

# GEOGRAPHY & ENVIRONMENT

## College of Science and Engineering

Dean: Dr. Carmen Domingo

## Department of Geography & Environment

HSS 279

(415) 338-2049

Website: [geog.sfsu.edu](http://geog.sfsu.edu) (<http://geog.sfsu.edu/>)

Chair: Andrew Oliphant

B.A. Geography Advisors: Blecha, Donovan, Guo, Liu

B.S. Environmental Science Advisors: Blesius, Davis, Nanus

Graduate Coordinator: Wilkinson

M.A. Graduate Advisors: Donovan, Wilkinson

M.S. Graduate Advisors: Blesius, Davis, Hines, Liu

## Program Scope

In the Bachelor of Arts in Geography (<http://geog.sfsu.edu/ba/>) program, students investigate physical and biological environments, human societies, and human-environmental interaction. Geographers seek to analyze the processes, spatial patterns and consequences of human-environment interaction, and address issues of sustainability. The major core courses introduce foundation concepts in physical and human geography, as well as geographic techniques such as GIS, cartography, and remote sensing. An upper-division distribution requirement gives students exposure to the breadth of the discipline. Each student then develops a focus of interest based upon upper-division course work related to a coherent theme in Physical Geography, Human Geography, Environmental Studies, Natural Resource Management, Geographic Information Science, or the Urban Environment, Transportation and Land Use Planning.

The Bachelor of Science in Environmental Science (<http://geog.sfsu.edu/environmental-science/>) prepares students for a career as an environmental scientist or environmental manager in industry, government, or NGOs. The curriculum comprises a core providing a foundation of science and methods courses – introductory earth systems and environmental science, biology, chemistry, physics and mathematics – as well as distributed electives in environmental science, environmental management and analytical methods, culminating in a capstone seminar shared with Geography students where students pursue a senior thesis or internship. A unique strength of this program compared to many environmental science programs is in geospatial analytical methods at the introductory and advanced levels.

The internship program supplements the scheduled classes and offers a wide range of opportunities for placement in the public or private sector. Internships entail first-hand application of skills and knowledge gained in the coursework.

Our highly regarded graduate programs (<http://geog.sfsu.edu/content/graduate-programs/>) have produced alumni at many state and federal agencies, NGO's, private firms, colleges, and universities. Recent research topics can be reviewed at our M.A./M.S. Theses and Research Projects (<http://geog.sfsu.edu/theses/>) page, which also includes examples of completed theses. Graduate and undergraduate students benefit from an engaged faculty dedicated to important applied research (<http://geog.sfsu.edu/publications-listing/>) in the Bay Area and beyond.

The Master of Arts in Geography (<http://geog.sfsu.edu/ma/>) is designed for individuals pursuing careers in environmental planning, monitoring, and advocacy; in resource management; in geographic techniques; in community college teaching; or for individuals preparing for doctoral work in geography. The graduate curriculum ensures all students have a grounding in both physical and human geography and offers opportunities for specialization in physical geography, natural resource management, environmental studies, regional geography, and techniques. The Concentration in Resource Management and Environmental Planning (<http://geog.sfsu.edu/marmep/>) provides the knowledge and skills necessary to carry out impact analysis, plan formulation and implementation.

The Master of Science in Geographical Information Science (<http://geog.sfsu.edu/msgis/>) (GISci) program prepares graduate students for advanced careers in a wide range of geospatial information research and applications. Geographic information science encompasses the development, use, and applications of geographic information systems (GIS), cartography, remote sensing, global positioning systems (GPS), and spatial statistics. A student completing this program will be prepared to take on advanced technical and leadership roles in environmental and resource agencies and firms employing GIS, remote sensing and other geospatial technologies.

The M.A. and M.S. programs culminate in either a master's thesis or a research project and comprehensive oral examination.

## Facilities

Research facilities (<http://geog.sfsu.edu/content/research/>) available to students include a geographic analysis teaching lab (HSS 290), an environmental science teaching lab (HSS 383), a physical geography lab, a map library, campus computer laboratories, and the main library. The Institute for Geographic Information Science (<http://gis.sfsu.edu/>) provides further resources and research opportunities. The department maintains licenses for industry-standard software such as ArcGIS, QGIS, R, ERDAS Imagine, ENVI, E-cognition, QT Modeler, PhotoScan, Trimble, and other geospatial software. The department cannot guarantee funding to incoming graduate students. The department occasionally offers technical positions and graduate assistant opportunities to graduate students in residence, and funding may be available from external grants and campus financial aid resources.

The undergraduate and graduate degrees offered by the Department of Geography & Environment provide excellent preparation for a variety of positions in the public or private sector. Graduates find challenging and interesting careers in environmental and planning agencies at the state and local level, environmental consulting and cartographic firms, and nonprofit organizations, as well as in community college teaching. Growing demand for students trained in GIS and environmental science makes geography and environmental science students with appropriate skills highly marketable.

## Professor

TENDAI CHITWERE (2007), *Professor of Geography and Environment*; B.S. (1995), State University of New York, Oneonta; M.P.S. (1997), Cornell University; Ph.D. (2006), Binghamton University.

JERRY D. DAVIS (1988), *Professor of Geography and Environment*; A.B. (1976), Georgia State University; M.A. (1982), Ph.D. (1987), University of Georgia.

JASON HENDERSON (2003), *Professor of Geography and Environment*; B.S. (1995), Louisiana State University; M.A. (1997), Ph.D. (2002), University of Georgia.

ELLEN HINES (2001), *Professor of Geography and Environment*; B.A. (1974), Mills College; M.A. (1997), San Diego State University; Ph.D. (2002), University of Victoria.

XIAOHANG LIU (2003), *Professor of Geography and Environment*; B.S. (1994), Peking University; M.S. (1998), (1999), Rutgers University; Ph.D. (2003), University of California, Santa Barbara.

ANDREW J. OLIPHANT (2002), *Professor of Geography and Environment*; B.A. (1989), M.A. (1996), Ph.D. (2000), University of Canterbury.

NANCY LEE WILKINSON (1986), *Professor of Geography and Environment*; B.A. (1975), San Jose State University; M.A. (1978), Ph.D. (1983), University of Oregon.

## Associate Professor

JENNIFER BLECHA (2007), *Associate Professor of Geography and Environment*; B.A. (1991), Pacific Lutheran University; M.A. (1995), University of Oregon; Ph.D. (2007), University of Minnesota.

LEONHARD BLESIVUS (2007), *Associate Professor of Geography and Environment*; Abitur (1979), Leibniz Gymnasium; M.Sc. (1987), Philipps University; Ph.D. (2002), University of Iowa.

COURTNEY DONOVAN (2007), *Associate Professor of Geography and Environment*; B.A. (1998), Syracuse University; M.A. (2001), The University of Arizona; Ph.D. (2008), University of Washington.

QIAN GUO (1998), *Associate Professor of Geography and Environment*; B.S. (1982), M.S. (1987), Beijing Normal University; Ph.D. (1996), University of Tennessee, Knoxville.

## Assistant Professor

LEORA NANUS (2014), *Assistant Professor of Geography and Environment*; B.S. (1995), University of California, Santa Cruz; M.S. (2000), Western Washington University; Ph.D. (2008), University of Colorado, Boulder.

## Majors

- Bachelor of Arts in Geography (<http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/ba-geography/>)
- Bachelor of Science in Environmental Science (<http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/bs-environmental-science/>)

## Minor

- Minor in Geography (<http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/minor-geography/>)

## Masters

- Master of Arts in Geography (<http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/ma-geography/>)
- Master of Arts in Geography: Concentration in Resource Management and Environmental Planning (<http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/ma-geography-concentration-resource-management-environmental-planning/>)

- Master of Science in Geographic Information Science (<http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/ms-geographic-information-science/>)

### GEOG 101 Our Physical Environment (Units: 3)

Environmental processes; elements of weather and climate; shapes of landforms; formation, distribution of soils and natural vegetation; physiography of oceans. Synergistic relations between the physical and human environments.

#### Course Attributes:

- B1: Physical Science
- Environmental Sustainability

### GEOG 102 The Human Environment (Units: 3)

Nature of cultural geography; interpretation of the cultural elements of the geographic landscape and study of our changing relationship with the environment.

#### Course Attributes:

- D1: Social Sciences
- Environmental Sustainability
- Global Perspectives

### GEOG 107 World Regions and Interrelations (Units: 3)

World culture regions: economic development, paths of cultural evolution, bases for political organization and resource appraisals; the persistence of cultural differentiation in the face of increasing interdependence, cultural transfer, and common threats to humanity.

#### Course Attributes:

- D1: Social Sciences
- Environmental Sustainability
- Global Perspectives

### GEOG 111 Our Physical Environment Lab (Unit: 1)

Prerequisite: Concurrent enrollment in GEOG 101.

Laboratory related to GEOG 101, Our Physical Environment. Topics include skills in mapping, graphing, field techniques and data analysis in introductory physical geography.

### GEOG 160 Introduction to Environmental Science (Units: 4)

Introduction to ecological and environmental systems, and processes and problems at global, state, and local levels; examination of ecosystems, natural resources and earth processes and their interactions with the human environment. Lecture, 3 units; laboratory, 1 unit.

#### Course Attributes:

- B2: Life Science
- B3: Lab Science
- Environmental Sustainability
- Global Perspectives

**GEOG 180 First-Year Experience: Sustainable City, Sustainable You (Units: 3)**

Prerequisite: GE Area A2\* with a grade of CR or C- or higher.

The City of San Francisco is striving to meet social and environmental challenges to sustain our communities. Students' actions contribute to The City's sustainability; at the same time, students struggle to sustain their own social, physical, financial, and academic well-being. Sustainability from body scale to city scale, examining identity development, social & environmental justice, and personal & social well-being. Writing, mapping, graphic, and oral communication in ways that support your personal and professional goals, culminating in a multimedia portfolio.

**Course Attributes:**

- E: Lifelong Learning Develop

**GEOG 203 Geographical Measurement (Units: 3)**

Prerequisite: A score of 50 or above on the Entry Level Mathematics (ELM) examination, or an approved exemption.

Extraction and analysis of qualitative and quantitative information about our environment. Applications of numerical and statistical techniques through the use of maps, geographic information systems, remote sensing, surveying, and GPS. Lecture, 2 units; activity, 1 unit.

(Note: In order for this course to satisfy General Education, students must earn a C- or CR or higher grade if taken fall 2014 or later.)

**Course Attributes:**

- B4: Math/QR

**GEOG 205 Geographic Techniques (Units: 3)**

Prerequisites: Restricted to sophomore standing and above; GEOG 101 or equivalent; and Area B4: Lower Division Mathematics/Quantitative Reasoning.

Geographical analysis; methodology, tools, and techniques used in geographical research, including data acquisition, classification, descriptive statistics; map reading; introduction to geographic information science and remote sensing. Lecture, 2 units; activity, 1 unit. [Formerly GEOG 103]

**GEOG 301 Bay Area Environments (Units: 3)**

Prerequisites: GE Areas A1\*, A2\*, A3\*, and B4\* all with grades of C- or better or consent of the instructor.

Introduction to the complex nature of human and environment interaction in the SF Bay Area. Exploration of environmental issues, geologic processes, water, weather, climate and ecosystems, anthropogenic changes across the region, and the future of the Bay Area.

(This course is taught in a hybrid modality [online and in-person].)

(This course is offered as A U 301 and GEOG 301. Students may not repeat the course under an alternate prefix.)

**Course Attributes:**

- UD-B: Physical Life Science
- Partial Online Course
- Environmental Sustainability

**GEOG 312 Geography of Landforms (Units: 4)**

Prerequisites: GEOG 101 and GEOG 205; or consent of the instructor.

Development of earth's surface landforms through processes involving weathering, hill slopes and flowing water, wind and ice. Structural and climatic control of landforms. Geographic analysis of landform systems. Lecture, 3 units; activity, 1 unit. Extra fee required.

**GEOG 313 Earth's Climate System (Units: 4)**

Prerequisites: GEOG 101 and GEOG 205; or consent of the instructor.

Physical characteristics and processes of Earth's climate system; atmospheric composition, radiation, energy and water budgets and circulations, interaction with biological, oceanic and cryospheric systems and global climate change. Computer-based analysis using climate measurements and models. Lecture, 3 units; activity, 1 unit.

**GEOG 314 Bioclimatology (Units: 4)**

Prerequisites: GEOG 101 and GEOG 205; or consent of the instructor.

Interactions between climate and the biosphere including ecosystem-atmosphere exchanges of energy, water and carbon, agricultural and urban climatology, wind transport and energy and measurement techniques. Lecture, 3 units; activity, 1 unit.

**GEOG 316 Biogeography (Units: 4)**

Prerequisites: GEOG 101, GEOG 205; or consent of the instructor.

Distribution, ranges, and limits of plants and animals and the biogeographical effects of human occupancy. Ecological and historical themes, the changing patterns of biota in space and time under changing environmental and human conditions. Lecture, 3 units; activity, 1 unit.

**GEOG 317 Geography of Soils (Units: 4)**

Prerequisites: CHEM 115 or CHEM 180; EARTH 110 or GEOG 101; and GEOG 205; or consent of the instructor.

Properties of soils and factors of formation: parent material, climate, organisms, topography, and time. Distribution of taxonomic suborders. Soils as a natural resource. Lecture, 3 units; activity, 1 unit. Extra fee required.

**GEOG 342 Surface Water Hydrology (Units: 4)**

Prerequisites: MATH 226 and EARTH 210 or EARTH 505 are recommended; or consent of the instructor.

Introduction to surface water hydrology; exploration of hydrologic processes; how precipitation and snowmelt become streamflow, evapotranspiration, and groundwater; watershed hydrology, streamflow processes, and water quality. Lecture, 3 units; activity, 1 unit. (Plus-minus letter grade only)

(This course is offered as EARTH 442 [Formerly GEOL 473] and GEOG 342. Students may not repeat the course under an alternate prefix.)

**GEOG 402 Human Response to Natural Hazards (Units: 3)**

Prerequisite: Upper-division standing.

Human-environmental interactions that result in major and/or frequent disasters to human lives and properties; overview of physical mechanisms of natural hazards; coping strategies of societies; mitigation of natural hazards in the context of sustainable development and environmental conservation.

**GEOG 421 Future Environments (Units: 3)**

Prerequisites: GE Areas A1\*, A2\*, A3\*, and B4\* all with grades of C- or better or consent of the instructor.

Geography of the future. Programs from an economic point of view and economic development from an ecological point of view, including the potential productivity of various regions. Future environments of North America.

**Course Attributes:**

- UD-D: Social Sciences
- Environmental Sustainability
- Global Perspectives
- Social Justice

**GEOG 422 Environmental Perception (Units: 3)**

Prerequisite: GEOG 102 or consent of the instructor.

Facets of human behavior associated with perceptions of the natural and spatial environment, including mapping, residential preference, hazard perception, environmental attitudes and impacts. Lecture, 2 units; laboratory, 1 unit.

**GEOG 423 Geographic Perspectives on Gender (Units: 3)**

Prerequisites: Upper-division standing; GE Areas A1, A2, and A3; or consent of the instructor.

This course critically examines the interrelationship between geography and gender. In particular, this course compares and considers the historical and contemporary positions and experiences of men and women throughout the world. As part of this, attention will be given to understanding the differences and commonalities of men and women's experiences in different sectors of society and across geographic scales. (This course is offered as GEOG 423 and WGS 423. Students may not repeat the course under an alternate prefix.)

**GEOG 425 Economic Geography (Units: 3)**

Prerequisite: Upper-division standing or consent of the instructor.

Location and geographic distribution of the world's major types of production and associated systems of distribution and consumption; interpretation of economic activities in relation to various features of the environment.

**GEOG 427 Agriculture and Food Supply (Units: 4)**

Prerequisites: Upper-division standing; GEOG 101; or consent of the instructor.

Investigation of the location and distribution of world agricultural production and the environmental forces influencing agricultural organization and food supply. Problems in U.S. and California agriculture are analyzed. Lecture, 3 units; activity, 1 unit.

**Course Attributes:**

- Environmental Sustainability
- Global Perspectives

**GEOG 428 International Political Economy of Food and Hunger (Units: 4)**

Prerequisite: Upper-division standing or consent of the instructor.

Exploration of why hunger persists in a world of abundance; food aid, farm policy, and global food trade; whether production can match population growth without environmental harm; crop genetic engineering, international policies and movements for sustainability, and food sovereignty/security.

(This course is offered as I R 428 and GEOG 428. Students may not repeat the course under an alternate prefix.)

**GEOG 430 Transforming Food and Agriculture Systems: Local to Global (Units: 4)**

Prerequisites: GEOG 101 and GEOG 102, or GEOG 427, or GEOG 428/ I R 428; or consent of the instructor.

Exploration of movements for sustainable and urban agriculture, local and regional food systems, food justice and food sovereignty; consideration of ecological, economic, and political aspects of building alternative food systems locally, nationally, and internationally. Field trips and community service required. Lecture, 3 units; laboratory, 1 unit.

**Course Attributes:**

- Environmental Sustainability
- Global Perspectives
- Social Justice

**GEOG 432 Urban Geography (Units: 4)**

Prerequisite: Upper-division standing.

Geographic characteristics of cities in relation to evolution, morphology, and function. The internal and external relationships of diversified urban areas. Lecture, 3 units; activity, 1 unit.

(This course is offered as GEOG 432 and USP 432. Students may not repeat the course under an alternate prefix.)

**Course Attributes:**

- Environmental Sustainability
- Global Perspectives

**GEOG 433 Urban Transportation (Units: 4)**

Prerequisite: Upper-division standing or consent of the instructor.

Interrelationship between urban transportation systems and internal spatial pattern of urban areas. Impact of the automobile and mass transit modes on urban morphology. Regional transportation planning methodology. Lecture, 3 units; activity, 1 unit.

(This course is offered as GEOG 433 and USP 433. Students may not repeat the course under an alternate prefix.)

**GEOG 434 Geographies of Health and Health Care (Units: 3)**

Prerequisite: Upper-division standing or consent of the instructor.

Geographies of health; the role place plays in determining the quality of health status, and in shaping access to and use of health care.

(This course is offered as GEOG 434 and PH 434 [Formerly H ED 434]. Students may not repeat the course under an alternate prefix.)

**GEOG 435 Geography of Global Transportation (Units: 3)**

Prerequisite: Upper-division standing.

Global transportation policies involving rail transit, bicycles, freight movement, airport ground access, and automobile travel. Case studies in the Bay Area, North America, Europe, China, and Africa. Lecture, 3 units; activity, 1 unit.

**GEOG 437 Bicycle Geographies (Units: 4)**

Prerequisite: Restricted to upper-division standing.

Use of the campus and San Francisco as a living laboratory to engage in bicycle planning; key concepts and theories of bicycle transportation; examination of bicycling trends, bicycle system design, and social, cultural and political dimensions to cycling locally and globally. Note: Bicycling required; reasonable accommodations for students with disabilities may be arranged in advance with Disability Programs and Resource Center (DPRC). Lecture, 3 units; activity, 1 unit. (Plus-minus letter grade only)

**GEOG 445 Geopolitics and Globalization (Units: 3)**

Prerequisites: GE Areas A1\*, A2\*, A3\*, and B4\* all with grades of C- or better or consent of the instructor.

Physical and cultural geographic factors in and between political-territorial units. Effects of resource distribution, political motivations, and ideologies on establishing territorial sovereignty. (This course is offered as GEOG 445 and I R 445. Students may not repeat the course under an alternate prefix.)

**Course Attributes:**

- UD-D: Social Sciences

**GEOG 454 San Francisco on Foot (Units: 2)**

Prerequisite: Upper division standing or consent of instructor.

Selected geographic themes--accessibility, spatial, interaction, differential land use, and the relationships between technology, values, and environmental utility--as expressed in the neighborhoods of San Francisco. Classwork, 2 units; fieldwork, 2 units. May be repeated for a total of 8 units.

**GEOG 455 Geography of Ethnic Communities (Units: 3)**

Prerequisite: Upper-division standing.

The spatial structure and organization of ethnic communities as illustrated by reference to San Francisco and other American cities.

**Course Attributes:**

- Am. Ethnic & Racial Minorities
- Social Justice

**GEOG 500GW Physical and Human Dimensions of Climate Change - GWAR (Units: 3)**

Prerequisites: GE Area A2; GEOG 101 and GEOG 102.

An interdisciplinary investigation of climate change including the causes, environmental and societal impacts as well as mitigation and adaptation strategies. The class bridges traditional human and physical branches of geography and examines a variety of associated writing conventions. (Plus-minus ABC/NC grading only)

**Course Attributes:**

- Graduation Writing Assessment

**GEOG 550 Geography of the United States and Canada (Units: 3)**

Prerequisite: Upper-division standing.

Anglo-America's physiography, climates, vegetation, soils, and natural resources and their effect on the development of industry, commerce, and population distribution.

**GEOG 552 Geography of California (Units: 3)**

Prerequisites: GE Areas A1\*, A2\*, A3\*, and B4\* all with grades of C- or better or consent of the instructor.

Location and description of California's natural resources; the influence of land surface, climate, natural vegetation, soils, and minerals upon economic development, routes of commerce, and population distribution. Current water problems.

**Course Attributes:**

- UD-D: Social Sciences
- Am. Ethnic & Racial Minorities
- Environmental Sustainability
- Social Justice

**GEOG 575 Emerging China (Units: 3)**

Prerequisites: Upper-division standing; GE Areas A1\*, A2\*, A3\*, B4\*, and E all with grades of C- or better; or consent of the instructor.

Examination of China's geographical conditions for development focusing on climate change, landforms, and natural resources. Focus on the patterns of human-environmental interactions that engender cultural institutions, economic development, and political changes. Discussion of the environmental sustainability of development strategies, and feasible alternatives. Build a geographical framework for critically assessing the impact of China's economic emergence on the environment and natural resources within and beyond its borders.

**Course Attributes:**

- UD-D: Social Sciences
- Environmental Sustainability
- Global Perspectives
- Social Justice

**GEOG 600 Environmental Problems and Solutions (Units: 3)**

Prerequisites: GE Areas A1\*, A2\*, A3\*, and B4\* all with grades of C- or better or consent of the instructor.

An ecological approach to nature and the landscape. Human populations, natural resources, and environmental quality in California with particular reference to the San Francisco Bay Area.

(This course is offered as GEOG 600 and ENVS 600. Students may not repeat the course under an alternate prefix.)

**Course Attributes:**

- UD-D: Social Sciences
- Environmental Sustainability
- Global Perspectives

**GEOG 601 Field Methods in Human Geography (Units: 3)**

Prerequisite for GEOG 701: Graduate standing or consent of the instructor.

Prerequisites for GEOG 601: Upper-division standing; GEOG 205; GPA of 3.0 or higher; or consent of the instructor.

Application of field methods in human geography. Research methodologies and design including interviewing, surveying, ethnographic methods, and archival research. Lecture, 2 units; activity, 1 unit.

(GEOG 701/GEOG 601 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 602 Field Methods in Physical Geography (Units: 4)**

Prerequisite for GEOG 702: Graduate standing or consent of the instructor.

Prerequisites for GEOG 602: Upper-division standing; GEOG 205; GPA of 3.0 or higher; or consent of the instructor.

Application of field methods to physical geography. Research methods and experimental design for field-based data collection including geomorphic surveying, biometric sampling, and atmospheric measurement and monitoring. Lecture, 2 units; laboratory, 2 units. (GEOG 702/GEOG 602 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 603 Introduction to Geographic Information Systems (Units: 3)**

Prerequisite: GEOG 205 or ENV 224, or equivalent.

Applications of computers in geographic problem-solving. Investigates the nature of geographic information sources—maps, earth images, and spatial databases—and the application of spatial analysis, mapping, charting, and image display tools. Lecture, 2 units; laboratory, 1 unit.

**GEOG 604 Environmental Data Science (Units: 3)**

Prerequisite for GEOG 704: Graduate standing or consent of the instructor.

Prerequisites for GEOG 604: Upper-division standing; GEOG 205 and GEOG 603; GPA of 3.0 or better; or consent of the instructor.

Environmental data science is the array of methods for turning raw data into understanding as applied to environmental research. An exploratory data analysis approach is employed where visualization of data in time and space can lead to insight and hypothesis development. Major topics include time-series analysis, geospatial methods employing open-source tools in the R language, and employing innovations in graphics and maps. Lecture, 2 units; laboratory, 1 unit. (GEOG 704/GEOG 604 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 606 Cartography (Units: 3)**

Prerequisite: GEOG 205 or equivalent.

Theory and practice in modern thematic cartography. Compilation and classification of geospatial datasets, the role of scale and projections in thematic maps, and theory and practice in cartographic symbolization, visualization, and communication. Ethics in geospatial visualization and issues in implementing cartographic visualizations in web and GIS environments. Lecture, 2 units; laboratory, 1 unit. Lab fee required.

**GEOG 610 Remote Sensing of the Environment I (Units: 4)**

Prerequisite: GEOG 205.

Introduction to remote sensing and digital image processing. Image acquisition, physical background, image interpretation. Display and enhancement of digital images, radiometric and geometric corrections. Lecture, 2 units; activity, 2 units. Extra fee required.

**GEOG 611 Remote Sensing of the Environment II (Units: 4)**

Prerequisite for GEOG 711: Graduate standing; GEOG 610; or consent of the instructor.

Prerequisites for GEOG 611: Upper-division standing; GEOG 610; GPA of 3.0 or higher; or consent of the instructor.

Advanced remote sensing and digital image processing. Selected topics including object-oriented image processing with Definiens Professional. Lecture, 2 units; activity, 2 units. (GEOG 711/GEOG 611 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 620 Geographical Information Systems (Units: 4)**

Prerequisites for GEOG 720: Graduate standing; GEOG 603 or equivalent; or consent of the instructor.

Prerequisites for GEOG 620: Upper-division standing; GEOG 603 or equivalent; GPA of 3.0 or higher; or consent of the instructor.

Theory and applications of Geographic Information Systems for automating, analyzing, and producing maps from geographic data. Lecture, 2 units; activity, 2 units. Extra fee required. (GEOG 720/GEOG 620 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 621 Geographic Information Systems for Environmental Analysis (Units: 4)**

Prerequisite for GEOG 721: Graduate standing or consent of the instructor.

Prerequisites for GEOG 621: Upper-division standing; GEOG 205 and GEOG 603 or equivalents and MATH 199 or a sufficient score on the calculus pretest; GPA of 3.0 or higher; or consent of the instructor.

GIS applied to environmental analysis. Raster surface analysis, spatial analysis of discrete and continuous surfaces, spatial statistics, and the generation of statistical surfaces from environmental samples and contour data. Seminar, 2 units; activity, 2 units. (GEOG 721/GEOG 621 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 625 Programming for Geographic Information Science (Units: 4)**

Prerequisites: GEOG 620 or GEOG 621; MATH 199 or sufficient score on calculus pretest.

Programming methods for developing new tools for automating existing methods for desktop (Python) and web (Javascript) GIScience environments. Essentials of object-oriented programming methods applied to GIS and remote sensing. Lecture, 2 units; activity, 2 units.

**GEOG 629 Coastal and Marine Applications of GIS (Units: 3)**

Prerequisite: GEOG 603 or consent of the instructor.

GIS for partial analysis to support coastal and marine research. Benthic habitat mapping, mapping and visualization for coastal/marine applications, spatial analysis of marine animal movements, habitat modeling and mapping of marine protected areas. Lecture, 2 units; laboratory, 1 unit. Extra fee required.

**GEOG 642 Watershed Assessment and Restoration (Units: 4)**

Prerequisites: GEOG 101 or EARTH 210, GEOG 603, and MATH 199 or a sufficient score on calculus pretest.

Assessing and restoring watersheds and streams. Exploration of hydrologic and watershed processes, variables influencing runoff and erosion, and hillslope and stream restoration techniques. Lecture, 3 units; activity, 1 unit. [CSL may be available] (This course is offered as GEOG 642 and EARTH 642. Students may not repeat the course under an alternate prefix.)

**GEOG 643 Biogeomorphology of Sierra Nevada Streams and Meadows (Units: 2)**

Prerequisite: GEOG 101 or EARTH 110.

Understanding the complex interactions of hydrologic and biogeomorphic systems on streams and meadows in the northern Sierra Nevada, and learning field methods for assessing stream function as they respond to long-term impacts related to glacial history and short-term human impacts of timber extraction, road construction, and grazing. Activity. (This course is offered as GEOG 643 and EARTH 643. Students may not repeat the course under an alternate prefix.)

**GEOG 644 Water Quality (Units: 3)**

Prerequisites: GEOG 101, GEOG 205, CHEM 180, BIOL 230 or BIOL 240.

Examination of physical and social properties of water quality including pollution testing and mitigation, state and federal regulations, public policy and environmental justice.

**GEOG 646 The Geography of Marine Resources (Units: 4)**

Prerequisite: GEOG 101 or consent of the instructor.

Character and spatial arrangements of resources of the ocean; analysis of marine biomass, minerals, and energy; examination of maritime policy and economic aspects of the marine environment. Lecture, 3 units; laboratory, 1 unit.

**GEOG 647 Geography of Water Resources (Units: 4)**

Prerequisite: GEOG 101 or consent of the instructor.

Distribution and development of atmospheric, surface, and groundwater resources; interrelationships between water and human activities in California and the West. Divergent solutions to water-related issues and controversies. Lecture, 3 units; laboratory, 1 unit. Extra fee required.

**GEOG 648 Management of National Parks and Protected Areas (Units: 4)**

Prerequisite: Upper-division standing or consent of the instructor.

Conservation and preservation of large ecosystem units: national parks, nature and wildlife reserves and equivalent natural areas. History, management, and problems of these tracts of land. Lecture, 3 units; laboratory, 1 unit.

**GEOG 651 San Francisco Bay Area Environmental Issues (Units: 4)**

Prerequisites: GE Areas A1\*, A2\*, A3\*, and B4\* all with grades of C- or better or consent of the instructor.

Mission and work of environmental management organizations. Managing our air, water, soil, wildlife, and aesthetic resources. Land use and transportation concepts. Field projects. Lecture, 3 units; laboratory, 1 unit.

(This course is offered as GEOG 651 and USP 651. Students may not repeat the course under an alternate prefix.)

**Course Attributes:**

- UD-B: Physical Life Science
- Environmental Sustainability

**GEOG 652 Environmental Impact Analysis (Units: 4)**

Prerequisite: GEOG 205 or ENVS 224 or consent of the instructor.

Cultural and physical environmental interrelationships. Evaluating impact proposals. Reconciling resource potentials with human needs, problems of social development impact, and environmental quality protection. Lecture, 3 units; activity, 1 unit.

(This course is offered as GEOG 652 and USP 652. Students may not repeat the course under an alternate prefix.)

**GEOG 657 Natural Resource Management: Biotic Resources (Units: 4)**

Prerequisites: GEOG 101, GEOG 205 or ENVS 224, or consent of the instructor.

Basic theories and methodologies of managing forest, wildlife and rangeland resources. Agencies, laws, and policies that govern natural resource management. Emphasis on the urban-wildland interface.

Lecture, 3 units; activity, 1 unit.

(This course is offered as GEOG 657 and ENVS 657. Students may not repeat the course under an alternate prefix.)

**GEOG 658 Land-Use Planning (Units: 4)**

Prerequisite: Upper-division standing.

The institutions, practice, and methodology of land-use planning. Relationship of planning to socio-economic objectives within the context of market and political forces. The planning process, locational analysis, zoning, and negotiated development. Lecture, 3 units; activity, 1 unit.

(This course is offered as GEOG 658 and USP 658. Students may not repeat the course under an alternate prefix.)

**GEOG 666 Geography of Garbage: Recycling and Waste Reduction (Units: 3)**

Prerequisite: Junior standing.

Geographical analysis of waste. Alternative solutions focusing on the San Francisco Bay Area: development and implementation of resource management programs. Lecture, 2 units; activity, 1 unit.

**Course Attributes:**

- Environmental Sustainability

**GEOG 667 Environmental Justice: Race, Poverty, and the Environment (Units: 4)**

Prerequisite: Upper-division standing or consent of the instructor.

Examination of environmental justice concepts, research and policies; understanding how toxins and other environmental assaults differentially affect communities and groups in USA and abroad; focus on research, ethnic, class dynamics; environmental justice movements, public policy and planning.

(This course is offered as USP 515 and GEOG 667. Students may not repeat the course under an alternate prefix.)

**Course Attributes:**

- Environmental Sustainability
- Global Perspectives
- Social Justice

**GEOG 668 Politics, Law, and the Urban Environment (Units: 4)**

Prerequisite: Upper-division standing or consent of the instructor.

Law and the legal system as mechanisms for regulating urban development and protecting the environment; intervention in development and land use; environmental decay, conservation of open space, other related resources. Lecture, 3 units; activity, 1 unit.

(This course is offered as USP 513, GEOG 668, and PLSI 513. Students may not repeat the course under an alternate prefix.)

**GEOG 685 Projects in Teaching Geography (Units: 1-3)**

Prerequisites: Upper-division standing; a grade of B or better in course for training; consent of the Instructor.

Training in the teaching of geography. Responsibilities include working with supervising faculty to review and prepare course materials, tutor students, conduct small discussion groups and give brief lectures/demonstrations. (Students may earn a maximum of 4 units toward the baccalaureate degree for any course(s) numbered 685 regardless of discipline.)

**GEOG 688 Geographic Internship (Units: 2-6)**

Prerequisites: 15 units in Geography; consent of the instructor.

Practical geographic assignments with sponsoring agencies. May be repeated for a total of 6 units with different internships. [CSL may be available]

**GEOG 690 Senior Seminar in Geography and Environmental Science (Units: 3)**

Prerequisites: Senior standing in BA Geography or BS Environmental Science; completion of core requirements, GEOG 101, GEOG 102 or GEOG 107, GEOG 205, GEOG 500GW.

Research project formulation and development, writing strategies and conventions in academic and professional contexts, career preparation in Geography. [Formerly GEOG 690GW]

**GEOG 691 Geography and Environment Capstone (Units: 2)**

Prerequisites: Senior standing; GEOG 205 and a GWAR course in geography.

Panel discussions with geographers and other environmental professionals working in the Bay Area. Workshops on career preparation and project development. Laboratory.

**GEOG 699 Independent Study (Units: 1-3)**

Prerequisite: Consent of the instructor, major adviser, and department chair.

Supervised study of a particular problem selected by the student in consultation with the adviser. May be repeated for a total of 3 units.

**GEOG 701 Field Methods in Human Geography (Units: 3)**

Prerequisite for GEOG 701: Graduate standing or consent of the instructor.

Prerequisites for GEOG 601: Upper-division standing; GEOG 205; GPA of 3.0 or higher; or consent of the instructor.

Application of field methods in human geography. Research methodologies and design including interviewing, surveying, ethnographic methods, and archival research. Lecture, 2 units; activity, 1 unit.

(GEOG 701/GEOG 601 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 702 Field Methods in Physical Geography (Units: 4)**

Prerequisite for GEOG 702: Graduate standing or consent of the instructor.

Prerequisites for GEOG 602: Upper-division standing; GEOG 205; GPA of 3.0 or higher; or consent of the instructor.

Application of field methods to physical geography. Research methods and experimental design for field-based data collection including geomorphic surveying, biometric sampling, and atmospheric measurement and monitoring. Lecture, 2 units; laboratory, 2 units. (GEOG 702/GEOG 602 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 704 Environmental Data Science (Units: 3)**

Prerequisite for GEOG 704: Graduate standing or consent of the instructor.

Prerequisites for GEOG 604: Upper-division standing; GEOG 205 and GEOG 603; GPA of 3.0 or better; or consent of the instructor.

Environmental data science is the array of methods for turning raw data into understanding as applied to environmental research. An exploratory data analysis approach is employed where visualization of data in time and space can lead to insight and hypothesis development. Major topics include time-series analysis, geospatial methods employing open-source tools in the R language, and employing innovations in graphics and maps. Lecture, 2 units; laboratory, 1 unit.

(GEOG 704/GEOG 604 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 705 Geographical Analysis (Units: 3)**

Prerequisites: Graduate standing in Geography; GEOG 205 or equivalent.

Methods of statistical analysis and review of their use in geographic literature; univariate and multivariate analysis, graphical presentation; statistical software. Lecture, 2 units; laboratory, 1 unit.

**GEOG 711 Remote Sensing of the Environment II (Units: 4)**

Prerequisite for GEOG 711: Graduate standing; GEOG 610; or consent of the instructor.

Prerequisites for GEOG 611: Upper-division standing; GEOG 610; GPA of 3.0 or higher; or consent of the instructor.

Advanced remote sensing and digital image processing. Selected topics including object-oriented image processing with Definiens Professional. Lecture, 2 units; activity, 2 units.

(GEOG 711/GEOG 611 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 720 Geographical Information Systems (Units: 4)**

Prerequisites for GEOG 720: Graduate standing; GEOG 603 or equivalent; or consent of the instructor.

Prerequisites for GEOG 620: Upper-division standing; GEOG 603 or equivalent; GPA of 3.0 or higher; or consent of the instructor.

Theory and applications of Geographic Information Systems for automating, analyzing, and producing maps from geographic data. Lecture, 2 units; activity, 2 units. Extra fee required.

(GEOG 720/GEOG 620 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)



**GEOG 721 Geographic Information Systems for Environmental Analysis (Units: 4)**

Prerequisite for GEOG 721: Graduate standing or consent of the instructor.

Prerequisites for GEOG 621: Upper-division standing; GEOG 205 and GEOG 603 or equivalents and MATH 199 or a sufficient score on the calculus pretest; GPA of 3.0 or higher; or consent of the instructor.

GIS applied to environmental analysis. Raster surface analysis, spatial analysis of discrete and continuous surfaces, spatial statistics, and the generation of statistical surfaces from environmental samples and contour data. Seminar, 2 units; activity, 2 units.

(GEOG 721/GEOG 621 is a paired course offering. Students who complete the course at one level may not repeat the course at the other level.)

**GEOG 735 Seminar in Global Environmental Policy (Units: 3)**

Prerequisite: Graduate standing or consent of the instructor.

International/global policy making process and responses to critical environmental problems confronting the world as well as underlying causes such as population explosion and energy consumption. Policy choices, negotiating strategies, and outcomes.

(This course is offered as I R 735 and GEOG 735. Students may not repeat the course under an alternate prefix.)

**GEOG 751 Environmental Management (Units: 3)**

Prerequisites: Graduate standing in Geography; GEOG 600 or consent of the instructor.

Management and planning concepts and their application to problems in resource development and environmental protection. History of environmental management and policy, national and international problems in environmental management. (Plus-minus letter grade only)

**GEOG 776 Environmental Policy (Units: 3)**

Prerequisite: Graduate standing or consent of the instructor.

Covers scope and theories of US and CA environmental policy. (This course is offered as P A 776 and GEOG 776. Students may not repeat the course under an alternate prefix.)

**GEOG 785 College Teaching of Geography (Units: 1-3)**

Prerequisites: Graduate standing; a grade of B or better in the course of training; consent of the instructor.

Training in the teaching of geography. Work with supervising faculty to review and prepare course materials, tutor students, conduct small discussion groups and give brief lectures/demonstrations. May be repeated for 3 units total of degree credit.

**GEOG 789 GIScience Internship (Units: 3)**

Prerequisites: Graduate standing in MS GIScience program and consent of the instructor.

Professional work experience: students will work 135 hours with sponsoring agencies or organizations under the supervision of a faculty member and an on-site work supervisor. (Plus-minus letter grade only)

**GEOG 801 Scope and Method in Geography (Units: 3)**

Prerequisite: Graduate standing in Geography.

Nature of geography and its historical development with emphasis on geographic literature. Alternative geographic approaches to themes central to the discipline. (Plus-minus letter grade only)

**GEOG 810 Seminar in Physical Geography (Units: 3)**

Prerequisites: Graduate standing in Geography; GEOG 801, appropriate upper-division course work.

Field to be specified in Class Schedule. May be repeated when topics vary. (Plus-minus letter grade only)

**GEOG 815 Seminar in GIScience (Units: 3)**

Prerequisites: Graduate standing in Geography or GIScience; upper-division coursework in GIScience; or consent of the instructor.

Theoretical development of GIScience with emphasis on exploring and discussing research literature in geographic information systems, remote sensing, and spatial analysis. Extra fee required. (Plus-minus letter grade only.)

**GEOG 820 Human and Social Geography (Units: 3)**

Prerequisites: Graduate standing in Geography; GEOG 801, appropriate upper-division course work; or consent of the instructor.

Investigation of the development of this subfield in human geography with special emphasis on theoretical frameworks, research paradigms and applications to contemporary life. (Plus-minus letter grade only)

**GEOG 832 Seminar in Urban Geography (Units: 3)**

Prerequisites: Graduate standing in Geography; GEOG 432; or consent of the instructor.

Seminar in geographic theory, methods of analysis, and research techniques relating to urban areas. (Plus-minus letter grade only)

**GEOG 857 Issues in Marine and Estuarine Conservation (Units: 3)**

Prerequisites: Restricted to graduate students in Geography; GEOG 801 or BIOL 708; or consent of the instructor.

Exploration of issues of marine, wetland and coastal conservation due to human exploitation of resources. Discussions include critical evaluations of landmark and current research; topics of relevance to individual student research. (Plus-minus letter grade only)

**GEOG 858 Seminar in Environmental and Land Use Planning (Units: 3)**

Prerequisites: Graduate standing in Geography; appropriate upper-division course work.

Nature and status of environmental planning, including contemporary themes and research trends. Application of geographic concepts, methods, and research techniques. (Plus-minus letter grade only)

**GEOG 895 Research Project (Units: 3)**

Prerequisites: Graduate standing in Geography; consent of the instructor and chair of student's committee; and approval of Advancement to Candidacy (ATC) and Culminating Experience (CE) forms by Graduate Studies. ATC and Proposal for Culminating Experience Requirement forms must be approved by the Graduate Division before registration.

(CR/NC, RP grading only)

**GEOG 896 Directed Reading in Geography (Units: 3)**

Prerequisites: Graduate standing in Geography and consent of the adviser.

Intensive supervised research to achieve better understanding of a specific topic, concept, or area chosen on the basis of individual student need. Readings, tutorial discussion, and research report or creative projects required. (Plus-minus AB/NC, RP grading only)

**GEOG 897 Research Project Formulation (Units: 2)**

Prerequisites: Graduate standing in Geography and filing of ATC form.

Development of Master's thesis: formulation of research question, literature review and methodology, leading to a written and oral proposal; focus on colloquia, thesis defenses, workshops on grants, publication writing, and research methods. (CR/NC grading only)

**GEOG 898 Master's Thesis (Units: 3)**

Prerequisites: Graduate standing in Geography; consent of the instructor and chairperson of candidate's committee; and approval of Advancement to Candidacy (ATC) and Culminating Experience (CE) forms by Graduate Studies. ATC and Proposal for Culminating Experience Requirement forms must be approved by the Graduate Division before registration.

(CR/NC grading only)

**GEOG 899 Independent Study (Units: 1-3)**

Prerequisites: Graduate standing in Geography; and consent of the graduate major adviser, supervising faculty member, and department chair.

Study is planned, developed, and completed under the direction of a member of the departmental faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. May be repeated for a total of 3 units.