GEOGRAPHY & ENVIRONMENT

College of Science and Engineering
Interim Dean: Carmen Domingo

Department of Geography & Environment
HSS 279
(415) 338–2049
Website: geog.sfsu.edu

Chair: Jerry Davis
B.A. Geography Advisors: Blecha, Donovan, Guo, Liu
B.S. Environmental Science Advisors: Blesius, Nanus, Oliphant
Graduate Coordinator: Wilkinson
M.A. Graduate Advisors: Henderson, Oliphant, 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 course work.

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 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/msgs) (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. A growing demand for students trained in GIS and environmental science make geography and environmental science students with appropriate skills highly marketable.

Professors
Davis, Henderson, Hines, Liu, Oliphant, Wilkinson

Associate Professors
Blecha, Blesius, Chitewere, Donovan, Guo

Assistant Professor
Nanus
Adjunct Faculty
Menning, Vance

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

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

Masters
- Master of Arts in Geography (bulletin.sfsu.edu/colleges/science-engineering/geography-environment/ma-geography)
- Master of Science in Geographic Information Science (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

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. Classwork, 3 units; laboratory, 1 unit.
Course Attributes:
- B2: Life Science
- B3: Lab Science
- Environmental Sustainability
- Global Perspectives

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)
Prerequisite: Upper division standing or consent of 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.
(Note: 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
- A U 301/GEOG 301
GEOG 312 Geography of Landforms (Units: 4)
Prerequisites: GEOG 101 and GEOG 205; or consent of 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 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 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 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: GEOG 101, GEOG 205, ERTH 110, CHEM 180 or CHEM 115; or consent of 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 ERTH 210 or ERTH 505 are recommended; or consent of 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) [Formerly GEOL 473]
(This course is offered as ERTH 442 or GEOG 342. May not be repeated under alternate prefix.)

Course Attributes:
- ERTH 442/GEOG 342

GEOG 402 Human Response to Natural Hazards (Units: 3)
Prerequisite: ENG 214 or equivalent.

Human-environmental interactions that result in major and/or frequent disasters to human lives and properties; interpretation 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)
Prerequisite: ENG 214 or equivalent.

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 instructor.

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

GEOG 423 Geographic Perspectives on Gender, Environment, and Development (Units: 3)
Prerequisites: Upper division standing; ENG 214; or consent of instructor.

Explores geographic frameworks linking gender and environment and examines how they have influenced the practice of development. Case studies from US, Latin America, Africa and Asia. Topics include global restructuring, gender-population-environment.
(This course is offered as GEOG 423 and WGS 423. Students may not repeat the course under an alternate prefix.)

Course Attributes:
- GEOG 423/WGS 423

GEOG 425 Economic Geography (Units: 3)
Prerequisite: Upper division standing or consent of 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 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 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.)

Course Attributes:
- I R 428/GEOG 428

GEOG 430 Transforming Food and Agriculture Systems: Local to Global (Units: 4)
Prerequisites: GEOG 101 and GEOG 102, or GEOG 427, or GEOG 428/IR 428; or consent of 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. Classwork, 3 units; laboratory, 1 unit.

GEOG 432 Urban Geography (Units: 4)
Prerequisite: ENG 214 or equivalent.

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
- Social Justice

GEOG 455 Geography of Ethnic Communities (Units: 3)
Prerequisite: ENG 214 or equivalent.

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 434 Geographies of Health and Health Care (Units: 3)
Prerequisite: Upper division standing or consent of 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 H ED 434. Students may not repeat the course under an alternate prefix.)

Course Attributes:
- GEOG 434/H ED 434
GEOG 500GW Physical and Human Dimensions of Climate Change - GWAR (Units: 3)
Prerequisites: GEOG 101 and GEOG 102; ENG 214 or equivalent with a grade of a C- or better.
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: ENG 214 or equivalent.
Anglo-America's physiography, climates, vegetation, soils, natural resources; the effect on development of industry, commerce, and population distribution.

GEOG 552 Geography of California (Units: 3)
Prerequisite: ENG 214 or equivalent.
Location and description of California's natural resources; 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)
Prerequisite: Upper division standing or consent of instructor.

GEOG 600 Environmental Problems and Solutions (Units: 3)
Prerequisite: ENG 214 or equivalent.
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 600/ENVS 600

GEOG 601 Field Methods in Human Geography (Units: 3)
Prerequisite: GEOG 205.
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.)
Course Attributes:
  • GEOG 601/701

GEOG 602 Field Methods in Physical Geography (Units: 4)
Prerequisite: GEOG 205.
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. Classwork, 2 units; fieldwork, 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.)
Course Attributes:
  • GEOG 602/702

GEOG 603 Introduction to Geographic Information Systems (Units: 3)
Prerequisite: GEOG 205 or ENVS 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. Classwork, 2 units; laboratory, 1 unit.

GEOG 606 Cartography (Units: 4)
Prerequisite: GEOG 205 or equivalent.
Techniques of planning and constructing maps; assembly of source materials and compilation; symbol designing, lettering and layout; drafting and reproduction. Manual and automated techniques. Problems of cartographic generalization and symbolization. Classwork, 2 units; laboratory, 2 units. Extra 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 instructor.
Prerequisite for GEOG 611: GEOG 610; or consent of 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.)
Course Attributes:
  • GEOG 611/711
**GEOG 620 Geographical Information Systems (Units: 4)**
Prerequisites: GEOG 720; Graduate standing; GEOG 603 or equivalent. Prerequisite for GEOG 620: GEOG 603 or equivalent.

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.)

**Course Attributes:**
- GEOG 620/720

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**GEOG 621 Geographic Information Systems for Environmental Analysis (Units: 4)**
Prerequisites: GEOG 205, GEOG 603 or equivalent, MATH 199 or sufficient score on calculus pretest.

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. Lecture, 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.)

**Course Attributes:**
- GEOG 621/721

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**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 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. Classwork, 2 units; laboratory, 1 unit. Extra fee required.

**GEOG 642 Watershed Assessment and Restoration (Units: 4)**
Prerequisites: GEOG 101 or ERTH 210, GEOG 603, MATH 199 or sufficient score on calculus pretest.

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

**Course Attributes:**
- GEOG 642/ERTH 642

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**GEOG 643 Biogeomorphology of Sierra Nevada Streams and Meadows (Units: 2)**
Prerequisite: GEOG 101 or ERTH 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 ERTH 643. Students may not repeat the course under an alternate prefix.)

**Course Attributes:**
- GEOG 643/ERTH 643

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**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 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. Classwork, 3 units; laboratory, 1 unit.

**GEOG 647 Geography of Water Resources (Units: 4)**
Prerequisite: GEOG 101 or consent of 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. Classwork, 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 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. Classwork, 3 units; laboratory, 1 unit.

**GEOG 651 San Francisco Bay Area Environmental Issues (Units: 4)**
Prerequisite: Upper division standing or consent of instructor.

Mission and work of environmental management organizations. Managing our air, water, soil, wildlife, and aesthetic resources. Land use and transportation concepts. Field projects. Classwork, 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 651/USP 651
GEOG 652 Environmental Impact Analysis (Units: 4)  
Prerequisite: GEOG 205 or ENVS 224 or consent of 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.)  
Course Attributes:  
• GEOG 652/USP 652

GEOG 657 Natural Resource Management: Biotic Resources (Units: 4)  
Prerequisites: GEOG 101, GEOG 205 or ENVS 224, or consent of 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.)  
Course Attributes:  
• GEOG 657/ENVS 657

GEOG 658 Land-Use Planning (Units: 4)  
Prerequisite: ENG 214 or equivalent.  
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.)  
Course Attributes:  
• GEOG 658/USP 658

GEOG 666 Geography of Garbage: Recycling and Waste Reduction (Units: 3)  
Prerequisites: Junior standing; ENG 214 or equivalent.  
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 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  
• USP 515/GEOG 667

GEOG 668 Politics, Law, and the Urban Environment (Units: 4)  
Prerequisite: Upper division standing or consent of 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.)  
Course Attributes:  
• USP 513/GEOG 668/PLSI 513

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 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)  
Prerequisite: Minimum of 15 units in Geography and 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 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: GEOG 205.
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.)

Course Attributes:
- GEOG 601/701

GEOG 702 Field Methods in Physical Geography (Units: 4)
Prerequisite: GEOG 205.
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. Classwork, 2 units; fieldwork, 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.)

Course Attributes:
- GEOG 602/702

GEOG 705 Geographical Analysis (Units: 3)
Prerequisites: Classified status 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. Classwork, 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 instructor.
Prerequisite for GEOG 611: GEOG 610; or consent of 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.)

Course Attributes:
- GEOG 611/711

GEOG 720 Geographical Information Systems (Units: 4)
Prerequisites for GEOG 720: Graduate standing; GEOG 603 or equivalent. Prerequisite for GEOG 620: GEOG 603 or equivalent.
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.)

Course Attributes:
- GEOG 620/720

GEOG 721 Geographic Information Systems for Environmental Analysis (Units: 4)
Prerequisites: GEOG 205, GEOG 603 or equivalent, MATH 199 or sufficient score on calculus pretest.
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. Lecture, 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.)

Course Attributes:
- GEOG 621/721

GEOG 735 Seminar in Global Environmental Policy (Units: 3)
Prerequisite: Graduate standing or consent of 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.)

Course Attributes:
- I R 735/GEOG 735

GEOG 751 Environmental Management (Units: 3)
Prerequisites: Classified standing in geography; GEOG 600 or consent of 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 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.)

Course Attributes:
- P A 776/GEOG 776
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 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 GScience Internship (Units: 3)
Prerequisites: Classified standing in MS GScience program and consent of 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: Classified 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: Classified 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)

Course Attributes:

- Generic Course

GEOG 815 Seminar in GScience (Units: 3)
Prerequisites: Classified graduate standing in geography or GScience; upper division coursework in GScience; or consent of instructor.

Theoretical development of GScience 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: Classified standing in geography; GEOG 801, appropriate upper division course work; or consent of 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: Classified standing in geography; GEOG 432; or consent of 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 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: Classified 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: Classified standing in geography; consent of 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: Classified standing in geography and consent of 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: Classified status 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: Classified status in geography; 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: Classified status in geography; consent of 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.

GEOG 9003 Introduction to Geographic Information Systems (GIS) (Units: 1.6)
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.

Course Attributes:

- Geographic Information
GEOG 9004 Managing a Geographic Information System Project (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9008 Raster GIS & Analysis (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9009 Cartographic Design for GIS (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9010 Using GPS for GIS (Units: 1.6)
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 Arc Info and ArcView will be discussed. Applications in natural and cultural resource inventories, transportation analyses, ecological studies, or atmospheric and hydrologic process studies.
Course Attributes:

- Geographic Information

GEOG 9011 Introduction to Remote Sensing (Units: 1.6)
This course covers basic concepts and procedures used in remote-sensed image processing. Emphasis is placed on use of imagery from passive sensors like digital satellite or aerial data. The course is designed for beginning level users and consists of lecture, examples, and introductory labs. Topics include sensor properties, the electromagnetic spectrum, image analysis and classification, image transformations and enhancement, applications, integration with GIS, accuracy assessment, and image processing software including E.Cognition, ERDAS Imagine, and ArcGIS Desktop.
Prerequisites: Introduction to Geographic Information Systems (Geog 9003) or equivalent.
Course Attributes:

- Geographic Information

GEOG 9013 Spatial Analysis & Modeling (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9015 Database Design & Management for GIS (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9016 Microsoft Access for GIS (Units: 1.6)
This course introduces the Microsoft Access database application for creating databases for use with GIS. Topics include database design; table and query creation; and data entry and manipulation. Class format: approximately two-thirds lecture, one-third lab.
Course Attributes:

- Geographic Information

GEOG 9019 Remote Sensing in GIS, Part II (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9020 Scientific Visualization in GIS (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9021 Introduction to Programming ArcGIS (Units: 1.6)
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.
Course Attributes:

- Geographic Information

GEOG 9022 Introduction to GIS Programming (Units: 1.6)
This course introduces students to the use of scripting languages for doing GIS applications and automating routine GIS tasks. The course includes scripting with Python, Visual Basic, and ArcObjects. No prior programming experience is required.
Course Attributes:

- Geographic Information

GEOG 9023 Advanced Processing Tools in GIS (Units: 1.6)
Advanced processing tools available in the GIS software, both ArcGIS and ESRI ArcObjects. The course will focus on the use of Python and VBA to automate complex spatial analysis and data management tasks. No prior programming experience is required.
Course Attributes:

- Geographic Information
GEOG 9022 Data Acquisition for GIS (Units: 1.6)
This course explores various methods of capturing data for use in GIS, including digitizing from maps, digital photos, and satellite imagery; locating and reformating 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.

Course Attributes:
• Geographic Information

GEOG 9023 GIS and Remote Sensing Applications for Coastal and Marine Scientists (Units: 1.6)
Use of geospatial technologies to map physical coastal and ocean processes is necessary for analysis of conservation issues, effective coastal zone management, and designation of marine protected areas. This intensive application course focuses on using GIS for spatial analysis and basic image processing to support coastal and marine research. Covered topics include benthic habitat mapping, spatial analysis of marine animal movements, habitat modeling, and mapping of marine protected areas. Fundamental knowledge of geospatial analysis theory and tools is required, as outlined in the prerequisites above. Class Format: Approximately 40% lecture, 60% lab exercises.

Course Attributes:
• Geographic Information

GEOG 9024 Watershed GIS (Units: 1.6)
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.

Course Attributes:
• Geographic Information

GEOG 9025 Ecological Applications of GIS (Units: 1.6)
This course builds upon skills learned in previous GIS courses, emphasizing common uses of GIS for ecological analysis. Class lectures and labs will familiarize students with ecological data sources and potential data issues, and cover a variety of ecological GIS applications such as species distribution mapping, habitat suitability modeling, corridor analysis, and invasive species mapping.

Course Attributes:
• Geographic Information

GEOG 9026 Introduction to R (Units: 1.6)
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.

Course Attributes:
• Geographic Information

GEOG 9027 Spatial Analysis of Public Health Data (Units: 1.6)
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.

Course Attributes:
• Geographic Information

GEOG 9028 Processing GIS Data with ModelBuilder and Python (Units: 1.6)
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, Toolbox, Scripts, Models using the ArcGIS ModelBuilder, and process documentation. Class Format: Approximately 50% lecture, 50% software applications.

Course Attributes:
• Geographic Information

GEOG 9029 Building a Geodatabase (Units: 1.6)
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.

Course Attributes:
• Geographic Information

GEOG 9030 Introduction to R (Units: 1.6)
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.

Course Attributes:
• Geographic Information

GEOG 9031 Ecological Applications of GIS (Units: 1.6)
This course builds upon skills learned in previous GIS courses, emphasizing common uses of GIS for ecological analysis. Class lectures and labs will familiarize students with ecological data sources and potential data issues, and cover a variety of ecological GIS applications such as species distribution mapping, habitat suitability modeling, corridor analysis, and invasive species mapping.

Course Attributes:
• Geographic Information
GEOG 9033 GIS for Sustainable Planning and Urban Design (Units: 1.6)
The course covers cartographic and analytic techniques in GIS to assist sustainable planning and urban design. The course begins with an intensive review of data resources and cartographic techniques for effective "existing conditions" maps. The remainder focuses on spatial analysis techniques to assist in sustainable planning and urban design. Topics include: (a) use of Network Analyst for generating "walksheds" and evaluating "walkability"; (b) using GIS to calculate indicators of smart growth and complete streets for Transit Oriented Development (TOD); (c) "smart growth"; land-use scenario planning analysis; and (d) use of 3D Analyst for building 3D models, flythroughs, and form based planning.
Class format: Approximately 50% lecture, 50% application.
Course Attributes:
• Geographic Information

GEOG 9034 Developing Rich Internet Mapping Applications (1.6CEU) (Units: 1.6)
This course is geared toward GIS analysts and others who want to create rich internet mapping applications to publish GIS content throughout an organization or to the public via the Internet. Attendees do not need to be highly experienced programmers but a basic understanding of HTML and familiarity with JavaScript are recommended.
Course Attributes:
• Geographic Information

GEOG 9035 Remote Sensing with LiDAR (Units: 1.6)
An introduction to LiDAR data and derived digital models. Emphasis is placed on creating surface models from point cloud data and integrating spectral data and object based image analysis for vegetation classification. ArcGIS Desktop and eCognition software are used.
Course Attributes:
• Geographic Information