The course will focus on the topic of matter: particle theory, forms, characteristics, properties, atomic theory and models, conservation of mass and energy, nuclear reactions, heat transfer within matter, chemical bonds and chemical structures.

**GSCI 164. Physical Science: Learning Through Teaching.** 2 credits.

A hands-on conversation on how technology, science and engineering come together to describe our world. The course will cover many of the traditional concepts presented in an introductory physics course. The course will treat coordinate systems and their use in describing motion, forces and energy conservation, thermodynamics (temperature, pressure, heat), light (color, ray model, wave model), waves (sound, magnetism, and electricity. The course will indirectly reinforce skills developed in other courses in the cluster including scientific tools (mathematics, graphing, diagramming, experimenting and analyzing data) and using informational resources. Corequisite: GSCI 163.

**GSCI 165. The Way Life Works.** 1 credit.

Patterns, energy, information, life's machinery, feedback, community and evolution. These are major themes in how life works. This course will use these themes as a backdrop for looking at the way life works.

**GSCI 110. Social Issues in a Global Context.** 3 credits.

An examination of current social issues, such as inequality and the changing workplace. Addresses questions of definition, nature, history, patterns and trends of various issues. Examines applicable theories and available research, social controls and social policy.

**GSCI 140. Microsociology: The Individual in Society.** 3 credits.

This course introduces the discipline of sociology and the subfield of microsociology. We examine the mutually constitutive relationship between the individual and society. Questions addressed include: How does society influence how we think, feel, believe, act, and interact with others? What influences the self, social identity, shared social meanings, social roles, and one's position in society? How do we, as individuals and as members of social groups, recreate, contest, and change society?

**GTHE 210. Introduction to Theatre.** 3 credits.

Study of the theatre as an art form. Emphasis on introducing students to a broad spectrum of theatrical activity and opinion. Consideration of the components that comprise a theatre event including acting, directing, design, costume, lighting and playwriting.

**GWRTC 103. Critical Reading and Writing.** 3 credits.

Fosters reflective, critical reading, writing, and research in public discourse, culture, humanities, technology, and science. Challenges students to consider cross-disciplinary modes of inquiry through multiple genres with an attention to enlightened, global citizenship. Emphasizes revising for rhetorical effectiveness. GWRTC 103 fulfills the General Education Cluster One writing requirement and is a prerequisite for all WRTC courses numbered 200 or above.

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**Geographic Science**

**Department of Integrated Science and Technology**

**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.

**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. Geospatial Tools I – 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.


An introduction to remote sensing, global positioning systems (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 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 inherent with spatial components. Identification of the spatial elements of a given problem, the data requirements for addressing that problem, collections/ acquisition, and organization of data and use of geographic information systems to explore spatial patterns relevant to the problem of interest. Prerequisites: GEOG 215, GEOG 216 and an introductory course in statistics (GIBS 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 Interactions with the Physical Environment.** 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 and GEOG 280.

**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 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/postivist, qualitative/humanistic social theory and GIS are viewed for their contributions to the discipline of geography. Prerequisite: 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 changes 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 related to the climate, biodiversity, natural resources and human populations. Sustainability will be introduced as a dimension of human development. Prerequisite: GEOG 290 or permission of instructor.

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 or permission of instructor.

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, wind, 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.

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 Korea, 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. Prerequisite: GEOG 290 or permission of the 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 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.

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 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 350. Topics in Geography. 1-3 credits.
Examination of geographic topics that are of current interest. Can be repeated as course content changes. Prerequisite: Permission of instructor.

GEOG 355. Cartography and Geospatial Visualization. 3 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 visualizations. Students will also develop a portfolio of hard copy and soft copy visualizations. Prerequisite: GEOG 215.
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. Prerequisite: GEOG 215 or 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.

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 types of remote sensing, the properties of common data types, making measurements using aerial photographs, basic digital image processing and applications. Prerequisite: GEOG 216.

GEOG 390. Research Design. 1 credit.
The first in a sequence of three courses designed to involve students in capstone research projects. This course focuses on identifying and designing a research project. Prerequisites: Junior standing and permission of the instructor.

GEOG/BIO 402. Forest Ecology. 4 credits.
A study of the function, structure, and composition of forested ecosystems. The effect of geography 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 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 ecosystem 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 320, senior standing or permission of instructor.

GEOG 430. Geography of Crop Plants. 3 credits.
A study of the function, structure, and composition of forested ecosystems. The effect of geography 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 instructor.

GEOG 436. 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 366 or permission of instructor.

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 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. Prerequisite: GEOG 220, senior standing or permission of instructor.

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 365 or permission of 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 365 or permission of instructor.

GEOG 490. Senior Research or Field Practicum. 3-6 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. 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. 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 496. Senior Thesis III. 2 credits.
Student completes an independent research project, either alone or within an investigative team, to identify and analyze a geographic problem or phenomenon, and provides a written report and public presentation on the problem analysis and solution. Prerequisites: GEOG 490 and senior standing. Taken during final semester of the GS program.

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. Honors. 6 credits. Year course.

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