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# Geographic Science

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**GEOG 161. Geospatial Tools and Techniques.** *1-6 credits, variable.*

An introduction to the use of geospatial tools, such as geographic information systems (GIS), global positioning systems (GPS) and remote sensing, applied to a variety of areas, including cultural geography, environmental science, ecology, geology and public planning.

**GEOG 200. Geography: The Global Dimension.** *3 credits.*

This course promotes global understanding through the study of humans, their institutions and processes, and the resulting interactions between humans and the environment. The course will include the study of Western and non-Western peoples and their social, cultural, political and economic relationships. May be used for general education credit.

**GEOG 210. Physical Geography (2, 2).** *4 credits.*

This introductory course is an examination of systems and processes that influence patterns of Earth's atmosphere, biotic communities, soils and landforms at multiple spatial and temporal scales. Included are classroom and laboratory experiences that are geared toward investigating interrelationships among atmospheric conditions, Earth's natural surface characteristics and human-induced modifications of Earth's features.

**GEOG 215. Cartography and GIS.** *3 credits.*

An introduction to cartography and geographic information systems (GIS). Basic concepts will be illustrated with examples from a variety of application areas including cultural geography, environmental science, land use and planning and business.

**GEOG 216. Earth Observation and GPS.** *3 credits.*

An introduction to remote sensing, global positioning system (GPS) and computer fundamentals in Geographic Science. Basic concepts will be illustrated with practical applications, including hands-on work collecting data with GPS units and exploring remote sensing images from a variety of different instruments. Environmental applications will be featured.

**GEOG 230. Spatial Thinking and Problem Solving.** *3 credits.*

Introduction to the critical thinking skills associated with problems with inherent spatial components. Identification of the spatial elements of a given problem, the data requirements for addressing that problem, collections/acquisitions and organization of data, and use of geographic information systems to explore spatial patterns relevant to the problem of interest. *Prerequisite:* [GEOG 215](#) with a "C" or better, [GEOG 216](#) with a "C" or better and an introductory course in statistics ([ISAT 251](#) or equivalent) or permission of instructor.

**GEOG 260. Selected Topics in Geography.** *3 credits.*

Exploration of geographic topics, tools or techniques of current interest. Can be repeated as course content changes.

**GEOG 280. Human Geography: The Cultural Landscape. 3 credits.**

The course themes are human culture, cultural variations over the face of the Earth and how these variations are related to selected global issues. Topics covered include world demographics, world religions and languages, patterns of human migration, political systems and human conflict, agricultural systems and impact on the physical world.

**GEOG 290. Human-Environment Interactions. 3 credits.**

This course evaluates human-environment interactions from a holistic point of view. It incorporates geographic perspectives of these interactions, which include political, cultural, social, economic, and ethical factors that influence how people perceive, impact, and manage the natural world. The course will emphasize geographic theories of resource use, humans as part of the landscape and human vulnerability to environmental changes. *Prerequisites:* [GEOG 210](#) with a "C" or better and [GEOG 280](#) with a "C" or better.

**GEOG 300. Population Geography. 3 credits.**

An introduction to population measurement, sources of population data and modern population problems. Topics include distribution, the changing age structure and migration issues affecting the U.S. At the global scale, topics include distribution, global migration patterns, the refugee crisis and prospects for feeding the rapidly increasing human population.

**GEOG/HUMN 301. Introduction to Natural Disasters. 3 credits.**

This course is designed to give students an overview of the various types of natural disasters; a look at the world regions that are most vulnerable to each type of disaster; and, a preview of disaster planning, management, relief and response as related to natural disasters.

**GEOG 305. History and Philosophy of Geography. 3 credits.**

Topics from the classical period to the modern period include 20th century theories and paradigm shifts involving cultural geography, physical geography, human-environment traditions, regional geographies and modeling. Diverse philosophies such as quantitative /positivist, qualitative/humanistic, social theory, and GIS are viewed for their contributions to the discipline of geography. *Prerequisites:* A grade of "C" or better in [GEOG 210](#) and [GEOG 280](#), and junior standing or permission of the instructor.

**GEOG/GEOL 310. Environmental Issues. 1-4 repeatable credits, no limit.**

Courses cover environmental issues such as air pollution, forest and wildlife management, water, resource management, soils and land use, and energy and the environment (among other topics). Courses examine the interface between humans and environmental systems while addressing the impact of social, economic and political systems and activities on the environment. May be repeated as course content changes.

**GEOG 311. Endangered Environments. 3 credits.**

In this course an investigation is made of a selected number of environmental problem areas around the world. Some examples include the temperate rainforest of Valdivia, South America, the tropical rainforests of Borneo and the Aral Sea of Eastern Europe. In the course, students will explore physical aspects of each environment and explore human impact and potential solutions to the problems.

**GEOG 315. Field Studies in Geography. 3 credits.**

This course exposes students to the methods and techniques commonly used by geographers while conducting fieldwork. The course will cover identifying and defining a researchable project, designing and testing data collection methods, and different methods of collecting, recording and presenting data. Students will also become familiar with various types of field equipment.

**GEOG 320. Human Dimensions of Global Change. 3 credits.**

This course addresses global change and human development. Conservation, sustainability and development are core themes that will be related to current changes occurring on a global scale. Global changes to be discussed in the course relate to the climate, biodiversity, natural resources and human populations. Sustainability will be introduced as a dimension of human development. *Prerequisite: [GEOG 290](#) with a “C” or better.*

**GEOG 322. Agricultural Systems. 3 credits.**

This course covers four distinct areas: the foundation of agriculture, the nature and distribution of soils on a global basis; the history of agriculture from the original selection of domestic crops to the 20th century; modern industrial agriculture and trade; and alternatives to chemical and energy intensive agriculture in the 21st century. *Prerequisite: [GEOG 290](#) with a “C” or better or permission of instructor.*

**GEOG 323. The Geography of Human Genetics, Infectious Diseases and Diet. 3 credits.**

Throughout history, infectious diseases have profoundly affected human populations. Using a case study approach, this course will give students an opportunity to investigate social and historical aspects of infectious disease as well as the microbiology, genetics, biochemistry and medical aspects of human infectious diseases and diet.

**GEOG 325. Environmental Ethics. 3 credits.**

Examines the basic principles of resource use including geographic, economic, social and political processes. Explores concepts underlying such issues as resource consumption and conservation, environmental perception, resource and environmental conflict, population growth and control, carrying capacity, and the evolution of the environmental movement.

**GEOG 327. Climatology. 3 credits.**

The systematic study of the atmosphere with emphasis on such phenomena as temperature, pressure, humidity, air masses and fronts; the occurrence of these phenomena on a global basis; and a detailed survey of the worldwide distribution of climate types. *Prerequisite: [GEOG 210](#) with a “C” or better or [GEOL 320](#).*

**GEOG 329. Global Climate Change. 3 credits.**

This course examines the interrelationship of the physical nature of the climate system, climate variability and change, and human activities. Case studies (El Nino, global warming, and stratospheric ozone depletion) are used to investigate how climate affects society, how human activities affect climate, and how non-climatic issues complicate our understanding of the relationship between climate and society. We consider how projections of future weather and climate affect decision-making. *Prerequisite: [GEOG 210](#) with a “C” or better.*

**GEOG 331. Geography of Virginia. 3 credits.**

The course will examine the human and physical geography of the development of modern-day Virginia, providing an overview of its prehistory, then tracing its development from the beginning of the seventeenth century through the present.

The course will include an analysis of Virginia's population, resources, and regional landscapes as they have been influenced by physical, cultural, historical, and economic factors. The relationship of Virginia to the rest of the world will also be examined.

**GEOG 332. Geography of Europe. 3 credits.**

Geographic assessment of regional and national characteristics of the European nations.

**GEOG 333. Geography of Russia and the Former Soviet Union. 3 credits.**

A study of the people and culture of Russia with an emphasis on their social, economic and political processes and situation. An analysis of how the interaction of geographic, social, political and economic factors affect the lives of the Russian people.

**GEOG 334. Geography of East and Southeast Asia. 3 credits.**

A survey of the physical and cultural environments of China, Taiwan, Japan, the Koreas, Indochina and the countries of Southeast Asia. Topics covered include weather and climate, physiography, natural resources, population characteristics, political systems, aspects of the economy and the role that each country plays on the regional and world stage.

**GEOG 335. Geography of Africa. 3 credits.**

An introduction to the regional geography of Sub-Saharan Africa that examines the physical geography of the continent, the historical roots of its present political geography, the consequences of its colonial past on communities and cultures as well as its natural resources. Students will examine continental issues such as resource management, food production, hunger, disease patterns and management of wildlife.

**GEOG 336. Environmental Hazards: A Focus on Southeast Asia. 3 credits.**

This course will focus on interactions between earth surface systems and social environments to demonstrate the complexity of natural hazards, and particularly those of Southeast Asia. Through regional geography, students will learn differing adaptation mechanisms of societies and cultures unique to the area and some of the natural hazards within the region. *Prerequisite: [GEOG 210](#) with a "C" or better or permission of instructor.*

**GEOG 337. Geography of Latin America. 3 credits.**

A study of countries in Latin America which includes their physical landforms, weather and climate, biogeography, natural resource base, attitudes toward the physical environment, characteristics of the economy, the current political role in international activities, and population characteristics that include growth rate, distribution, migration and ethnicity.

**GEOG 338. Geography of the Philippine Islands: Problems and Possibilities. 3 credits.**

Exploration of the Philippines focuses on poverty, environmental conservation, resource exploitation and ecosystem degradation in upland and marine environments. Topics include population dynamics, political pressure and instability, and urban challenges. The future of the country is investigated on all geographic scales with regard to its role in a globalized world economy.

**GEOG 339. Geography of the Caribbean. 3 credits.**

This course is designed to give students a general geographical overview of the islands states and territories surrounded by the Caribbean Sea. Students will study physical landforms, weather and climate, environmental issues, population

characteristics, history, local and regional politics, and economic aspects of political units in the region.

**GEOG 340. Biogeography. 3 credits.**

This course emphasizes geographical biogeography and is as an advanced physical geography class. Included are analyses of spatial patterns of biota from local to global scales and examinations of the systems and processes that result in spatial and temporal patterns of species existence and diversity, community composition, energy pathways, adaptive traits, and human influences on biotic systems and processes.

*Prerequisite:* [GEOG 210](#) with a "C" or better.

**GEOG 341. Wilderness Techniques. 3 credits.**

Wilderness legislation, legal mandates and wilderness issues are examined. Human impacts due to overuse or conflicting uses are studied, as are the philosophical aspects of wilderness ethics. This course is taught entirely in the field. Camping and hiking are required. *Prerequisite:* *Permission of the instructor.*

**GEOG 342. Management and Protection of Natural Resources. 3 credits.**

This course provides a managerial perspective for protection and management of natural resources. A systems approach for applied management strategies is provided for aquatic, terrestrial, threatened and endangered ecosystems. Topics include application of state, federal, international laws, regulations, policies and guidelines. Students develop management plans and explore jurisdictional resource protection issues.

**GEOG 343. Wildlife Management. 3 credits.**

An introductory discussion of applied management strategies for wildlife species and their ecological requirements is provided relative to human influences. Management techniques that are useful for determining population or health status are demonstrated for select vertebrate species. The evolution of wildlife laws, polices and management strategies are addressed to provide relevant awareness into the appropriate concepts of wildlife management.

**GEOG 344. Economic Geography and Development Issues. 3 credits.**

An overview of the classification of economic activities, the factors involved in the location of various types of economic activities and the regional variation in the standard of living associated with economic development. Additional topics include regional economic growth and types of economic systems and development perspectives, the roles that politics and demographics play in the economic development of a country, and the globalization of economic activities.

**GEOG 345. Geography of Poverty. 3 credits.**

This course provides a geographical perspective on poverty faced by communities and countries of the world today. The focus is on how poverty is defined, measured and mapped, the causes and impacts of poverty, theories for ending poverty and organizations that work to address poverty. It includes a geographical study of communities and countries that have successfully alleviated extreme poverty.

**GEOG 348. Indigenous Geographies. 3 credits.**

This course introduces indigenous geographic representations. Topics include territorial sovereignty, traditional resource use, sustainable development and protection of sacred sites. Students will explore the central geographic practice of cartography, which has taken on new meaning as cultural identification for Indigenous peoples. The use of

new technologies to represent traditional understandings of Earth is also explored.

*Prerequisite:* [GEOG 290](#) or permission of instructor.

**GEOG 350. Topics in Geography. 3 credits.**

Examination of geographic topics that are of current interest. Can be repeated as course content changes. *Prerequisite:* [GEOG 200](#), [GEOG 210](#), [GEOG 215](#) or [GEOG 280](#), or permission of the instructor.

**GEOG/HUMN 360. GIS for Humanitarian Assistance. 3 credits.**

In responding to humanitarian crises, governments and aid organizations must deploy aid workers, deliver essential services, set up temporary settlements, and distribute items such as water and food that are needed for survival. Spatial analysis and maps are critical to the success of these efforts. In this course, students learn the basics of Geographic Information Systems (GIS) for humanitarian assistance and learn how relief organizations use GIS in their work.

**GEOG 365. Cartography and Geospatial Visualization. 3-6 credits.**

This course examines the fundamentals of visualizing spatial data in static and dynamic environments. Students will learn about cartographic design, thematic cartographic techniques, developing spatial data from non-spatial information and with GPS equipment, and geographic visualization. Students will also develop a portfolio of hard copy and soft copy visualizations. *Prerequisite:* [GEOG 215](#) with a "C" or better.

**GEOG 366. Introduction to Geographic Information Science. 3 credits.**

An overview of geographic information science and its role in technology and society. Spatial databases and descriptive data will be created and implemented into various geographic information systems. Advanced analytical operations will be used to practice the analysis capabilities of geographic information systems. *Prerequisites:* [GEOG 215](#) with a "C" or better or [GEOG 161](#) and permission of the instructor.

**GEOG 375. Political Geography. 3 credits.**

Geopolitical conflicts and issues are examined. Concepts such as territoriality, nationalism, religious and ethnic struggle, environmental degradation, and freedom and justice are discussed in the context of political unrest. Significant geopolitical theories and social and economic processes are explored.

**GEOG 376. Urban Geography. 3 credits.**

Study of the city in its geographic setting, giving perspective of modern urban problems, origin and growth of cities and influence of location on city functions. Looks at the internal structure of cities and the influence of the internal structure on its population groups.

**GEOG 380. Cultural Geography. 3 credits.**

Introduction to cultural geography with emphasis on diversity of language, religion and folklore, as well as culture traits and practices and their historical diffusion. Ties to livelihood, the rural-urban continuum and demographic change are explored, as are foci on philosophy, power, race, class and gender. Exploitation and sustainability will be introduced as dimensions of cultural and environmental interaction.

**GEOG 385. Principles of Remote Sensing (2, 2). 3-6 credits.**

This course is an introduction to remote sensing, the study of images and other types of data acquired by satellites and aircraft. Topics include the principles underlying multiple type of remote sensing, the properties of common data types, making measurements using aerial photographs, basic digital image processing, and applications. *Prerequisite:* [GEOG 216](#) with a "C" or better.

**GEOG 390. Practicing Geographic Science. 1 credit.**

Professional development for students in geography. Educational opportunities and career options. Library and literature research skills. *Prerequisite: Junior standing.*

**GEOG/BIO 402. Forest Ecology. 4 credits.**

A study of the function, structure, and composition of forested ecosystems. The effect of physiography on the distribution of forest communities will be explored. Issues of forest management and restoration will also be considered. Field laboratory topics will include dendrology and sampling techniques within different forest successional stages. *Prerequisite: [BIO 124](#) or permission of the instructor.*

**GEOG 406. Forest Inventory: A Geospatial Approach. 3 credits.**

This course teaches forest measurement at the tree, plot, stand, and forest levels. It includes heights, stem diameters, volumes, and biomasses of individual trees; fixed and variable radius plots; basal area estimates; sampling designs, and stand and stock table construction. Students learn how geospatial technologies can be used to collect data on forests, make forest inventories more accurate and precise, and assist in performing forest-related analyses and visualizations. *Prerequisite: [GEOG 230](#) or permission of instructor.*

**GEOG 410. Geography and Film. 3 credits.**

This course is concerned with the intersection of geography and film. An always-present undercurrent focuses on films whose location and/or culture are an essential backdrop in the cinematic experience. *Prerequisite: [GEOG 290](#) or permission of instructor.*

**GEOG 415. Environment, Landscape and Culture. 3 credits.**

This seminar analyzes human-environment interactions as shaped by cultural perceptions, past events, and ecological processes. Place-based and interdisciplinary, landscape studies focus on the unique circumstances of a location and shift temporal and geographic scales to achieve broader understandings of cultural and ecological adaptation and resilience. Methods of historical ecology and field research are introduced. Regional projects underscore readings and research assignments. *Prerequisite: [GEOG 290](#) or permission of instructor.*

**GEOG 427. World Water Resources. 3 credits**

Humans face water challenges that can be understood through the lens of geography. Students will study different physical aspects of Earth's water, including the hydrologic cycle, climate controls of precipitation, river basin hydrology, water quality and availability, and aquatic ecosystems. The course investigates human dimensions of water such as economics, disease, management and planning, conflict, and the future of water resources. *Prerequisite: [GEOG 210](#) or permission of instructor.*

**GEOG/ISAT 429. Sustainability: An Ecological Perspective. 3 credits.**

This course examines present global environmental impacts and efforts made to change production and consumption patterns toward those that reduce impact on ecosystems or promote increased ecosystems health. The focus lies in understanding the basic resources of productivity including soils, agricultural systems, agroforestry, forestry and aquatic environments and applying solutions on a personal and community level. *Prerequisite: [GEOG 290](#) or permission of the instructor.*

**GEOG 430. Geography of Crop Plants. 3 credits.**

This course evaluates the influence of geography on crops and crop development by examining the evolution, genetic diversity and cultivation of agricultural crops.

Topics include the origins of agriculture, patterns of geographic spread, and the interrelationships between domesticated plants and the societies that grow them.

**GEOG 440. Global Biodiversity. 3 credits**

This project-based course emphasizes physical and human-oriented processes that influence Earth's biodiversity. It includes how human constructs influence the number of species counted, biodiversity measurement techniques and how geographers contribute to conservation methods. It introduces human challenges that are causing a decline in biodiversity and resultant impacts on human quality of life. *Prerequisites:* [GEOG 290](#) and [GEOG 340](#).

**GEOG 465. Topics in GIS. 3 credits.**

The course examines varying topical issues in geographic information science. The course may be repeated as course topics vary. *Prerequisite:* [GEOG 366](#) or permission of the instructor.

**GEOG 466. GIS and Geographic Databases. 3 credits.**

An introduction to the creation, use and management of digital spatial data used by industry and government. Integration of large spatial data sets into the geographic information system, data management and data exchange, and the geodetic transformation of data sets are emphasized. Digital elevation models, land use data, population data, digital topographic map and street network data will be used. *Prerequisite:* [GEOG 366](#) or permission of the instructor.

**GEOG 467. GIS Project Management. 3 credits.**

An introduction to geographic information systems (GIS) project management. Basic project management techniques will be applied by defining, designing, implementing and documenting a geographic information system. *Prerequisite:* [GEOG 366](#) or permission of the instructor.

**GEOG 468. Internet Geographic Information Systems. 3 credits.**

Theoretical and practical exploration of methods, standards and policies related to the development and utilization of geographic information systems on the Internet. Students will create and utilize distributed geospatial data and analytical systems using the World Wide Web and the Internet to address geographical problems. *Prerequisite:* [GEOG 365](#) or [GEOG 366](#).

**GEOG 469. Applications of Geographic Information Systems. 3 credits.**

The course advances the knowledge of GIS in theory and practice by focusing on specific application areas. Spatial databases and complex attribute data will be created, and GIS modeling techniques will be used to solve problems relevant to the specified topical area. The course may be repeated once for additional credit when the topic changes. *Prerequisite:* [GEOG 366](#) or permission of the instructor.

**GEOG 470. Senior Seminar in Environmental Conservation, Sustainability and Development. 3 credits.**

This capstone seminar integrates the student's previous class experiences to provide a holistic exploration of linkages between environmental conservation and human development status and strategies through in-depth analysis of compelling human-environment issues. Topics vary by semester and include environmental politics, global perspectives on population, sustainable communities and global biodiversity. For majors and minors only. *Prerequisites:* [GEOG 290](#) and senior standing.

**GEOG 476. Sustainable Cities Seminar. 3 credits**

This seminar explores ways to make cities more environmentally, socially and economically sustainable. Students will study key urban sustainability principles, examine global case studies, undertake local fieldwork and pursue projects developing interventions in real-world city settings. The course emphasizes a geographical approach in addressing urban human and environmental challenges. *Prerequisite:* [GEOG 290](#).

**GEOG 485. Processing Remotely Sensed Data. 3 credits.**

This course focuses on computer-based techniques for processing remotely sensed data and applications of these techniques. Subjects covered will include geometric and radiometric correction, image enhancement, data transformations, change detection and quantification, and classification. Both traditional techniques and techniques designed for newly available data types will be examined. *Prerequisite:* [GEOG 385](#) or permission of the instructor.

**GEOG 486. High Spatial Resolution Remotely Sensed Data. 3 credits.**

This course focuses on the acquisition and use of high spatial resolution remotely sensed data. Topics include aerial photograph acquisition, digital terrain model creation, orthorectification, object oriented image processing, image fusion, visual image interpretation, collecting and processing LiDAR data, and ethical and legal issues associated with high spatial resolution data. *Prerequisite:* [GEOG 385](#) or permission of the instructor.

**GEOG 490. Senior Research or Field Practicum. 3 credits.**

Working with a research adviser, student completes an internship, a study abroad program, or project research. Student delivers interim progress reports and an annotated bibliography or other relevant research products. May be repeated once. *Prerequisites:* [GEOG 390](#) and permission of their research adviser.

**GEOG 491. International Studies. 1-3 credits.**

Student will make arrangements for the international experience. A research project or work-study project will be designed by the student and faculty member prior to departure. The research of work will be carried out in the country of travel. May not be taken for capstone credit. Project must be approved by GS faculty. May be repeated for credit.

**GEOG 495. Internship in Geography. 3-6 credits.**

Practical experience within a public agency, non-profit or private business utilizing geographic methodology. Work experience will be supervised by an official of the business or agency and a faculty member. Periodic seminars and written reports are required. *Prerequisites:* Permission of the faculty sponsor and the GS Program Operations Manager. May not be taken for capstone credit.

**GEOG 497. Independent Study. 3 credits.**

Student performs an independent research project, either alone or within an investigative team, to identify and analyze a problem from a geographic perspective. *Prerequisite:* Permission of the instructor. May not be taken for capstone credit.

**GEOG 499 A, B, C. Honors. 1-3 credits.**

Year course.