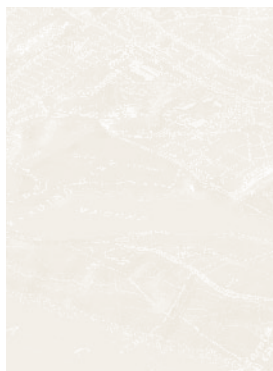


2009/2010

# GEOGRAPHIC INFORMATION SYSTEMS

at San Francisco State University



Jerry Davis, Director  
Seth Hiatt, Associate Director  
(415) 338-3566, email [igisc@sfsu.edu](mailto:igisc@sfsu.edu), [www.cel.sfsu.edu/gis/](http://www.cel.sfsu.edu/gis/)

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GIS is a key emerging and evolving industry, and GIS analysis is one of the hottest career opportunities today.

GIS CAREERS exist in every imaginable discipline, with many applications in resource and environmental management, commercial business and marketing, urban and regional planning, defense, map production, research, and beyond.

GIS TECHNICIANS AND ANALYSTS are in demand across the nation, and for that matter, the world, as the use of GIS in government agencies, private businesses, and nonprofit organizations grows dramatically.

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# GEOGRAPHIC INFORMATION SYSTEMS GIS

## PROFESSIONAL DEVELOPMENT CERTIFICATE

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**Jerry Davis, Director,**

**Seth Hiatt, Associate Director**

**(415) 338-3566, email [igisc@sfsu.edu](mailto:igisc@sfsu.edu), [www.cel.sfsu.edu/gis/](http://www.cel.sfsu.edu/gis/)**

### INSIGHTS

*“Across the country, tens of thousands of trained [geospatial] workers are needed to fill positions that are going begging.”*

*—Emily Stover DeRocco, Assistant Secretary, Employment and Training Administration, U.S. Department of Labor*

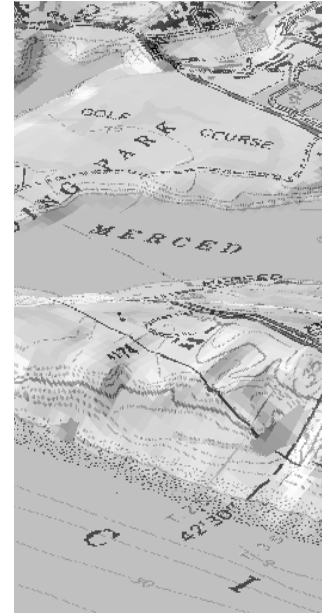
### WHAT IS GIS?

**Have you ever used an atlas to find information on a country?** Read maps printed in newspapers and magazines? Used the internet to find driving directions or the navigation system in a car?

Then you have interacted with geospatial technology, in particular a geographic information system (GIS). A GIS is most often associated with maps, however, this is only one way you can work with geographic data in a GIS. A GIS is a comprehensive database tied to features on the earth's surface, with an integrated set of tools for querying, analyzing, and displaying geographic information. It is an “Information System for Geography”, a “window into the database” to support queries, analysis, and editing of the information about the surface of the earth. It is a mapping application (and beyond) that can change an organization fundamentally and positively.

GISs are rapidly gaining recognition as the primary means of dealing with information stored on maps. GIS careers exist in every imaginable discipline, with many applications in resource and environmental management, commercial business and marketing, urban and regional planning, defense, map production, research, and beyond.

GIS is a key emerging and evolving industry, according to a U.S. Department of Labor 2003 report, and GIS analysis is one of the hottest career opportunities today. Skilled GIS technicians and analysts are in demand across the nation, and for that matter, the world, as the use of GIS in government agencies, private businesses, and nonprofit organizations grows dramatically. In recent years, forward-looking leaders are recognizing the benefit of spatial analysis for a variety of uses and, as a result, are incorporating GIS as a key element in their information systems or technology. At over \$30 billion the demand for skilled GIS professionals is growing substantially and opportunities in GIS are being integrated across a broad range of fields. Such diversity gives you the ability to combine your passions or interests with GIS for a satisfying and successful career.



### THE PROGRAM

SF State Extended Learning offers a professional development certificate program in geographic information systems and geospatial technology, providing instruction in practical geospatial techniques, technology, and analysis. Courses are conducted as intense short courses that in conjunction with other courses offer a well-articulated training option. Classes are developed and taught by geospatial experts, all of whom have practical experience in the field. The program is accredited through San Francisco State University by the Western Association of Schools and Colleges, the official regional accrediting body for academic institutions in the western part of the country.

Education is a key component of the GIS professional certification programs that have been evolving from the GIS Certification Institute and Urban and Regional Information Systems Association (URISA). Both of these professional certifications allow application of credits with an accredited institution to satisfy a significant portion of the points needed to meet certification requirements.

## PROGRAM MISSION

The local and national job markets for GIS professionals are very strong and are expected to grow substantially in the foreseeable future. GIS professionals work in a variety of settings, including the private sector (for example, logistics and market analysis), public sector at the local, state, and national levels, and in GIS software firms. The certificate program at San Francisco State University has been successful in placing students in numerous employment areas that need skilled GIS professionals. Employers are seeking individuals with the skills and knowledge required to solve the increasingly complex problems faced by today's businesses and government agencies. In recognition of this growing trend in use of GIS, SF State Extended Learning's certificate of completion in GIS offers students applications-oriented training in the use of this rapidly maturing technology. The courses are designed to provide students with skills and a conceptual base from which they will be able to develop and manage large or small GIS projects.

## PROGRAM OBJECTIVES

San Francisco State University's GIS Certificate Program provides students with broad exposure to principles and applications of GIS. The programs overall structure is designed to teach students who only have a basic knowledge of the field from the ground up. Certificate requirements are intended to parallel skills needed by GIS professionals. A student who has earned the GIS Certificate will be well-versed in GIS theory and will have knowledge and practical exposure to the following:

1. principles of geospatial technologies including GIS, global positioning systems (GPS), remote sensing (satellite and aerial photography), and other related spatial technology
2. hardware and software used in GIS (with hands-on experience),
3. planning and construction of spatial databases,
4. fundamentals of GIS including spatial modeling, analyses, and visualization,
5. managing large and small-scale GIS programs, and
6. cartographic representation of data, i.e. the art and science of map-making.

## INTENDED AUDIENCE

The program is designed for professionals, students and the general public in environmental resource management, urban and regional planning, local government, facilities management, and other fields who need to become skillful and knowledgeable users of geographic information systems. This program will most benefit entry-level and intermediate-level GIS users who lack formal education in geography or GIS.

## ADMISSION REQUIREMENTS

Because the program is for a professional development certificate, there is no formal application process. There are no prerequisites, though familiarity with maps or geographic concepts is recommended.

You can register for and attend individual classes or multiple classes anytime during the semester. Participants may complete the program requirements and receive a certificate of completion or attend just those classes that are of particular interest.

## TRANSFER OF CREDITS

Students that have attended GIS courses at other institutions may transfer in one course provided the content of the course is equivalent following review. This will reduce the total CEUs required for the certificate to 16.0. Coursework beyond the first transferred can be used to waive certain core course requirements and be replaced with additional elective courses. However, this does not reduce the total CEUs required for the certificate any further.

## LENGTH OF PROGRAM

The time it takes for current students, professionals, and the general public interested in GIS to complete a certificate of completion varies according to each student's availability and interests. The 17.6 units required to earn a certificate may be completed in as short a time as 4 months – one semester – or students may choose to take as long as several years. On average the time it takes a candidate to complete certification is 6 - 9 months.

## LOCATION AND FREQUENCY OF CLASSES

Classes are offered in conjunction with the Department of Geography and the Institute for Geographic Information Science on the main San Francisco State University campus. Course sequences begin three times per year in late August, late January, and late May or early June. Classes are designed as intense two-day trainings scheduled for eight hours (8:30 am - 5:30 pm) per day on Friday and Saturday.

The Department of Geography has a state-of-the-art computing facility to facilitate GIS instruction and research. Each student will have access to a Windows XP computer with the latest versions of ESRI ArcGIS, Arcview, and Leica ERDAS Imagine for class/labs.

## CONTRACT TRAINING

The Institute for Geographic Information Science can provide specialized training for businesses and agencies seeking to train a number of employees in GIS applications. Training can be tailored to meet clients' needs. For more information, please call (415) 338-3566 or visit <http://gis.sfsu.edu>.

## CURRICULUM

The GIS Certificate is a Professional Development Certificate, not an academic degree, and as such, courses carry CEUs, nationally recognized units of measurement for professional development and training. CEUs may be used when employers, agencies, and other authorities require a specified number of hours of study and where non-academic credit is acceptable. One CEU equals 10 hours of instruction. Our curriculum has been developed by both academics and professionals providing students with a unique training experience in both GIS practice and theory.

Participants may complete the program requirements and receive a certificate of completion, or attend just those classes that are of particular interest. Candidates for certificate designation must pass each of the five core courses (8.0 CEUs), plus earn an additional 9.6 CEUs from the list of elective courses (for a total of 17.6 CEUs). Once a candidate has completed the necessary coursework an application for the certificate of completion must be submitted.

## REQUIRED CORE COURSES

All required core courses are offered twice a year (spring and fall semester) and some are offered more frequently.

### Required Core Courses

	Fall	Spring	Summer
Introduction to GIS	•	•	•
Managing a GIS Project	•	•	
Cartographic Design for GIS	•	•	
Database Management for GIS	•	•	
Data Acquisition for GIS	•	•	•

## ELECTIVE COURSES

Students may choose any elective to complete the 176-unit program. Elective courses offer in-depth instruction in a variety of geospatial applications and advanced skills in geospatial techniques and technology. The range of elective options allows students to gain broad exposure to different areas of geographic information systems or to concentrate their studies to a particular area of interest.

All electives are offered on a rotating basis. Some electives are offered once a year and some are offered more frequently.

### Elective Courses

	Fall	Spring	Summer
Raster GIS and Analysis	•		
Using GPS for GIS		•	
Remote Sensing in GIS, Part I	•		
Remote Sensing in GIS, Part II	•		
Spatial Analysis and Modeling		•	
Scientific Visualization in GIS		•	
Introduction to Programming ArcGIS	•		
GIS & Remote Sensing for Coastal/Marine Science			•
Watershed GIS		•	
Fundamentals of ArcIMS	•	•	
GIS in Crime Analysis	•		
Spatial Analysis of Public Health Data		•	
Processing GIS Data with Visual Tools			•
Building a Geodatabase	•	•	
Further Exploration of ArcGIS	•	•	
Introduction to R	•		

For the current schedule please refer to the SF State Extended Learning website, [www.cel.sfsu.edu/gis/](http://www.cel.sfsu.edu/gis/) or the SF State GIS Department website, <http://gis.sfsu.edu/cert>

## Textbooks and Materials

All materials for classes are provided by the program and included in the cost. To assist in the hands-on learning process, free one-year (time out) student license of ESRI ArcGIS (Arcview level) GIS and Spatial, Geostatistical, and 3D Analysts (\$9000 retail value) are available to students completing the certificate program. Additionally, students completing the program are provided free access to certain ESRI Virtual Campus courses, online training options for learning ESRI software and GIS concepts, to supplement their training experience through the SF State GIS certificate program.

## Financial Aid

SF State Extended Learning receives no state money to support its programs; therefore, financial aid is extremely limited and restricted to academic degree programs. The GIS certificate is not an academic certificate program therefore financial aid generally cannot be granted for its tuition fees. However, past students have been able to come across money in a variety of places (e.g. TERI loans).

## Register for Courses Early

Class size is limited due to the need for all students to have access to computer terminals. Registration for individual courses is on a first-come, first-served basis. To guarantee a space in a class, early registration is advised. For further information visit [www.cel.sfsu.edu/register](http://www.cel.sfsu.edu/register).

## REQUIRED COURSES

### GEOG 9003 INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS (GIS) (1.6 CEU)

*Prerequisite: familiarity with the Windows operating system and database programs highly recommended.* This course is an introduction to the concepts and uses of GIS. Lecture topics include history of GIS, GIS data structures and sources of data, GIS tools, vendors and software, applications, and resources. Exercises include spatial data display and query, map generation, and simple spatial analysis using ArcGIS software. Class format is approximately 50% lecture and 50% lab exercise.

**Instructor: Andy Richardson**

### GEOG 9004 MANAGING A GEOGRAPHIC INFORMATION SYSTEM PROJECT (1.6 CEU)

*Prerequisite: familiarity with basic GIS concepts is highly recommended.* Designed for managers who may be new to supervising GIS projects. Topics covered include defining the scope of a project; data acquisition; project planning; project budget estimation; staffing; pilot studies; cooperative projects. Case studies.

**Instructor: Jeff Milliken**

### GEOG 9009 CARTOGRAPHIC DESIGN FOR GIS (1.6 CEU)

*Prerequisite: Introduction to Geographic Information Systems.* This course is a discussion and demonstration of the essential cartographic principles and practices used for designing maps. The focus is on techniques for creating maps that effectively communicate single/multi-variant qualitative and quantitative spatial data to the viewer. Through numerous hands-on exercises, participants will have the opportunity to use most of the map production tools provided with ESRI software products to prepare raw data and produce a variety of thematic maps. Class format: approximately 50% lecture, 50% software application.

**Instructor: Thomas Lupo**

### GEOG 9015 DATABASE DESIGN & MANAGEMENT FOR GIS (1.6 CEU)

*Prerequisite: Introduction to Geographic Information Systems.* 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 definitions; table normalization; table creation and population; query optimization; and data integration. Class format: approximately 50% lecture, 50% software application.

**Instructor: Bob Earle**

### GEOG 9022 DATA ACQUISITION FOR GIS (1.6 CEU)

*Prerequisite: Introduction to 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: approximately 50% lecture, 50% software applications.

**Instructor: Andy Richardson**

## ELECTIVE COURSES

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### GEOG 9008 RASTER GIS & ANALYSIS (1.6 CEU)

*Prerequisite: Introduction to Geographic Information Systems or familiarity with ArcGIS.* Topics in this course include the use of raster GIS tools for natural resource modeling and environmental analysis; the raster structure and its advantages and limitations, appropriate data and procedures; simple raster surface modeling and image integration; map algebra concepts using ArcGIS Spatial Analyst; proximity and dispersion modeling, and cost surfaces.

**Instructor: Jerry Davis**

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### GEOG 9010 USING GPS FOR GIS (4.6 CEU)

*Prerequisite: familiarity with ArcGIS.* Methods for incorporating GPS field research data into a GIS project, and field data collection with GPS data loggers will be explored. Data preprocessing and conversion methods for use with ArcGIS will be discussed. Applications in natural and cultural resource inventories, transportation analyses, ecological studies, or atmospheric and hydrologic process studies.

**Instructor: Jerry Davis**

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### GEOG 9011 REMOTE SENSING IN GIS, PART I (1.6 CEU)

This course provides basic concepts and procedures used in remote-sensed image processing. Emphasis is placed on use of digital satellite image data. The course is designed for beginning level users and consists of lecture, discussion, and examples. Topics include: basic fundamentals and methodologies, satellite image data sources and specifications, appropriate uses and limitations, integration with GIS, and available software.

**Instructor: Jeff Milliken**

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### GEOG 9019 REMOTE SENSING IN GIS, PART II (1.6 CEU)

*Prerequisite: Remote Sensing in GIS, Part I or equivalent.* This course expands on the concepts and techniques presented in the preceding course. The format is 20% lecture and discussion and 80% lab. Students will be introduced to ERDAS Imagine software. Topics include: image loading, georeferencing, display, and basic image classification procedures.

**Instructor: Jeff Milliken**

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### GEOG 9013 SPATIAL ANALYSIS & MODELING (1.6 CEU)

*Prerequisite: Introduction to Geographic Information Systems or equivalent.* This course will focus on many of the vector-based analytical tools and techniques available within ArcGIS, as well as ways of linking external analytical tools (models, statistical programs) to ArcGIS. Case studies will be used to illustrate more complex examples. Class format: approximately two-third lecture, one-third software application.

**Instructor: Andy Richardson**

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### GEOG 9020 SCIENTIFIC VISUALIZATION IN GIS (1.6 CEU)

*Prerequisite: Raster GIS & Analysis, familiarity with basic GIS concepts and ArcGIS highly recommended.* An introduction to the use of GIS in the visualization of map and image-based scientific data sets, and subsequent interpretation. Topics covered include terrain analysis, viewshed analysis, spatial statistical analysis of point sample data, and surface generation from points and contour data sets. ArcGIS 3D Analyst will be used to explore the possibilities of three-dimensional data visualization.

**Instructor: Jerry Davis**

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### GEOG 9021 INTRODUCTION TO PROGRAMMING ArcGIS (1.6 CEU)

*Prerequisite: Introduction to Geographic Information Systems or familiarity with ArcGIS.* Introduction to programming ArcGIS using the Geoprocessing Environment. Students will learn to create geoprocessing tools that can be combined with other tools, in models and the toolbox, to process complex analysis tasks and automate repetitive data maintenance needs. Scripting with Python is emphasized as the appropriate technology for getting GIS work done by users, and is compatible with ArcGIS modules and all current geospatial data structures: rasters, shapefiles, coverages, and geodatabases. Students need no prior programming experience.

**Instructor: Jerry Davis**

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### GEOG 9023 GIS AND REMOTE SENSING APPLICATIONS FOR COASTAL AND MARINE SCIENTISTS (4 CEU)

*Prerequisite: familiarity with Windows 2000 operating systems highly recommended.* Over the course of the last decade, marine and coastal applications of GIS and remote sensing have gained wide acceptance in the scientific and GIS communities. In recognition of this growing interest, the GIS certificate program at San Francisco State University is offering a course dedicated to those interested in incorporating GIS/remote sensing technologies in the study of the marine and coastal zones. Previous offerings of this class have been very successful for both student and instructor alike and we are proud to offer it to the community.

#### Days 1 & 2: Introduction to Geographic Information Systems (GIS)

This course is an introduction to the concepts and uses of GIS as it relates to coastal and marine science. Lecture topics include GIS data structures and sources of data, applications, GIS tools and spatial analysis with special consideration to the marine environment. Exercises include spatial data acquisition, display and query, modeling, and basic spatial and surface analysis using ArcGIS software.

#### Days 3 & 4: Remote Sensing

This course is an introduction to the physical principles of electromagnetic radiation through earth's atmosphere and remote sensing sensors relevant for coastal and marine studies. The course is designed for beginning level users.

#### Day 5: Hands on!

Bring your own field data, or we can supply you with material to work with. For further information, please contact Ellen Hines at ehines@sfsu.edu or (415) 405-0921.

**Instructors: Ellen Hines and Toby Garfield**

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### GEOG 9024 WATERSHED GIS (1.6 CEU)

*Prerequisite: Raster GIS & Analysis or familiarity with ArcGIS.* This course explores GIS methods used to study and manage watershed, with a focus on their hydrologic and geomorphic systems—from upland source areas to the stream channels that transport their runoff and provide habitat for riparian species. The course begins with a brief exploration of the nature and processes of watersheds and drainage systems. GIS support for watersheds includes not only spatial analysis and map development, but also field map generation and the creation of graphical products (e.g. longitudinal profiles) from field studies. GIS tools will be applied to problems of hillslope runoff and soil erosion prediction, interpretation of historical and current runoff-discharge relationships, and modeling the effects of changing land use.

**Instructor: Jerry Davis**

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**GEOG 9025**  
**FUNDAMENTALS OF ARCIIMS (1.6 CEU)**

*Prerequisite: Introduction to Geographic Information Systems is recommended but not required.* This two-day course provides a conceptual overview and hands-on experiences in Internet mapping and Web-based geospatial information processing with state-of-the-art commercial software. Participants will be provided with an overview of the basic features and components of ArcIMS (ESRI, Inc. web-mapping software) and teaches the skills needed to create a basic ArcIMS website from start to finish. Participants learn the components of ArcIMS as they create map content that can be served on the Internet and fine-tune ArcIMS website performance. This course is designed for GIS professionals, Web administrators, systems administrators, or anyone else who is interested in learning ArcIMS technology in order to publish interactive maps on the Internet. Class Format: approximately 50% lecture, 50% software applications.

**Instructor: Barry Nickel**

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**GEOG 9026**  
**GIS IN CRIME ANALYSIS (1.6 CEU)**

*Prerequisite: Introduction to Geographic Information Systems is recommended but not required.* This course explores the practical issues surrounding spatial aspects of crime. Day one provides a basic introduction to GIS software, spatial data used for crime mapping, entering and manipulating data, and basic fundamentals of map-making. Day two introduces basic analysis techniques, including proximity analysis, spatial distribution analysis, distance analysis, and more advanced topics such as hot spot analysis, density mapping, and spatial dispersion mapping. Class Format: approximately 50% lecture, 50% software applications.

**Instructor: Xiao Hang Liu**

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**GEOG 9027**  
**SPATIAL ANALYSIS OF PUBLIC HEALTH DATA (1.6 CEU)**

*Prerequisite: Introduction to Geographic Information Systems is recommended but not required.* This course introduces the use of geographic information systems in the analysis of public health data. Day one introduces basic GIS operations such as buffering, layering, spatial queries, introductory cartography and spatial statistics. Day two progresses to public health applications including site selection, assessment of spatial pattern of disease locations and disease rates, spatial interpolation of exposures, and environmental justice assessments. In addition, recent computational advances for applying these methods will also be reviewed. Class Format: approximately 50% lecture, 50% software applications.

**Instructor: Xiao Hang Liu**

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**GEOG 9029**  
**PROCESSING GIS DATA WITH VISUAL TOOLS (1.6 CEU)**

*Prerequisite: Introduction to Geographic Information Systems.* This course explores the visual tools and methods used for processing data in GIS. The course introduces students to the geoprocessing concept, and its framework (tools, scripts and models), and will focus on model use not just for advanced analysis but also for common repetitive procedures common in GIS manipulation. Topics will include the Geoprocessing framework, the analytical method, Tools, Toolboxes, Scripts, Models using the ArcGIS ModelBuilder, and process documentation. Class Format: Approximately 50% lecture, 50% software applications.

**Instructor: Michael Byrne**

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**GEOG 9030**  
**BUILDING A GEODATABASE (1.6 CEU)**

*Prerequisite: Introduction to Geographic Information Systems is recommended and familiarity with ArcGIS Desktop.* The geodatabase is the newest spatial data model created by Environmental Systems Research Institute, Inc. for use in the ArcGIS desktop application suite. The model vastly improves the accuracy and integrity of spatial data through key advantages that allow you to assign behaviors to individual features, define relationships between classes of features, apply high-level topological models, and network editing. This course serves as an introduction to personal geodatabase concepts and illustrates how to implement geographic database designs.

Topics include:

- Building a new geodatabase, feature data set, feature class, and table
- Populating a geodatabase with GIS data
- Adding behavior to your features by creating subtypes and validation rules
- Migrating existing GIS data into a geodatabase
- Setting up relationships between objects
- Applying topology rules to improve data accuracy
- Using network analysis for path searching, flow tracing etc.

Class Format: Approximately 50% lecture, 50% software applications.

**Instructor: Xiao Hang Liu**

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**GEOG 9099**  
**FURTHER EXPLORATION OF ARCGIS (1.6 CEU)**

*Prerequisite: Introduction to Geographic Information Systems or consent of instructor.* This course explores further application of ArcGIS by guiding the students through a hands-on, real-world GIS project. It focuses on designing a project, acquiring and transforming data, creating metadata, choosing the appropriate analysis and then presenting the results. The course is designed for professionals with GIS experience and for students with prior GIS training. The format is 20% lecture and 80% software application.

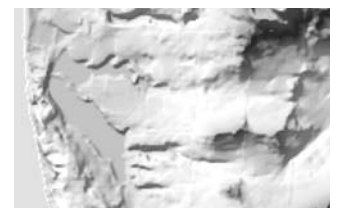
**Instructor: Ellen Hines**

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**GEOG 9031**  
**INTRODUCTION TO R (1.6 CEU)**

*Prerequisite: GEOG 9013 Spatial Analysis and Modeling.* This course serves as a basic introduction to R, a freely available statistical program widely used in professional, scientific, and academic communities. Course topics will include fundamentals of the R command-line interface, data management and manipulation, data visualization and graphics, basic spatial statistics, and modeling. Statistical tools available in ArcGIS will also be reviewed, and ArcGIS will be used to generate R input data and to process R output. It is recommended that students have had at least one statistics course and some experience with ArcGIS.

**Instructor: Seth Hiatt**



# GIS FACULTY

**Michael Byrne**, M.A., Geography (UC Davis), currently works for the California Office of Statewide Health Planning and Development. Michael is a Research Geographer/GIS Architect focused on developing external collaborations using GIS in healthcare and health planning. He has 15 years of GIS experience in a wide variety of state government and academia. Michael is the Chair of the California GIS Council and on the Board of Directors for the California Geographic Information Association and GreenInfo Networks.

**Jerry Davis**, Ph.D., Professor of Geography, SF State, is director of the California State University GIS Specialty Center. He specializes in geomorphology, soils, field methods, and geographic information systems. Jerry developed the GIS curriculum at SF State and his current research interests focus on karst geomorphic processes and the use of computers and GIS for field data collection and processing. To appreciate Jerry's involvement in watershed research and restoration please visit his website at <http://bss.sfsu.edu/jdavis/wpaf/cv.pdf>.

**Bob Earle**, M.A., Geography (SF State, 1973), has managed, designed and implemented geographic and information systems for over 25 years. He has worked for the California Coastal Commission, Chevron USA, Stanford University and several other private and public planning, transportation and engineering organizations. He presently is the GIS Database Administrator for Sacramento County. He also has been a member of the American River College adjunct faculty (GIS Certificate program) for five years, coordinates the Sacramento Area ESRI developers Group (SUDS), and is a private GIS consultant.

**Ellen Hines**, Ph.D., Assistant Professor of Geography, teaches GIS at San Francisco State University. Her research on marine mammals includes studies on dugongs in southern Thailand, gray whales in British Columbia, and harbor seals in San Francisco Bay. Her research interests include the integrated use of GIS and remote sensing in delineation of marine mammal habitat. She has twice organized workshops on GIS and remote sensing for marine mammal scientists at Society for Marine Mammalogy Biennial conferences.

**Xiao Hang Liu**, Assistant Professor, Ph.D. in Geography, M.S. in Computer Science. Dr. Liu's teaching and research interests are primarily in geographic information techniques (GIS, Remote Sensing, and Spatial Statistics) and its application in socioeconomic issues such as urban land use/land cover change, population distribution, and environmental modeling. Her ongoing research include the linkage between built environment and public health, environmental justice, and using internet GIS to promote public participation in neighborhood revitalization.

**Tom Lupo**, M.A., Geography (SF State) has over 20 years of professional experience organizations. Most of his career has been spent with the California Department of Fish and Game, where he is now Chief of the Biogeographic Data Branch [www.dfg.ca.gov/dbd](http://www.dfg.ca.gov/dbd) in Sacramento. In addition to being an instructor at SF State GIS certificate program since 1995, he is also an adjunct faculty member in Geography at American River College in Sacramento.

**Jeff Milliken**, M.A., Geography (SF State), and B.S., Geology (Colorado State University), has worked in the private and public sectors as a geologist and remote sensing/GIS specialist for 25 years. He is currently a Remote Sensing and GIS Specialist with the Bureau of Reclamation doing work for both the Lower Colorado and Mid Pacific Regional Offices. His current work primarily focuses on using and developing Remote Sensing and GIS applications for mapping and monitoring land cover types in support of water resource-related projects.

**Barry Nickel**, M.A., Biology (SF State), currently serves as Associate Director of the Institute for Geographic Information Science (IGISc), the geospatial research center of San Francisco State University. With over 10 years experience in geospatial technologies (geographic information systems, remote sensing, global positioning systems, telemetry, internet mapping applications), Barry has successfully integrated this technology with research and analysis on a selection of projects concerning ecological and urban developments. His primary research interests are concerned with the assessment of scale-dependency in the spatial and foraging ecology of large vertebrates through the development of spatially explicit models.

**Andy Richardson**, M.A., Geography (SF State, 1994), started working in the GIS field at a small East Bay company in 1987. Since then he has managed the Multidisciplinary GIS Center at San Francisco State University, worked as a GIS Analyst for the California Department of Forestry and Fire Protection, served as the GIS Specialist at the Teale Data Center's GIS Technology Center, and is now the GIS Manager of Caltrans' Central Coast district. His thesis investigated the incidence and dispersion of fires in the San Francisco Water Department Crystal Springs Watershed.

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*Cover images represent the area around San Francisco State University with data files from the USGS Bay Area Regional Database (BARD) at <http://bard.wr.usgs.gov/>*

*Images were manipulated using the ArcGIS8 software suite.*

