

Geography

In the College of Arts and Letters

OFFICE: Storm Hall 323
TELEPHONE: 619-594-5437
FAX: 619-594-4938

Faculty

Emeritus: Blick, Eidemiller, Fredrich, Getis, Greenwood, Griffin, Johnson, Keen, Kiewiet de Jonge, McArthur, O'Brien, Pryde, Quastler, Stutz, Taylor, Wright, Yahr

Chair: O'Leary

The Stephen and Mary Birch Foundation Chair in Geographical Studies: Christakos

Professors: Aguado, Aitken, Christakos, Ford, Hope, Jankowski, O'Leary, Rey, Stow, Weeks

Associate Professors: Tague, Tsou

Assistant Professors: An, Bosco, Costello, Skupin

Offered by the Department

Doctor of Philosophy degree in geography.

Master of Arts degree in geography.

Master of Science degree in geography.

Concentration in geographic information science.

Concentration in watershed science.

Major in geography with the B.A. degree in liberal arts and sciences.

Emphasis in methods of geographical analysis.

Emphasis in natural resource and environmental geography.

Emphasis in physical geography.

Emphasis in urban and regional analysis.

Major in geography with the B.S. degree in applied arts and sciences

Emphasis in geographic information science.

Minor in geography.

Certificate in geographic information science.

The Stephen and Mary Birch Foundation Chair in Geographical Studies

The Stephen and Mary Birch Foundation Chair in Geographical Studies was created through the Birch Foundation's grant to the Department of Geography to endow a chair and create a Center for Earth Systems Analysis Research. Dr. George Christakos, internationally recognized for his expertise in theory and methodology of spatial analysis and mathematical modeling applied to environmental, ecological, health, and geographical systems, is the third holder of the chair.

The Major

Geography is the study of spatial aspects of the physical environment, human activities and landscapes, and the nature of their interactions. Geographers draw upon theories from both the physical and social sciences. As physical scientists, they study the processes and resulting features of the earth's surface, such as vegetation, climate, soils, landforms, and resources. As social scientists, geographers explore such topics as the arrangement of societies on the earth's surface, land use patterns, urbanization, resource and energy usage, and environmental conservation.

The Department of Geography offers a broad range of fields from which to select an emphasis. These include physical geography—focusing on scientific explanations of the earth's physical features and processes; natural resource and environmental geography—concerned with human impacts on the earth; urban and regional analysis—dealing with the form of cities and the dynamics of regional systems; methods of geographical analysis—providing a background in cartography, geographic information systems, remote sensing and spatial statistics. A comprehensive program is offered in general geography—encompassing topics from all of the emphases.

The department also offers a Certificate in Geographic Information Science. This program is for students interested in mapping, computer graphics, surveying, aerial photography, and the use of satellite technology to study earth resources. A variety of career opportunities exist for geography majors. In recent years many graduates with bachelor degrees have entered the fields of urban and environmental planning, both in the public and private sectors. Employment is also available as geographic information systems specialists, cartographers, park naturalists, and remote sensing specialists. The following represent some of the jobs held by recent graduates: environmental impact analyst, urban planner, cartographer, park ranger, transportation planner, travel agent, teacher, zoning investigator, terrain analyst. Some graduates have chosen to pursue opportunities in business where firms are interested in hiring college graduates with broad academic backgrounds.

Advising

All College of Arts and Letters majors are urged to consult with their department adviser as soon as possible; they are required to meet with their department adviser within the first two semesters after declaration or change of major.

Major Academic Plans (MAPs)

Visit <http://www.sdsu.edu/mymap> for the recommended courses needed to fulfill your major requirements. The MAPs Web site was created to help students navigate the course requirements for their majors and to identify which General Education course will also fulfill a major preparation course requirement.

Geography Major

With the B.A. Degree in Liberal Arts and Sciences (Major Code: 22061)

All candidates for a degree in liberal arts and sciences must complete the graduation requirements listed in the section of this catalog on "Graduation Requirements." No more than 48 units in geography courses can apply to the degree.

Graduation with Distinction. A student desiring to graduate with Distinction in Geography must meet the university requirements listed in the section of this catalog on "Graduation Requirements" and be recommended by the geography faculty.

General Geography Program

A minor in another department approved by the undergraduate adviser in Geography is required for this degree.

Preparation for the Major. Geography 101, 101L, 102. (7 units)

Language Requirement. Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to section of catalog on "Graduation Requirements."

Graduation Writing Assessment Requirement. Passing the Writing Proficiency Assessment with a score of 10 or above, or English 508W, 581W, 584W, or Rhetoric and Writing Studies 305W, 500W, 503W with a grade of C (2.0) or better. See page 81 in "Graduation Requirements" section for a complete listing of requirements.

Student Assessment. Passing Geography 495 with a grade of credit (Cr) to be taken during the fall or spring semester of the calendar year in which the student expects to graduate. Geography 495 is not included in the minimum units required for the major.

Major. A minimum of 27 upper division units in geography to include three units selected from each of the following groups: (a) Geography 321-336; (b) 353-354, 554-559, 585-586; (c) 370, 378, 483, 570-575; (d) 378, 401, 409, 504-511; (e) 380-381; (f) 385, 484, 581-588, and nine units from one of the following groups: (a) Physical: Geography 378, 401, 409, 504-511; (b) Natural Resource and Environmental: 370, 378, 483, 570-575; (c) Urban and Regional Analysis: 353-354, 385, 554-559, 585-586; (d) Methods of Geographical Analysis: 380-385, 484, 581-588; (e) Cultural: 354, 554, but not more than six units from Geography 312, 321-336. No course may be used more than once to satisfy this requirement.

Emphasis in Methods of Geographical Analysis

Students selecting this emphasis are not required to complete a minor in another department.

Preparation for the Major. Geography 101, 101L, 102, 104; Computer Science 106 or 107; Statistics 250 or comparable statistics course. (16 units)

Language Requirement. Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to section of catalog on "Graduation Requirements."

Graduation Writing Assessment Requirement. Passing the Writing Proficiency Assessment with a score of 10 or above, or English 508W, 581W, 584W, or Rhetoric and Writing Studies 305W, 500W, 503W with a grade of C (2.0) or better. See page 81 in "Graduation Requirements" section for a complete listing of requirements.

Student Assessment. Passing Geography 495 with a grade of credit (Cr) to be taken during the fall or spring semester of the calendar year in which the student expects to graduate. Geography 495 is not included in the minimum units required for the major.

Major. A minimum of 36 upper division units in geography to include Geography 385; 15 units selected from Geography 380-381, 484, 498, 581-588*; three units selected from each of the following groups: (a) 321-336; (b) 370, 483, 570-575; (c) 353-354, 554-559; six units selected from Geography 378, 401, 409, 504-511; and three units of upper division geography electives.

* Geography 595 may be used to satisfy three units in this group where appropriate and approved by the department.

Emphasis in Natural Resource and Environmental Geography

Students selecting this emphasis are not required to complete a minor in another department.

Students may select either track (a) Environmental Analysis or track (b) Environmental Policy.

Preparation for the Major. Geography 101, 101L, 102; Biology 100 and 100L; Political Science 102; Statistics 250 or comparable statistics course. (17 units)

Language Requirement. Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to section of catalog on "Graduation Requirements."

Student Assessment. Passing Geography 495 with a grade of credit (Cr) to be taken during the fall or spring semester of the calendar year in which the student expects to graduate. Geography 495 is not included in the minimum units required for the major.

Graduation Writing Assessment Requirement. Passing the Writing Proficiency Assessment with a score of 10 or above, or English 508W, 581W, 584W, or Rhetoric and Writing Studies 305W, 500W, 503W with a grade of C (2.0) or better. See page 81 in "Graduation Requirements" section for a complete listing of requirements.

Track (a): Environmental Analysis

Additional Preparation for the major. Mathematics 121 or 150; Chemistry 100; and Physics 107. (11-13 units)

Major. A minimum of 36 upper division units in geography to include Geography 370 and 385; three units from 380-381; three units from 321-336; six units from 378, 401, 409, 504-511, and three units from 353-354, 554-559.

An additional 15 units to be selected from 3 or 4 units from Geography 484 or 587, three units from 581-588, and nine units from 483, 570-575, 595.

Track (b): Environmental Policy

Additional Preparation for the major. Economics 101 or 102. (3 units)

Major. A minimum of 36 upper division units in geography to include Geography 370 and 385; three units from 380-381; three units from 321-336; six units from 378, 401, 409, 504-511, and three units from 353-354, 554-559.

An additional 15 units to be selected from 3 or 4 units from Geography 484, 581-588 and 12 units from 483, 570-575, 595.

Emphasis in Physical Geography

Students selecting this emphasis are not required to complete a minor in another department.

Preparation for the Major. Geography 101, 101L, 102; Mathematics 121 or 150; Chemistry 200; Physics 180A, 182A; Statistics 250 or comparable statistics course. (22-23 units)

Language Requirement. Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to section of catalog on "Graduation Requirements."

Graduation Writing Assessment Requirement. Passing the Writing Proficiency Assessment with a score of 10 or above, or English 508W, 581W, 584W, or Rhetoric and Writing Studies 305W, 500W, 503W with a grade of C (2.0) or better. See page 81 in "Graduation Requirements" section for a complete listing of requirements.

Student Assessment. Passing Geography 495 with a grade of credit (Cr) to be taken during the fall or spring semester of the calendar year in which the student expects to graduate. Geography 495 is not included in the minimum units required for the major.

Major. A minimum of 36 upper division units in geography to include Geography 380 or 381, 385; 15 units selected from Geography 378, 401, 409, 498, 504-511*; six units selected from Geography 484, 581-588; and three units selected from each of the following groups: (a) 321-336; (b) 353-370, 554-575; and three units of electives.

* Geography 595 may be used to satisfy three units in this group where appropriate and approved by the department.

Emphasis in Urban and Regional Analysis

Students selecting this emphasis are not required to complete a minor in another department.

Preparation for the Major. Geography 101, 101L, 102; Computer Science 106 or 107; Economics 102; Statistics 250 or comparable statistics course. (16 units)

Language Requirement. Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to section of catalog on "Graduation Requirements."

Graduation Writing Assessment Requirement. Passing the Writing Proficiency Assessment with a score of 10 or above, or English 508W, 581W, 584W, or Rhetoric and Writing Studies 305W, 500W, 503W with a grade of C (2.0) or better. See page 81 in "Graduation Requirements" section for a complete listing of requirements.

Student Assessment. Passing Geography 495 with a grade of credit (Cr) to be taken during the fall or spring semester of the calendar year in which the student expects to graduate. Geography 495 is not included in the minimum units required for the major.

Major. A minimum of 36 upper division units in geography to include Geography 385; 15 units selected from Geography 353-354, 498, 554-559, 572, 585-586*; six units selected from 378, 401, 409, 504-511; three additional units from each of the following groups: (a) 321-336; (b) 370, 483, 570-575; (c) 380-381; and three units of electives.

* Geography 595 may be used to satisfy three units in this group where appropriate and approved by the department.

Geography Major

**With the B.S. Degree in Applied Arts and Sciences
(Major Code: 22061)**

Emphasis in Geographic Information Science

Students selecting this emphasis are not required to complete a minor in another department.

Preparation for the Major. Geography 101, 101L, 102, 104; Biology 100, 100L; Chemistry 200; Computer Science 107, 108; Mathematics 121 and 122, or 150; Physics 180A, 182A; Statistics 250 or a comparable statistics course. (36-38 units)

Graduation Writing Assessment Requirement. Passing the Writing Proficiency Assessment with a score of 10 or above, or English 508W, 581W, 584W, or Rhetoric and Writing Studies 305W, 500W, 503W with a grade of C (2.0) or better. See page 81 in "Graduation Requirements" section for a complete listing of requirements.

Student Assessment. Passing Geography 495 with a grade of credit (Cr) to be taken during the fall or spring semester of the calendar year in which the student expects to graduate. Geography 495 is not included in the minimum units required for the major.

Major. A minimum of 37 upper division units to include Geography 381, 385, 484, 585, 587; and 21 units of upper division electives selected as follows: six units from Geography 483, 581-595; nine units from Geography 370, 378, 401, 409, 504-511, 570-575; three units from Geography 353-358, 554-559; three units from Computer Science 310*, 320.

* Additional prerequisite required.

Geography Minor

The minor in geography consists of a minimum of 18-19 units of geography to include Geography 101, 102 and one of the following areas:

Cultural: Six units from Geography 312, 354, 554, and six units selected from regional courses Geography 321-336.

Methods of Geographical Analysis: Nine units selected from Geography 380-385, 484, 581-589, and three units selected from any other upper division geography course.

Natural Resource and Environment: Nine units selected from Geography 370, 378, 483, 570-575, and three or four units selected from methods courses Geography 380-385, 484, 581-589.

Physical: Nine units selected from Geography 378, 401, 409, 504-511, and three or four units selected from methods courses Geography 380-385, 484, 581-589.

Urban and Regional Analysis: Nine units selected from Geography 353-354, 554-559, and three or four units from either methods or regional courses Geography 321-336, 380-385, 484, 581-589.

Courses in the minor may not be counted toward the major, but may be used to satisfy preparation for the major and general education requirements, if applicable. A minimum of six upper division units must be completed in residence at San Diego State University.

Geographic Information Science Certificate*

The purpose of the program is to prepare students to acquire, manage, and visualize geospatial data in public and private organizations. Students must apply for admission to the program before the completion of 12 certificate units and must complete the required units with a 2.5 grade point average.

The certificate requires 27 units distributed between the departments of Geography and Computer Science as follows: 12-15 units selected from Geography 104, 381, 484, 581-589, and 12-15 units selected from Computer Science 105, 107, 108, 220, 310, 320, 503, 514, 520, 535, 551, 575. Courses with relevant content (e.g. Geography 596 or Computer Science 596) may be substituted for the geography and computer science courses with the approval of the certificate adviser. Courses in the certificate may be counted toward the major in geography but may not be counted toward the minor.

* Additional prerequisites required for this certificate.

Courses (GEOG)

Refer to *Courses and Curricula and University Policies* sections of this catalog for explanation of the course numbering system, unit or credit hour, prerequisites, and related information.

LOWER DIVISION COURSES

GEOG 101. Principles of Physical Geography (3) [GE] I, II

Note: Cannot be used for General Education in combination with Anthropology 101.

Principles underlying the fundamental nature and dynamics of the physical world: the atmosphere, hydrosphere, biosphere, lithosphere, and their systematic spatial relationships.

GEOG 101L. Physical Geography Laboratory (1) [GE] I, II

Three hours of laboratory.

Prerequisite: Credit or concurrent registration in Geography 101.

Practical exercise and observation in map analysis, weather elements, climatic regions, and the earth's landform features. Designed to supplement Geography 101.

GEOG 102. Principles of Cultural Geography (3) [GE] I, II

Introduction to cultural geography, covering the elements of culture, such as technology, language, religion, political organization, methods of livelihood, settlement patterns and population, and the regional distribution of these elements over the earth. Field trips may be arranged.

GEOG 103. Weather and Climate (3) [GE] I, II

Note: Cannot be used for General Education in combination with Anthropology 101.

The composition, structure, and circulation of the atmosphere, including elementary theory of storms and other weather disturbances.

GEOG 104. Geographic Information Science and Spatial Reasoning (3) [GE]

Prerequisite: Satisfaction of the Entry-Level Mathematics requirement.

Fundamental concepts in geographic information systems, cartography, remote sensing, spatial statistics, and global positioning systems. Use of critical technologies in addressing human and environmental problems.

GEOG 106. World Regional Geography (3) [GE] I, II

Cultural and world geography, focusing on elements of culture as applied to regions of the world: ethnicity, language, religion, urbanization, economics, political organization. Alternative conceptions about geography held by children, adults, and individuals of different cultures.

GEOG 296. Experimental Topics (1-4)

Selected topics. May be repeated with new context. See *Class Schedule* for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

**UPPER DIVISION COURSES
(Intended for Undergraduates)**

GEOG 312. Culture Worlds (3) [GE] I, II

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences required for nonmajors.

Geographical characteristics and development of major cultural realms of the world. Spatial components of contemporary conflict within and between these regions. Not open to students with credit in Geography 106.

GEOG 321. United States (3) [GE] I, II

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences required for nonmajors. Recommended: Geography 101 or 102.

Systematic and regional analysis of physical and cultural landscapes of the United States.

GEOG 323. Middle America (3) [GE] I, II

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences required for nonmajors. Recommended: Geography 101 or 102.

The land and peoples of Mexico, Central America, and the islands of the Caribbean; a survey of the resources, economies, and trade of the region. Field trips may be arranged.

GEOG 324. South America (3) [GE]

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences required for nonmajors. Recommended: Geography 101 or 102.

The physical regions and human geography of South America, including the history of colonization and the exploitation of resources.

GEOG 336. Europe (3) [GE]

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences required for nonmajors. Recommended: Geography 101 or 102.

Systematic analysis of the geographic bases of modern European life. Regional investigation of countries of Europe except the Soviet Union.

GEOG 353. Location of Economic Activity (3)

Prerequisite recommended: Geography 101 or 102.

International arrangement and interrelationship of resources, production, exchange and consumption; principles and theory in industrial location; world trade and economic development selecting favorable locations for capital investments, determining growth potential of service and market areas, meeting environmental impact requirements.

GEOG 354. Geography of Cities (3) [GE] I, II

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences required for nonmajors. Recommended: Geography 101 or 102.

Survey of the location, function and spread of cities; the spatial and functional arrangement of activities in cities, leading to an analysis of current urban problems: sprawl, city decline, metropolitan transportation. Field trips may be arranged.

GEOG 370. Environmental and Natural Resource Conservation (3) [GE] I, II

Prerequisites: Geography 101 or 102; and completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences required for nonmajors.

Quality of environmental and natural resources within changing human and natural systems: pollution problems; preservation of open space, habitats, and wilderness; and conservation of natural resources.

GEOG 378. Environmental Geomorphology (3)

Prerequisites: Geography 101 and Mathematics 121 or 150.

Introduction to environmental physiographic dynamics. Assessment of man's role in these dynamics and their effect on urban and rural land use, including such topics as induced erosion, landslides, and flooding.

GEOG 380. Map Investigation (3) I, II

Two lectures and three hours of laboratory.

Prerequisite: Geography 101 or 102.

Use of the map as an analytical tool in geography. History of developments in cartography.

GEOG 381. Computerized Map Design (3) I, II

Two lectures and three hours of laboratory.

Prerequisite: Geography 101 or 102.

Art and science of creating digital maps as media for describing and analyzing geographic phenomena. Computer laboratory instruction and practice in cartographic techniques with emphasis on thematic maps and geographic information systems.

GEOG 385. Spatial Data Analysis (3) I, II

Prerequisites: Geography 101 or 102; Statistics 250 or comparable course in statistics.

Analysis of spatially distributed data including computer applications. Spatial sampling, descriptive statistics for areal data, inferential statistics, use of maps in data analysis.

GEOG 401. Geomorphology (3)

Prerequisite: Geography 101.

Morphology and genetic interpretation of the relief features of the earth's surface.

GEOG 409. Global Climate Change (3)

Prerequisite: Geography 101 or 103.

Global climate system and feedbacks with biosphere. Past climates and potential future changes, including changes in greenhouse gases, ozone depletion and acid rain. Predictions and uncertainty regarding changes including natural and anthropogenic causes.

GEOG 483. Watershed Analysis (3) II

Prerequisite: Geography 101.

Watershed analysis is an organizing framework for collecting and analyzing scientific information to facilitate environmental management. Framework examined from both an ecological process and an environmental management perspective.

GEOG 484. Geographic Information Systems (3)

Two lectures and three hours of laboratory.

Prerequisite: Three units from Geography 380, 381, 587, or from computer programming.

Procedures for encoding, storage, management, and display of spatial data; theory of computer-assisted map analysis; examination of important geographic information systems.

GEOG 495. Geography Capstone (1) Cr/NC

Prerequisite: Senior standing in geography or environmental sciences with an emphasis in watershed science with expectation of graduation within next calendar year.

Synthesis of knowledge gained by students in upper division geography courses at SDSU, based on in-class essays and creation of a portfolio outlining learning experiences in geography. Practical information to prepare for professional employment.

GEOG 496. Selected Studies in Geography (3)

Prerequisite: Six units in geography.

Critical analysis of problems within a specific field of the discipline. May be repeated with new content. See *Class Schedule* for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit six units. Field trips may be arranged.

GEOG 498. Senior Thesis (3)

Prerequisite: An overall grade point average of 3.0 and consent of department.

A written thesis based on an individual research project.

GEOG 499. Special Study (1-3) I, II

Individual study. Maximum credit six units.

UPPER DIVISION COURSES (Also Acceptable for Advanced Degrees)

GEOG 504. Coastal and Submarine Geomorphology (3)

Prerequisites: Geography 101 and Mathematics 121 or 150.

Analysis of marine waves, of their modification in shallow waters, of coastal currents and tides. Interpretation of coastal and submarine relief in relation to environmental processes and their modification by humans. Field trips may be arranged.

GEOG 505. Fluvial Geomorphology (3) I, II

Prerequisite: Geography 401.

Physical foundation of river systems. Geographic variability in river channels and influence of human activities on fluvial forms and processes. Role of fluvial geomorphology in river and watershed management. Field trips may be arranged.

GEOG 507. Geography of Natural Vegetation (3) I

Prerequisite: Geography 101.

The natural vegetation associations of the world, their distribution, classification and development, including relationship to human activities. Field trips may be arranged.

GEOG 508. Environmental Climatology (3)

Prerequisites: Geography 103; Mathematics 121 or 150.

Interaction between the atmosphere and earth surface. Solar and thermal radiation, turbulent heat transfer, soil heat transfer. Change in the atmosphere due to natural variations and human activity. Impacts on the environment.

GEOG 509. Regional Climatology (3)

Prerequisite: Geography 103.

The causes of climatic types as they occur throughout the world. Principles of several climatic classifications.

GEOG 511. Hydrology and Global Environmental Change (3)

Prerequisites: Geography 101 or 103.

Hydrologic processes and regimes, how these are affected by environmental change and how hydrologic process and regimes affect patterns of environmental change. Processes operating at global, regional, and local scales are examined, including land-use/land-cover change and climate change.

GEOG 554. World Cities: Comparative Approaches to Urbanization (3) II

Prerequisite: Geography 354.

Worldwide trends in urbanization. Case studies of selected cities from various culture areas with focus on international variations in city structure and urban problems.

GEOG 556. Location and Spatial Structure of Cities (3)

Prerequisite: Geography 354 or three units of upper division coursework in a related field.

Principles and characteristics of urban growth and settlement; the internal structure and functioning of urban centers; spatial models of urban land use; growth management, transportation problems, and sociopolitical urban problems. Field trips may be arranged.

GEOG 559. Urban Transportation Geography (3)

Prerequisite: Three units of upper division urban or transportation coursework in geography or related field.

Urban transportation networks and their effects, past, present and future, on the economy and physical structure of the urban region. Field trips may be arranged.

GEOG 570. Environmental Resource Conservation (3)

Prerequisite: Geography 370.

Management of environmental and natural resources. Effective programs and the institutional frameworks in which they occur.

GEOG 572. Land Use Analysis (3) II

Prerequisite: Geography 370.

Problems of maintaining environmental quality in the process of land conversion from rural to urban uses with emphasis on land capability and suitability studies. Field trips may be arranged.

GEOG 573. Population and the Environment (3)

Prerequisite: Geography 102.

Population distribution, growth, and characteristics as they relate to environmental degradation, both as causes and consequences. Roles of women, sustainable development, carrying capacity, optimum population, and policy initiatives in relationships between population and environment.

GEOG 574. Water Resources (3)

Prerequisite: Geography 370.

Occurrence and utilization of water resources and the problems of water resource development. Field trips may be arranged.

GEOG 575. Geography of Recreational Land Use (3) I

Prerequisite: Geography 101 or 102.

Importance of location and environment in the use, management, and quality of recreation areas. Field trips may be arranged.

GEOG 581. Cartographic Design (3)

Two lectures and three hours of laboratory.

Prerequisite: Geography 381.

Computer-assisted map production techniques with emphasis on map design and color use.

GEOG 583. Internet Mapping and Distributed GIServices (3)

Two lectures and three hours of laboratory.

Prerequisite: Geography 381 or 484.

Current development of Internet mapping and cartographic skills for web-based maps (multimedia, animation, and interactive design). Fundamental theories of distributed GIS to support Internet mapping with focus on distributed component technologies, Internet map servers and web services. Not open to students with credit in Geography 582.

GEOG 584. Geographic Information Systems Applications (3)

Two lectures and three hours of laboratory.

Prerequisite: Geography 484 or 588.

Conceptualization, completion, and implementation of geographic information systems (GIS) at local, regional, national, and global levels. Spatial analysis and modeling with GIS. GIS in planning, management, and research.

GEOG 585. Quantitative Methods in Geographic Research (3)

Prerequisite: Geography 385.

Application of statistical techniques to geographic research including simple regression and correlation, multiple regression, classification, factor analysis, and computer applications.

GEOG 586. Qualitative Methods in Geographic Research (3) II

Prerequisite: Geography 102.

Application of qualitative techniques to geographic research including reflexive survey design and in-depth interviews, non-obtrusive methods, landscape interpretation, textual methods and discourse analysis, feminist criticism, and humanistic and historical materialist perspectives on measurement.

GEOG 587. Remote Sensing of Environment (4) I

Three lectures and three hours of laboratory.

Prerequisite: Geography 101. Recommended: Physics 180A-180B.

Techniques for acquiring and interpreting remotely sensed data of environment. Electromagnetic radiation processes, aerial photographic systems, and human interpretation of aerial and satellite imagery. Geographic analysis of selected terrestrial, oceanographic, and atmospheric processes and resources. (Formerly numbered Geography 488.)

GEOG 588. Intermediate Remote Sensing of Environment (4) II

Three lectures and three hours of laboratory.

Prerequisites: Geography 385 and 587.

Multispectral remote sensor systems and interpretation of imagery from nonphotographic systems. Computer-assisted image processing. Geographic analysis of selected terrestrial, oceanographic, and atmospheric processes.

GEOG 589. GIS-Based Decision Support Methods (3)

Prerequisite: Geography 484.

Integration of Geographic Information Systems (GIS) with decision support techniques for problem-solving and decision-making. Public participation and collaborative use of GIS for location-based planning and resource management.

GEOG 595. Geographic Internship (3) I, II

Prerequisites: Six upper division units in geography and consent of instructor.

Students will be assigned to various government agencies and industry and will work under the joint supervision of agency heads and the course instructor. Maximum credit three units.

GEOG 596. Advanced Topics in Geography (1-3)

Prerequisite: Six upper division units in geography.

Advanced special topics in geography. See *Class Schedule* for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum combined credit of six units of 596 and 696 applicable to a 30-unit master's degree.

GRADUATE COURSES
Refer to the *Graduate Bulletin*.

