on GIS concepts.

Grading: This course is graded Credit/Non-Credit. To receive a Credit grade, students must demonstrate completion of each section by answering the review questions that follow each lab, and turn in results for those labs with that requirement.

Disclosures of Sexual Violence (Title IX): SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Dean of Students. To disclose any such violence confidentially, contact:

- The SAFE Place – (415) 338-2208; psyservs.sfsu.edu/content/safe-place
- Counseling and Psychological Services Center – (415) 338-2208; psyservs@sfsu.edu

Disability Access: Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) is available to facilitate the reasonable accommodations process. The DPRC is located in the Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by email dprc@sfsu.edu.

Data Acquisition for GIS
Course Outline

1) Introduction
- Course Overview
- What is Data Acquisition?
- Review of Raster and Vector Data Models
- Lab Exercises

2) Data Capture Methods
- Raster Data Capture
  - Scanning
  - Satellite Image Classification
  - Conversion from Vector
- Vector Data Capture
  - Global Positioning Systems (GPS)
  - Tables with XY Coordinates
  - Address Matching (Geocoding)
  - Conversion from Raster
    - Batch Conversion
    - Scanning and Trace
  - Vector Digitizing

Lab – Vector Digitizing
- Panning and Zooming
- Vegetation
  - Georeference Scanned Map
  - Digitize
- Digitize Streams
- Import UFOs

3) Editing Spatial Data
- Need for Editing
- Error Reduction Techniques
- Topology
- Drawing Environment
- Editing Process
- Selecting Features
- Snapping Environment
- Editing Polygons
- Editing Lines
- Editing Points
- Templating

Lab – Editing
- Editing Tools & Environments
- Editing Vegetation
  - Polygon Editing Methods
- Editing Streams
  - Line Editing Methods
- Extra Credit
  - Editing with Topology

Data Acquisition for GIS
Course Outline (cont.)

4) Attributes
- Need for Attributing
- Standard Fields
- User Fields
- Field Types
- File Formats
- Relational Data Structures
- Table Access / Editing Tools
- Attributing Methods
  - Select and Code
  - Use Digitizing Code
  - Join External Data Files
- Validation

Lab – Attributing
- Attribute Vegetation
  - Select and Code Polygons
- Attribute Streams
  - Select and Code Records in Table
- Attribute UFOs
  - Enter and Join Data from Spreadsheet
- Extra Credit
  - Attribute Using Domains

5) Georeferencing
- Definition and Need for Georeferencing
- Discussion of Ellipsoids & Datums
  - Common Datums
- Discussion of Projections
  - Families of Projections
  - Types of Error & Mitigation
- Discussion of Coordinate Systems
  - Common Coordinate Systems
  - Choosing a Coordinate System
- Discussion of Georeferencing
  - Finding Control Points
- Changing Projections

Lab – Georeferencing
- Vegetation
  - Convert Degrees, Minutes, Seconds to UTM
  - Georeference Scanned Woodside Quad
  - Georeference Scanned Vegetation Map
- Project UFOs from Decimal Degrees to UTM

Data Acquisition for GIS
Course Outline (cont.)

6) Joining Maps	**Lab – Joining Maps**
• Need for Joining Maps • Map Joining Process • Edgematching Process • Dissolve • Cleanup	• Set up Environment • Streams o Edgematch & Append • Vegetation o Snap & Append o Dissolve Boundary
7) Data Conversion	**Lab – Data Conversion**
• Existing Digital Data • File Formats • Conversion Software & Options • Metadata	• Research National Hydrography Dataset o Download NHD • View in ArcGIS Pro o View Metadata • Compare to Streams • Clip to Woodside Quad? • Reproject to UTM