

COURSES FOR GEOGRAPHY AND THE ENVIRONMENT

Geography and the Environment Courses

GY500 Research Traditions Meth In Gy

Hours 3

An investigation of the historical development of geography, including its changing philosophies and prominent contributors. Students are also introduced to various approaches for conducting research in geography and must develop a written research proposal in an area of their interest.

GY504 Physical Geo of SE US

Hours 3

A study of the physical landscapes in the southeastern United States. Emphasis is on the geological setting, geomorphic features, climate, soils, and vegetation, and the interrelationships of these conditions that shape the landscape in this region.

GY505 Dir Research Physical Geograph

Hours 1-3

No description available

GY506 Dir Research Human Geography

Hours 1-3

No description available

GY509 Forest Ecosystem Restoration

Hours 4

Investigation of the theories, tools, and techniques used in historical ecology with a focus on the establishment of reference conditions for habitat restoration and management decisions.

GY510 Geography of National Parks

Hours 3

This course is devoted to the changing geography of the national park system and related protected areas throughout the world, with an emphasis on their design, planning, and operations.

GY512 Hydroclimatology

Hours 3

To provide a basic understanding of the waters of Earth, especially with relation to the effects of precipitation and evaporation upon the occurrence and character of water in streams, lakes and on or below the land surface.

GY513 Applied Climatology

Hours 3

Applied Climatology is a graduate/senior level course designed to expand upon fundamental concepts learned in GY 101 and also GY 402 (Climatology). Within this broad field, a specific focus in GY 513 concentrates upon climate and human health/behavior, and human modification of climate. The course contains a mixture of lecture, lab, and field assignments.

Prerequisite(s): GY 101

GY514 Climate Change and Health

Hours 3

This course is an introduction to the effect of global climate change on health. The course will be taught from a geographical perspective and will introduce students to the physical science of climate change and the impact it has on health through discussion of extreme weather events, altered ecological systems, and threats to human security and welfare. Discussion will build on the core concepts of climate change science to provide students with a solid foundation to further examine a variety of topics from acute impacts such as heat waves and other weather extremes to chronic conditions such as shifting disease vector habitats, degraded air quality, and food security. Direct correlations between health impacts and climate change will be emphasized throughout as will discussion of mitigation and adaptation strategies.

GY516 Introduction to Geostatistics Using R

Hours 3

This course is an introduction to geostatistical data analysis using R. The course will be taught from the perspective of geographical and climate data analysis but serves as a broad introduction to the high-level programming language, R, as well as applied spatial data analysis. Students will load and manipulate data of different types, perform a variety of statistical analyses, generate graphical output, and create productive workflows using R alone. The primary outcome will be to facilitate students' use of R to analyze data of their own choosing on a final project. Students will present these methods to the class for others to critique, analyze and learn from. Code sharing and re-use is highly emphasized, as is collaboration. The course is designed as a 1-hour lecture plus 2-hour lab each week.

GY517 Extreme Weather and Society

Hours 3

EW&S is an integrated physical and social science (W) seminar class consisting of readings, discussion, and lectures on perception, understanding, and communication of severe weather hazards.

GY518 Spatial Statistics and Geostatistics

Hours 3

This course presents a comprehensive overview of the geographic sub-disciplines of Spatial Statistics and Geostatistics. Students will learn about the nature of spatial data, and the methods of centrography, point pattern analysis, spatial interpolation, spatial autocorrelation, density mapping and estimation, spatial regression, and both spatio-temporal and network based spatial statistical analyses. Students will learn the limitations of the methods, their proper use, and how to accurately describe their outputs.

GY520 Remote Sensing I

Hours 4

Focuses on basic principles behind remote sensing physics, techniques, and technology and introduces new sensor systems and digital image processing. Major topics include electromagnetic radiation principles, airborne remote sensing, microwave remote sensing, satellite remote sensing, and digital image processing.

GY521 Spatial Databases

Hours 4

This course is an advanced course in the field of Geographic Information Systems (GIS) and covers spatial database design and management. Specifically, this course covers the following aspects: basic concepts and principles of relational and spatial databases, relational/spatial database design, entity-relationship (ER) diagram, structured query language (SQL), spatial query, data/user management, spatial indexing, etc. Meanwhile, this course also aims to help students develop some practical skills in relational and spatial databases via the use of relevant database software (e.g., PostgreSQL/PostGIS and Microsoft SQL Server) in the lab section.

Prerequisite(s): GY 430

GY522 Introduction to UAS

Hours 3

This course will prepare students for real-world safe operation of Uncrewed Aerial Systems (UAS), and will provide basic understanding of the regulations in preparation for small Unmanned Aircraft Systems FAA 107 certification test. The class covers the history of UAS, types of UAS platforms, payloads/sensors, UAS operational requirements, current FAA rules and regulations, industry and societal implications, career outlooks, and geospatial applications of UAS. The field flight demonstration involves flight mission planning with Pix4Dcapture software. Activities will focus on using simulation tools to help students learn how to operate a drone and how to use ArcGIS Pro and PIX4Dmapper to process common drone data. This course is designed to provide a comprehensive foundation in UAS, blending theoretical knowledge with hands-on experience.

GY523 Quantitative Methods

Hours 3

This course introduces several quantitative methods used by geographers to analyze and interpret geographic data and solve geographic problems. Topics include: Data formatting and organization, descriptive statistics, sampling, hypothesis formulation and testing, and parametric and non-parametric statistical procedures through factor analysis.

GY526 Uncrewed Aircraft Systems (UAS) Applications

Hours 3

This course covers an overview of a variety of Uncrewed Aircraft Systems (UAS) field applications. This course will provide students with real world applications of UAS used by scientists and professionals and their applied benefits of using UAS products. Examples of UAS field application topics to be discussed in this course will be on water, agricultural, land, and natural resources.

GY527 Uncrewed Aerial Systems (UAS) Data Processing and Analysis

Hours 3

This course will focus on how to process and analyze different types of data collected by UAS. The class covers different types of UAS data, flight mission planning, and relevant methods and tools for UAS data processing and analysis. Class activities will focus on how to use ArcGIS Pro and PIX4Dmapper to process and analyze different types of drone data.

GY528 Web GIS

Hours 4

This course is about the use of GIS in the web environment. Specifically, this course covers the following aspects: basic concepts and principles of Web GIS, Web GIS design, Web GIS implementation, and Web GIS applications. Meanwhile, this course also aims to help students develop practical skills in using ArcGIS products to design and implement Web GIS applications.

Prerequisite(s): GY 430

GY529 Fundamentals of GIS

Hours 3

This course is a hands-on, practical Geographic Information Systems (GIS) introduction. GIS is a computer-based system used for gathering, analyzing, and displaying geographic information. GIS enables users to integrate multiple spatial data sources, perform complex geographic analysis and present the results in digital and paper map. This technology has a wide range of applications for research, businesses and governments. Tailored toward first-time users, this course will focus on learning how to use the ArcGIS software package to import, generate, display and analyze spatial data.

GY530 Intro Geographic Info Systems

Hours 4

Introduces the basic concepts of GIS, including definition and components of GIS, spatial data structures, data sources, data input, manipulation and analysis, applications of GIS, and managing GIS.

GY532 Spec Research In Geog

SP

Hours 2-4

No description available

Special Topics Course

GY534 GIS Internship

Hours 3-6

Individual work experience in GIS supervised by the staff of an off-campus agency.

GY535 Remote Sensing II

Hours 4

Focuses on the quantitative analysis of non-photographic remote sensor data, providing students with hands-on experience using a digital image processing software package. Topics include preprocessing, image enhancement, classification, digital change detection, and remote sensing and GIS.

GY536 Adv Geographic Info Syst

Hours 4

Focuses on the analytical use of spatial information as well as GIS applications. Topics include spatial aspects of geographic information, attribute data structure, error and uncertainty, spatial analysis theories, GIS modeling, and GIS design.

GY537 GIS for Transportation

Hours 4

The application of Geographic Information Systems to transportation has resulted in a sub-field known as GIS-T. This course will provide a hands-on introduction to GIS-T.

GY539 GIS Programming

Hours 4

This course focuses on the extension of geographic information systems (GIS) through programming as well as on the development of stand-alone algorithms for spatial analysis and numerical modeling.

GY541 Land Use Regulations

Hours 3

The course explores the legal standards by which land is regulated and controlled in the U.S. It is designed for students who wish to become actively involved or exposed to land management and the planning profession.

GY542 Computational Methods for Socio-Ecological Systems

Hours 4

Environmental problems are social problems, and social problems are environmental problems. This truism is becoming increasingly apparent with the convergence of several grand challenges: climate change, biodiversity loss, widening socioeconomic inequality, and meeting the growing food demands of a global population expected to top 9 billion by 2050. Moreover, possible solutions to these problems often present unavoidable social value tradeoffs that are difficult to judge objectively, and the complexity of social and ecological systems make unintended consequences nearly impossible to foresee. In other words, social-ecological problems are “wicked problems”.

Prerequisite(s): GY 523 or instructor permission

GY543 Location Science

Hours 3

This course presents the theory and practice of Location Science – the study of the optimal or near optimal spatial location and allocation of facilities, routes, personnel, or other assets. A variety of optimal procedures for location problems is presented, including minimum spanning tree, shortest path, maximal flow, and transportation problem algorithms. The Simplex method as applied to location problems is outlined and demonstrated. Heuristic approaches to location problems including greedy heuristics and Tabu search heuristics are reviewed. The peer-reviewed literature in location science is explored.

GY544 Field Studies In Africa

Hours 6

Experiential learning course. It explores how different cultural groups in Africa relate to the natural environment.

GY545 Agriculture: Environment and Development

Hours 3

This course examines the geographical elements of how people use the biophysical environment to grow domesticated plants (crops). Agriculture is understood in this course as the transformation of biophysical or “natural” environments into “cultural” environments. It is assessed in regard to both the plants cultivated, and the soil, slope, moisture, and temperature conditions that exist and then are modified or created by farmers. Ecological and systematic approaches are taken in order to understand how different agricultural strategies insure continual long-term productivity and stability. Microeconomics is an important and recurring theme.

GY551 Global Environmental Change

Hours 3

Global Environmental Change focuses on the major issues of global change, including anthropogenic climate change, land use and land cover change, biodiversity issues, environmental pollution, potential global change-related impacts on human health, and relevant social policies. The class will follow a quasi-seminar format where individual presentations and group discussion will comprise a large portion of the in-class activity. Each week students will do research on and/or read assigned articles and additional articles of your own selection on relevant subjects. Instructor will provide a summary of the weekly topic and as a class, students will discuss issues raised in the research and readings.

GY552 Environ Decision Making

Hours 3

Designed to help students develop both the tools and the personal philosophy necessary to analyze and manage scarce resources. A review of current environmental topics is followed by a survey of different paradigms and techniques that contribute to environmental decision making.

GY553 Environment & Society

Hours 3

Explores the linkages between the biophysical environmental and human social systems. Public-policy implications are viewed from a social science perspective.

GY558 Urban Analysis Planning

Hours 3

A thorough examination of the literature in economics, political science, and sociology that is relevant to the geographical study of contemporary urban structure, power, and conflict.

GY559 Water, Energy, Food System Sustainability

Hours 3

The primary objective of this course is to introduce students to the essential characteristics and basic processes of inquiry and analysis in the area of the water-energy-food (WEF) nexus. Specifically, the WEF nexus will be considered in relation and its application to human concerns, such as emerging supply and demand issues and their impacts of social and economic systems, ecological health, and human well-being. This course will encourage the development of critical thinking skills and requires students to analyze, synthesize, and evaluate knowledge about core WEF concepts.

GY561 Political Ecology

Hours 3

Political ecology is a multidisciplinary approach to studying the environment through interrogating how power shapes and intersects with human-environment relationships. As a field of inquiry and practice, political ecology has greatly expanded over the past several decades to not just understand the political foundations of environmental problems or challenges, but also the co-production of environments with close attention to matters of justice, power, and inequality. Political ecology contends that through critical analysis and interdisciplinary methodologies, we can come to better understand the roots of socio-environmental problems in order to work for political change and social good.

GY562 Land Use Science

Hours 4

This course explores the interactions between land use, land cover, and social and environmental processes at multiple scales. The emphasis is on understanding how the natural landscape influences human activities, how humans modify the natural landscape to meet our needs, and how those modifications create a co-evolution between landscapes and human use. Understanding how land uses are, or should be, allocated to achieve multiple goals, including food and fiber production, space for human settlement, provision of ecosystem services, and access to renewable energy sources, requires consideration of these multiple objectives and of the various factors driving land-use decisions at multiple scales.

GY566 Transport Geography

Hours 3

Examines location and function of the multimodal North American transportation system, the urban transport planning process, and the political and environmental contexts of transport systems, including impacts of continued reliance on the automobile.

GY570 Special Topics

SP

Hours 1-6

Special Topics.

Special Topics Course

GY572 Soil Science

Hours 4

Introduction to the scientific study of soils. Covers soil physical properties, morphology, development, classification, environmental functions and uses, and resource degradation.

GY573 Public Policy Development in Water Resources Seminar

Hours 3

This course will evaluate the current approaches to policy theory and examine systematically the broader implications of the substantive aspects of public policy development in the water resources spectrum. In analysis of public policy development in water resources, the student will look at both policy process and policy substance. Attention will be given to the questions of how and why water policy differs across states, and how one might evaluate policy performance cross-nationally.

GY574 Cartography Practicum

Hours 3-6

Individual work experience in cartography supervised by the faculty and staff of the University.

GY576 Gis Practicum

Hours 3-6

Individual work experience in GIS supervised by the faculty and staff of the University.

GY577 Water Resources Management, Law, and Policy

Hours 3

The Water Resources Management, Law, and Policy course will provide students with a survey of water resources development, control, law, policy and management with particular emphasis on public policy considerations including: the acquisition and exercise of water rights –appropriative and riparian; groundwater management; water districts and user organizations; environmental considerations; Federal/State relations including interstate allocation; and the Alabama Water Resources Act. The course will also address international water law—the multinational treaties, laws, cases, practices and politics governing Earth’s transboundary freshwater resources (watercourses including rivers, streams, lakes, and groundwater aquifers) shared by two or more countries.

GY579 Planning Internship

Hours 3-6

Individual work experience in planning supervised by the staff of an off-campus planning agency.

GY581 Water Diplomacy

Hours 3

The course will focus on the linkages between water resources policy and conflict or cooperation with primary interest on interstate (transboundary) and intrastate water issues. The conceptual framework of the course is centered on water scarcity, water conflict, hydropolicy, hydrohegemony, water security, and dispute resolution. The role of disparate stakeholders and the problem of scale will be considered. The policy, norms and laws for mediating water conflict at different jurisdictional levels, including adversarial legalism (lawsuits) are examined.

GY582 Data Science Analytics for Water

Hours 3

Navigating the nexus of water resources and data science, this course offers a deep dive into the transformative power of analytics in understanding and managing our most vital resource. Grounded in practical applications, students harness computational tools like Python or R, and Excel to explore, analyze, and visualize water-related data. The course emphasizes the synergy of traditional methods and contemporary data-driven techniques, including advanced visualization with tools like Power BI. Beyond just techniques, the course offers a journey into the essence of water data, from data collection to predictive modeling for critical challenges like floods and droughts. Through interdisciplinary engagement, students will gain a comprehensive understanding of water’s data landscape, fostering informed solutions for a sustainable future. Combining hands-on labs with theoretical insights, students emerge not just as data analysts but as stewards of our water future.

GY585 River Hydrology

Hours 3

Rivers are dynamic natural systems that are of great importance to ecosystems and society. This course examines river hydrology processes from a physical geography perspective. A major theme of the course will be impacts of human actions on river systems.

Prerequisite(s): instructor permission

GY586 Watershed Science and Management

Hours 3

An examination of the physical operation of drainage basins (watersheds), focusing on surface water hydrology, erosion, and sedimentation.

Prerequisite(s): GY 102 or GEO 101

GY588 Digital Terrain and Watershed Analysis

Hours 4

This course covers concepts, numerical algorithms, and techniques for digital terrain and watershed analysis. It combines lectures with a substantial practical lab component. The lectures covers spatial representation of topography, topographical data acquisition techniques (Photogrammetric Stereo, InSAR, LiDAR, GPS, cartography), terrain visualization, terrain parameter derivation, extraction of critical terrain features, landform recognition and classification, watershed analysis, cut-and-fill and volumetric analysis, drainage network extraction, watershed delineation, and distributed watershed models. The practical component, involving 8 lab assignments and one individual mini-project, will give students hands-on experience in using proprietary GIS software packages, ArcGIS, EPA BASINS 4.0 and HSPF 12.0 to handle topographic and image data for terrain and watershed analysis.

Prerequisite(s): GY 430 or equivalent or GY 530

GY589 Forest Eco Veg Analysis

Hours 4

A study of the relationship of trees to the environment, and the interrelationship of organisms that compose the forest community.

GY590 Internship

Hours 3

Individual work experience with agency involved in geographical research, analysis, and reporting.

GY591 Fluvial Geomorphology

Hours 3

This course provides an in-depth investigation of the processes that form rivers and their evolution.

GY596 Forest Ecosystem Management: Silviculture

Hours 4

In this course silviculture is treated as applied forest ecology. The goal of this course is to provide students with a knowledge of silviculture and its ecological basis so they can design manipulations in forest ecosystems to achieve a range of management objectives. The course requires field trips to tour different sites and visit with forest scientists and managers. In this course students learn about tree growth and stand development and use this information to develop silvicultural prescriptions to meet a diverse range of management goals. We will explore how silvicultural treatments can influence stand structure and composition and how these changes influence timber quantity and quality, forest health, biodiversity, soil, and wildlife habitat among other features. We will also focus on how silviculture is influenced by broader social, economic, and ecological issues.

Prerequisite(s): GY 489 or GY 409 or GY 492 or GY 494 or instructor permission

GY598 Non-Thesis Research

Hours 1-3

No description available

GY599 Thesis Research

Hours 1-12

This independent research course partially fulfills required master's-level research thesis hours toward the master's degree in Geography. The course is conducted under the guidance of the thesis advisor. Material covered will be of an advanced nature aimed at providing master's students with an understanding of the latest research and current developments within the field. Discussion and advisor guidance will be directed towards readings of research articles and development of research methodology, with the aim of producing an original research contribution that represents a novel development in the field, or a novel perspective on a pre-existing topic in the field.

GY601 Geography Colloquium

Hours 1

This seminar format course fulfills required graduate level participation in colloquium hours. Students will attend seminars by invited speakers and departmental faculty, and will have the opportunity to present on their own current and planned research. Colloquium topics will be communicated to students well in advance, through departmental emails and other avenues. A total of 3 colloquium hours are required for PhD students and 1 hour for MS students. The course is conducted under the guidance of the Colloquium Chair. The student repeats hours in this course until the required three hours have been satisfactorily completed. Material covered will be of an advanced nature aimed at providing graduate students with an understanding of the latest research and current developments within the field.

GY602 Seminar in Climatology

Hours 3

This course is a doctoral level research intensive seminar in the geographic sub-field of climatology. The course will be taught by faculty with varied expertise within climatology and will, therefore, be dynamic in its topical focus from semester to semester. Content will broadly fall within hydro-climatology, synoptic climatology, climatological extremes, bio-climatology, and historical or paleo-climatology. The material covered will be of an advanced nature aimed at providing doctoral students with an understanding of the latest research and current developments within the field. Discussion will be directed towards readings of research articles and development of research methodology with the aim of producing an original research product that could be submitted in a scholarly journal for publication.

GY610 Seminar in Forest Science and Management

Hours 3

This is a reading and discussion intensive graduate seminar course. Each week you will be expected to come to class prepared to critically discuss the readings and other assignments. We will cover a diversity of topics in forest science and management and some additional reading may be necessary for you to be fully prepared to engage in class discussion. Our seminar time will be devoted to discussion of topics selected by individual students and the instructor. Students are encouraged to select a topic related to their research, but this is not a requirement. Throughout the semester we will also discuss the philosophy of science, the rubrics of scientific evaluation, the publication process, and other topics to aide in your training as a research scientist.

GY612 Hydroclimatology

Hours 3

Hydroclimatology focuses on understanding the processes and patterns of distribution of water (in all forms) from an Earth Systems perspective as well as the impacts of hydroclimatological variability on the environment and society.

GY615 Seminar Human-Environmental Interactions

Hours 3

This is a reading and discussion intensive graduate seminar course. Each week, students will be expected to come to class prepared to critically discuss the readings and other assignments. A diversity of topics will be covered in human-environmental interactions in geography and some additional reading may be necessary for students to be fully prepared to engage in class discussion. Seminar time will be devoted to discussion of topics selected by individual students and the instructor. Throughout the semester there will be discussion of the philosophy of science, the rubrics of scientific evaluation, the publication process, and other topics to aide in student training as a research scientist.

GY630 Seminar in Geographic Information Science

Hours 3

Geographic Information Sciences (GISci) include a range of spatial technologies, including Geographic Information Systems, remote sensing, computer modeling, GPS, and cartography. This seminar will examine contemporary issues in GISci through readings and group discussion.

GY663 Seminar in Geomorphology

Hours 3

Geomorphology is the study of earth surface processes and landforms, including quantitative analyses of how and why landscapes change over space and time. In this seminar students will examine how and why geomorphic systems function and change in response to climatic and tectonic forcing and human activities through readings and group discussions.

GY670 Special Topics

SP

Hours 1-6

Courses with this number address geography topics not covered by existing courses. The credit hours and format are arranged as appropriate to each topic. The specific course title is added at the time the course is taught. Offered irregularly.

Special Topics Course

GY699 Dissertation Research in Geography

Hours 1-12

This independent research course partially fulfills required doctoral level research dissertation hours toward the Ph.D. in Geography. A total of 24 dissertation hours are required. The course is conducted under the guidance of the Ph.D. advisor. The student repeats hours in this course at least until the dissertation requirements have been satisfactorily completed. Material covered will be of an advanced nature aimed at providing doctoral students with an understanding of the latest research and current developments within the field. Discussion and advisor guidance will be directed towards readings of research articles and development of research methodology with the aim of producing an original scientific contribution that represents a novel development in the field or a novel twist on a pre-existing topic in the field.

Prerequisite(s): You must be a PhD student in Geography that has defended a dissertation proposal and successfully completed requirements for Ph.D. candidacy.