

GEOGRAPHY AND GIS (GEO)

GEO 101 | ENVIRONMENTAL GEOGRAPHY | 4 quarter hours (Undergraduate)

An introduction to the history, scope, and breadth of environmental inquiry within Geography. The course will be divided between Physical Geography -- that is, the spatial aspects of the Geosystem including the Atmosphere, Hydrosphere, Lithosphere, and Biosphere, and geographical perspectives of and approaches to the Human-Environment, to include Hazards Geography, Resource Geography, Cultural and Political Ecology.

GEO 103 | URBANIZATION | 4 quarter hours (Undergraduate)

The course explores the evolution of urban forms and structures in the United States from the perspective of geography. In addition to studying the historic emergence of the American urban system, the course covers processes and phenomena associated with the spatial organization of housing, transportation, commercial and industrial land-use planning, as well as urban poverty, local governance, and issues of race, gender and sexuality.

GEO 133 | URBAN GEOGRAPHY - EXPERIENTIAL LEARNING | 4 quarter hours (Undergraduate)

The course provides an in depth analysis of a Chicago neighborhood, connecting this to wider U.S. trends in urbanization and urban development. Students conduct a research project, through archival study and field work.

GEO 140 | MAPPING WORKSHOP FOR ONLINE STORYTELLING | 2 quarter hours (Undergraduate)

This 2-credit workshop introduces students from any major to software that provides narrative driven online maps that combine cartography with text and images. Software packages such as ESRI StoryMap, Carto, GoogleMaps, QGIS Cloud and Leaflet will be introduced, with a special focus on accessible and well designed visualizations that can communicate effectively to a wide audience.

GEO 172 | CULTURAL GEOGRAPHY: THE NATURE-CULTURE INTERFACE | 4 quarter hours (Undergraduate)

How do artists depict the natural world and how does culture contribute to those depictions? For example, how do lyrics and music portray nature, and how is this related to a sense of place and even identity? How do landscapes represented in visual media construct, reinforce, or challenge ideas about a place? What does the design of parks and green space say about cultural values? And how do writers use the natural world in literature to contribute to plot development and create a mood? In this course we will analyze how nature is represented in forms of culture? visual arts, music, design, and literature. Students will learn to critically evaluate how places are understood through these cultural forms, and consider not only the ways that culture shapes these representations, but also the ways that these representations shape or reinforce ideas about the natural world and humans? place in it. We will draw on research in the discipline of geography for our case studies and topics. Since the 1970s, research in geography has analyzed how places and landscapes are represented and understood through the arts, and also how arts and culture manifest themselves in places and landscapes. For example, studies of landscape design and public parks, such as Chicago's own Lincoln Park, reveal not only cultural values and aesthetic tastes, but also the role played by political power and class hierarchies in the development of such spaces. Utilizing cultural geography resources, students will develop the theoretical skills to examine the nature-culture interface.

GEO 200 | SUSTAINABLE URBAN DEVELOPMENT | 4 quarter hours (Undergraduate)

This course focuses on the application and meaning of 'sustainability' to our discussion and understanding of cities, urban communities, and the urbanization process. The course conceptualizes sustainability as residing at the intersection of political, economic, social, and ecological thinking and examines its utility and flexibility towards urban form and function. The course pursues the topic of urban sustainability through the lenses of scale (e.g., local vs. global), justice (e.g., social vs. ecological), and diversity (e.g., cultural vs. biotic).

GEO 201 | GEOPOLITICS | 4 quarter hours (Undergraduate)

A survey of theories of geopolitics and international relations, the course explores issues of international security and organization, regional integration, and nationalism, state formation and conflict. Historic geopolitical cases from Europe (Northern Ireland, EU, Balkans), the Middle East and North Africa, and the Russian realm, provide opportunities to assess theoretical approaches and profile the security and foreign policy concerns of the U.S. in the new millennium.

GEO 204 | RELIGIOUS GEOGRAPHY | 4 quarter hours (Undergraduate)

Religion and geography are fundamentally intertwined. From the establishment of theocratic states that control territory, to the sprawl of US suburbia that has led to megachurches, the role of religion in shaping the earth's cultural landscape is undeniable. Religious beliefs shape geographies - there are places that, through faith, become sacred; elsewhere religious individuals and groups struggle to claim places in the name of their beliefs. This course will examine case studies from around the world to explore the intersection of geography and religion.

GEO 205 | RACE, JUSTICE, AND THE URBAN ENVIRONMENT | 4 quarter hours**(Undergraduate)**

A theoretical and applied investigation of the social, political, and economic processes influencing the spatial distribution of environmental amenities and harms across the U.S. urban landscape, with particular focus on urban structure and the role of environmental justice struggles in shaping urban policy and the urban landscape.

GEO 206 | BOUNDARIES AND IDENTITIES | 4 quarter hours**(Undergraduate)**

A critical survey of the manner in which social, political, ethnic, gender and racial identities are being constructed by modernity and post-modernity. Cross-listed as INT 206 and PAX 206. Recommended for GEO majors when taught by Professor Nast.

GEO 210 | INTERNATIONAL ENVIRONMENTAL CONSERVATION | 4 quarter hours**(Undergraduate)**

The purpose of this course is to explore the relationship between our physical environment and society by focusing on natural resources. While the course introduces key concepts in environmental thought (conservation, preservation, sustainable development, etc.), another aim is to introduce students to some of the practical aspects of working in resource and environmental management. Lectures and readings examine contemporary environmental issues internationally. The textbook focuses on mainstream models of nature-society relations such as rational planning in resource management and sustainable development, while the additional readings and videos will introduce students to critiques of the mainstream approaches and suggest alternatives to them. The issues covered in this course include climate change, atmospheric pollution, freshwater resources and water quality, forestry and biodiversity loss, food production and distribution and sustainable lifestyles.

GEO 211 | BIOGEOGRAPHY | 4 quarter hours**(Undergraduate)**

Biogeography is the study of the distribution of plants and animals on the earth's surface, and the historical and ecological factors and human activities responsible. It asks questions such as: Why were placental mammals absent from (pre-European) Australia, while marsupials were abundant? How are current plant species' distributions different from those of the past, and what implications does this have for their ability to respond to global changes? Why have islands sustained so many extinctions compared to mainlands? Why are there so many insect species in the tropics and so few at high latitudes? How are humans changing the distribution and abundances of plant and animals? This course explores these and other such questions. The goal is to understand biodiversity patterns and processes across earth, and how this knowledge can help maintain biological communities in human-dominated, 21st century landscapes.

GEO 215 | INTERNATIONAL DEVELOPMENT AND REGIONAL INEQUALITY | 4 quarter hours**(Undergraduate)**

This course charts the economic transformation in the Third World / Global South. The first third of the course examines theories of development and underdevelopment before moving on to a critique of the concept of development as a modernist paradigm using a postcolonial framework. The rest of the course examines the restructuring of the agricultural, manufacturing and service sectors, including the financial sector, in non-Western countries.

GEO 219 | WOMEN AND SCIENCE | 4 quarter hours**(Undergraduate)**

In this course, we will examine the evolving relationship between women and science. There are growing opportunities for and representation of women in scientific fields in many parts of the world, but there are historical contexts that should be considered and remaining challenges that are being addressed. We will begin the course with a review of the scientific method—what is this process and what about it has enabled it to attain legitimacy as a way of knowing the world? We will also learn about female scientists in the fields of environmental geography and ecology who have broken gender norms and boundaries and made notable scientific contributions. Students will learn through several case studies of both well-known scientists as well as those who are less widely recognized. Finally, we will examine aspects of science and culture that have impacted women's participation and achievements.

GEO 220 | OCEANOGRAPHY | 4 quarter hours**(Undergraduate)**

Develops the concepts of physical oceanography. Topics include the chemical and physical properties of seawater, the dynamics of ocean currents and circulations, the physics of water waves and tides, the interaction of the ocean with the atmosphere, the formation of coastlines, and the effects of pollution on the ocean. Cross-listed with PHY 220.

MAT 120 or HON 180 or (MAT 130 or above) or consent of instructor is a prerequisite for this course.

GEO 225 | EARTH'S CHANGING CLIMATE | 4 quarter hours**(Undergraduate)**

The dynamic atmospheric processes which control day-to-day weather and the longer term processes which determine prevailing climatic conditions are the two principal foci of this course. Special topics include weather systems, climate change, global warming, and human impacts on climate. Cross-listed with PHY 225.

MAT 120 or HON 180 or (MAT 130 or above) or consent of instructor is a prerequisite for this course.

GEO 231 | HISTORICAL GEOGRAPHY OF CHICAGO | 4 quarter hours**(Undergraduate)**

An exploration of Chicago's urban geography, focusing in detail on topics such as historical geography, industrial development, community development, built environment (i.e., housing/architecture), transportation and neighborhood change. Cross-listed with HST 240 and AMS 240.

GEO 233 | COMPARATIVE URBANISM | 4 quarter hours**(Undergraduate)**

An exploration of non-U.S. urban and planning traditions, through the urban morphological and comparative study of the foundation, and social-political forces that shaped cities such as Paris, St. Petersburg, Istanbul, Bombay-Mumbai, Hong Kong, and Mexico City.

GEO 240 | HISTORY OF CARTOGRAPHY | 4 quarter hours**(Undergraduate)**

The course explores the history of mapmaking as a dimension and expression of the intellectual, scientific, technological, and political transformation of society. Focusing primarily on Europe and North America, the course covers the prevailing schools of thought and practitioners, and the structures and forces that shaped them. The course includes hands-on study of archival quality maps in DePaul's Special Collections and other regional institutions. Short field trip to the Newberry Library required.

GEO 241 | GEOGRAPHIC INFORMATION SYSTEMS I: DIGITAL MAPPING | 4 quarter hours (Undergraduate)

Geographic Information Systems (GIS) are widely used in fields such as urban planning, environmental monitoring, marketing, law enforcement, public health, disaster management, and data journalism, among many others. Students will learn to make digital maps, manipulate and query tabular data, use coordinate systems, and conduct spatial analysis and write code for digital mapping through lectures and hands-on exercises using ArcGIS. The course is the first in a five-course undergraduate GIS certificate. Cross-listed with PSC 201.

(MAT120 or HON 180) or (MAT 130 or above) or instructor permission is a prerequisite for this course.

GEO 242 | GEOGRAPHIC INFORMATION SYSTEMS II: COMMUNITY GIS | 4 quarter hours (Undergraduate)

An intermediate-Level course focusing on applications of GIS for community development. Students conduct real-world GIS projects for community organizations in Chicagoland. Students will learn to design and create geographic information products that meet community partners' needs through the process of proposing, defining, and implementing GIS projects in collaboration with community partners. The course teaches an intermediate-level GIS skills, including address geocoding, spatial join, proximity analysis, and density mapping. Instruction is accomplished through lectures and hands-on exercises using ArcGIS.

GEO 241 or PSC 201 is a prerequisite for this class.

GEO 243 | EARTH OBSERVATION | 4 quarter hours (Undergraduate)

Earth observation is the gathering of information about the planet via remote sensing technologies. This introductory level course covers how images of Earth are acquired via satellite and airborne sensors as well as how to process and interpret them to better understand our planet. The fundamentals of geospatial technology and introductory satellite-based remote sensing algorithms will be taught via lectures and hands-on labs.

GEO 241 is a prerequisite for this class.

GEO 260 | GLOBALIZATION AND RESOURCES | 4 quarter hours (Undergraduate)

An exploration of globalization and the politics and flow of natural resources between the developed and developing world, especially since World War II. Using case studies from around the world, the course introduces students to competing paradigms of environmental and resource destruction and to the complexities and contingencies of social and environmental change in the "new" global economy.

GEO 266 | WORLD ECONOMY: STATES, MARKETS AND LABOR | 4 quarter hours (Undergraduate)

This course introduces students to competing economic and political frameworks that analyze the interaction of states, markets and societies. The overall theme of the course is the spread of capitalism and the tandem disembedding of economic relations from social relations beginning with the Industrial Revolution in the 18th century through to the early 21st century.

GEO 269 | CULTURAL AND POLITICAL ECOLOGY | 4 quarter hours (Undergraduate)

The course introduces students to the theoretical foundations and evolution of critical Political Ecology and its assessment of environmental change and social vulnerability in the developing world. The course traces the history of the discipline to its early roots in geography, anthropology, and ecology and tracks its emergence as a theoretically sophisticated critique of the global spread of economic development and environmental policy.

GEO 299 | KNOWLEDGE, PLACE AND POWER | 4 quarter hours (Undergraduate)

An exploration of the social construction of knowledge through the historic evolution of geographic thought. This class interrogates geography's role in how space and place have been created to support existing hierarchies, and how geographic thought has evolved to contest these hierarchies. Students will engage with a variety of intellectual frameworks such as positivism, Marxism, feminism, postcolonial theory, and poststructuralism, among others.

GEO 300 | GEOGRAPHICAL INQUIRY | 4 quarter hours (Undergraduate)

An in depth exploration of modern debates within geography. Students prepare their own geographic research project and participate at a regional conference.

GEO 301 | ECONOMIC INEQUALITY AND POLITICAL TRAUMA | 4 quarter hours (Undergraduate)

The term trauma has been deployed in many parts of the world in the context of the rise of populist movements as voting blocs, without constructing a coherent conceptual framework for understanding how the concept of trauma explains political phenomena such as electoral outcomes. This course provides a framework for understanding how historical legacies, economic inequality and contemporary political contexts are linked.

GEO 310 | GREEN INFRASTRUCTURE | 4 quarter hours (Undergraduate)

Green Infrastructure (GI) goes beyond the conventional conservation efforts of creating and maintaining national and state parks and wildlife refuges. Instead, GI promotes conservation that takes place at different spatial scales to create a network of open spaces out of existing open spaces and green corridors as well as offering strategies for constructing green spaces out of abandoned urban spaces.

GEO 315 | THE STATE AND ECONOMIC GROWTH | 4 quarter hours (Undergraduate)

This course focuses on the role of the state in economic growth. The first half of the course studies the historical background, theory and criticism of the role of the state in economic growth, including the transitional economies of post-Communist countries. The second half examines case studies from different Asian and Eastern and Central European countries in the key moments of the incorporation of those states and their societies into the globalized economy. Some topics covered include corruption, transitioning informal economies and industrial policy.

GEO 316 | THE EUROPEAN UNION | 4 quarter hours (Undergraduate)

An integration of political geographic and international relations perspectives on European integration: Special emphases on political philosophies and theories of integration, the geopolitics of block formation and enlargement, institutional structure, the evolution of policies, and the future directions of the European Union. Cross-listed with PSC 340 and IRE 106.

GEO 330 | SUSTAINABLE URBAN TRANSPORTATION | 4 quarter hours (Undergraduate)

The course introduces transportation geography and explores the characteristics of sustainable transportation systems. From electric vehicles to new services like car and bike sharing, the course examines the role that transportation plays in environmental, social, and economic sustainability. Students will learn about current issues in urban transportation (both passenger and freight), and receive an introduction to tools and techniques used by transportation planners, e.g., Geographic Information Systems (GIS). Formerly GEO 230.

GEO 333 | URBAN PLANNING | 4 quarter hours (Undergraduate)

A seminar on the intellectual history and theories of urban planning and design, and their application in urban settings in the U.S. and abroad. Systematic study of case studies leads to the investigation of current urban planning issues in Chicago.

GEO 334 | URBAN/CITY DESIGN | 4 quarter hours (Undergraduate)

The course introduces the study of "city/urban design": one of the building professions, which include architecture, landscape architecture, sculpture, and land design from a distinctly geographic perspective. It addresses the evolution of concepts, ideas, and practices of the urban design profession through case studies, and discusses designs' impacts on the quality of urban life, and the city's 'legibility,' access, and equity. This, primarily, studio/skills-based course introduces students to key techniques shared by the building professions: 'figure-ground' and perspective drawing, urban sketching, georeferencing, 'rephotography,' site analysis, 3D object design and printing, and physical model-building.

GEO 335 | GEODESIGN | 4 quarter hours (Undergraduate)

The course builds on Geography's considerable geotechnology curriculum (GIS and remote sensing) to deliver a survey of emerging theories of, and evolving practices in Geodesign. Described as a platform for organizing project conceptualization and decision-making, site analysis, design requirements, stakeholder participation and collaboration, design modeling, simulation, realization, and evaluation, Geodesign is a new, strategic, interdisciplinary field of professional practice with critical applications for engineering-intensive urban and regional planning projects. Project planning and decision-making require the consideration of a broad range of information, concepts, and tools that entangle earth and human system inputs. Geodesign integrates data analytical needs of building professions (architecture, landscape architecture, urban design, and land design), regulatory fields (urban and environmental planning), environmental sciences, and engineering into a decision-making and plan realization platform that is built with special consideration to a project's geospatial structure.

GEO 339 | TOPICS IN ARCHITECTURE AND URBANISM | 4 quarter hours (Undergraduate)

Cities are changing dramatically as a result of the accelerated circulation of finance capital worldwide, the emergence of new information and data visualization technologies, the expansion of credit, the ceaseless retrenchment of population groups inside and around cities, and the emergence of new architectural and planning paradigms. The course explores and researches aspects of these transformative processes and their impacts on race, class, economic prosperity, and the contingencies of quality of urban life. A significant research and writing project is required in this specialist high-level course.

GEO 340 | PLACES, HUMANITIES AND GEOGRAPHIC INFORMATION SYSTEMS | 4 quarter hours (Undergraduate)

The course examines applications of GIS to digital humanities. The course focuses on techniques for processing geospatial data and making maps from sources related to humanities subject using a popular open source GIS software, QGIS. The course examines digital humanities projects that use GIS, and ways to deal with challenges to work with humanities data in addition to fundamentals of GIS. Students will learn techniques for map design, image georeferencing, mapping texts, mapping changes, and mapping qualitative data. The class is largely conducted through lectures and hands-on activities in a GIS laboratory.

GEO 343 | EARTH OBSERVATION II | 4 quarter hours (Undergraduate)

This course incorporates imagery from satellite and airborne sensors to teach intermediate-level remote sensing techniques for earth observation. There will be an emphasis on conducting computationally intensive remote sensing tasks (such as machine learning) and using programming languages to efficiently process images. The course culminates in a self-directed remote sensing research project. Prereq. GEO 243.

GEO 243 is a prerequisite for this course.

GEO 344 | GEOGRAPHIC INFORMATION SYSTEMS III: SPATIAL ANALYSIS FOR SUSTAINABILITY | 4 quarter hours (Undergraduate)

An advanced-level course. Students conduct spatial analysis into sustainability issues of their interest. Students will learn techniques for suitability analysis, point pattern analysis, network analysis, and spatial interpolation with GIS. Instruction is accomplished through lectures and hands-on computer lab exercises using ArcGIS.

GEO 242 is a prerequisite for this class.

GEO 345 | PROGRAMMING IN PYTHON FOR GIS | 4 quarter hours (Undergraduate)

Knowledge of a scripting language is a valuable skill for GIS analysts. Students will learn the basics of Python (a programming language), including script writing and implementation. By completing this course, students should be able to manipulate GIS data, automate GIS work flows, and develop customized GIS tools by writing script in Python in ArcGIS. The class is largely conducted through hands-on activities in a GIS laboratory.

GEO 241 or PSC 201 is a prerequisite for this class.

GEO 346 | GIS ANALYSIS OF ENVIRONMENTAL AND PUBLIC HEALTH | 4 quarter hours (Undergraduate)

Spatial data visualization and GIS applications are increasingly at the forefront of health data analysis. This course will examine health data using GIS and topics will be drawn from GIS applications that explore epidemiology, local and global health inequalities, and the role of GIS in public health, using data visualization, network and site analysis, and applied GIS research techniques. Cross-listed with GEO 446.

GEO 241 or PSC 201 is a prerequisite for this class.

GEO 347 | WEB GIS AND SPATIAL DATA VISUALIZATION ON THE WEB | 4 quarter hours (Undergraduate)

This project-oriented course will enable students to independently develop Web-based This project-oriented course will give students exposure to a wide variety of customizable web applications that allow for visualization of 2D and 3D geospatial data. The course introduces current developments in Web GIS technologies, their applications, and topics relevant to the creation, manipulation, and hosting of spatial datasets online. Students will learn how to use Web GIS mapping tools and how to configure and publish web-enabled interactive maps using commercial internet map servers. Using data collected using drone photography and other sources, students will additionally be introduced to how to create and host on the web 3D geospatial scenes. In addition to ArcGIS Online, open-source web mapping libraries such as Folium and Leaflet will be introduced, as well as physical 3D printing of GIS maps. Cross-listed with GEO 447.

GEO 241 or PSC 201 is a prerequisite for this class.

GEO 348 | SPATIAL DATA SCIENCE | 4 quarter hours (Undergraduate)

Data that carry location markers have become prevalent. Examples include demographic data from census, crime incidents through open government, location traces from smartphones, imagery from satellite, and pollution data from sensors. There will be more needs for spatially integrating and analyzing data to make better sense of and make connection among data. The course examines fundamental concepts and methods for spatial data science through a series of activities for creating, exploring, wrangling, and analyzing spatial data. Topics include web scraping, geocoding, exploratory spatial data analysis, spatial data quality, regionalization, and hot spot detection. The course focuses on creating reproducible workflow for spatial data science projects using relevant Python libraries with a Jupyter Notebook that enables interactive computing on the web. GEO 345 or CSC 241 or the permission of instructor is the prerequisite of GEO 348.

GEO 345 or GEO 445 or CSC 241 or CSC 242 or CSC 401 or with instructor permission is a prerequisite for this course.

GEO 350 | WORLD OF WINE | 4 quarter hours (Undergraduate)

An analysis of the geographical factors that influence the global production and distribution of wine. Students must be 21 years of age or older.

GEO 351 | GEOGRAPHY, FOOD AND JUSTICE | 4 quarter hours (Undergraduate)

While the need for food is universal, geographies of food production, distribution and consumption are anything but even. This leads to multiple issues of food injustice at a variety of scales. This course critically examines the contemporary global food system with the goal of providing students with skills and knowledge to engage in food justice activism. Students study the development of food systems and how inequalities have emerged in production, distribution and consumption. The course then explores food justice movements including the emergence of alternative food networks in the U.S and internationally. Assignments may engage students in local food projects and or/advocacy campaigns.

GEO 369 | RISKS, HAZARDS AND NATURAL DISASTERS | 4 quarter hours (Undergraduate)

This course is about the interaction of humans with extreme natural and anthropogenic events like storms, earthquakes and climate change. We will examine how people become vulnerable to such events, how they are affected by them, how they contribute to causing them, how they cope - or fail to cope - and what they do when existing adjustments are unsuccessful. You will learn how disasters are the product of multiple and interacting forces; biophysical processes are only part of the equation. We will explore how livelihoods, places and institutions come together to create hazardous situations and disastrous outcomes. We will look at trends in hazards and losses, and the distribution of vulnerability and hazard impacts within and across populations and places. For a variety of global environmental and social reasons, losses from hazards and disasters are projected to increase at increasing rates into the foreseeable future. Hazards and the disasters they generate, thus, are inherently engaging subjects. They also depend on a multidisciplinary approach for their investigation and mitigation, bringing in the insights of natural scientists, social scientists, engineers, planners, emergency managers, first responders, and others. Geography is a very active discipline in the investigation of hazards, with its physical science, social science, and mapping traditions, as well as its ability to integrate these very different conceptual approaches with practical applications at all stages of the disaster cycle.

GEO 391 | STATISTICAL DATA ANALYSIS FOR GIS | 4 quarter hours (Undergraduate)

This course examines statistical concepts and techniques that are applied to geographic problems. Topics include descriptive statistics and inferential statistics geared toward working with geographic data in GIS. Students will learn techniques for summarizing variables, testing difference of means, spatial autocorrelation, hot spot analysis, and correlation analysis through lectures and hands-on exercises using statistics and GIS software.

GEO 241 or PSC 201 is a prerequisite for this class.

GEO 395 | SEMINAR IN SELECTED TOPICS | 4-8 quarter hours (Undergraduate)

Upper-division seminar exploring selected geographical issues.

GEO 398 | INTERNSHIP | 1-6 quarter hours (Undergraduate)

The course combines academic study with practical experience obtained through work in an extramural internship setting. The internship course requires academic output in the form of a research journal, paper, or other project.

GEO 399 | INDEPENDENT STUDY | 1-4 quarter hours (Undergraduate)

Intensive study of a topic of special interest. Private conferences with instructor of supervised reading and research. Variable credit.

Junior or Senior standing and department consent are a prerequisite for this class.

GEO 430 | SUSTAINABLE URBAN TRANSPORTATION | 4 quarter hours (Graduate)

The course introduces transportation geography and explores the characteristics of sustainable transportation systems. From electric vehicles to new services like car and bike sharing, the course examines the role that transportation plays in environmental, social, and economic sustainability. Students will learn about current issues in urban transportation (both passenger and freight), and receive an introduction to tools and techniques used by transportation planners, e.g., Geographic Information Systems (GIS).

**GEO 433 | URBAN PLANNING | 4 quarter hours
(Graduate)**

A seminar on the intellectual history and theories of urban planning and design, and their application in urban settings in the U.S. and abroad. Systematic study of case studies leads to the investigation of current urban planning issues in Chicago.

**GEO 440 | PLACES, HUMANITIES AND GEOGRAPHIC INFORMATION SYSTEMS | 4 quarter hours
(Graduate)**

This course explores the issues raised by digital humanities in art history through a specific focus on the digital mapping of art historical questions. Students will focus on advanced discussions of digital mapping but also apply these theoretical and methodological concerns to art historical problems. Students will learn techniques of map design, mapping texts, mapping changes, and mapping qualitative humanities data as they develop their own historical project.

**GEO 441 | GEOGRAPHIC INFORMATION SYSTEMS (GIS) FOR COMMUNITY DEVELOPMENT | 4 quarter hours
(Graduate)**

This course will focus on applications of Geographic Information Systems (GIS) to community studies and community development. As an amalgam of information technologies (e.g. database management, Web 2.0) and earth measurement technologies (e.g. global positioning systems, remote sensing), GIS is rapidly entering the realm of community development. The course will explain how GIS works; enable students to learn techniques including mapping, spatial analysis, and data management; and provide students with the opportunity to apply GIS to community development. Cross-listed with MPS 552.

**GEO 442 | GEOGRAPHICAL INFORMATION SYSTEMS (GIS) FOR SUSTAINABLE URBAN DEVELOPMENT | 4 quarter hours
(Graduate)**

An intermediate-level GIS course focusing on the application of GIS skills to real-world problems. Students as a group will conduct GIS projects that are proposed by community-based organizations (CBOs) that work towards promoting sustainability in Chicagoland. Topics include remote sensing, GPS, geocoding, hot spot detection, spatial interpolation, and network analysis. The course also explores case studies on using GIS for sustainable urban development. PREREQUISITE(S): GEO 441 or MPS 552 (GIS for Community Development).

GEO 441 or MPS 552 or instructor permission is a prerequisite for this course.

**GEO 443 | EARTH OBSERVATION II | 4 quarter hours
(Graduate)**

This course incorporates imagery from satellite and airborne sensors to teach intermediate-level remote sensing techniques for earth observation. There will be an emphasis on conducting computationally intensive remote sensing tasks (such as machine learning) and using programming languages to efficiently process images. The course culminates in a self-directed remote sensing research project.

GEO 441 or equivalent is a prerequisite for this course.

**GEO 445 | PROGRAMMING IN PYTHON FOR GIS | 4 quarter hours
(Graduate)**

Knowledge of a scripting language is a valuable skill for GIS analysts. Students will learn the basics of Python (a programming language), including script writing and implementation. By completing this course, students should be able to manipulate GIS data, automate GIS work flows, and develop customized GIS tools by writing script in Python in ArcGIS. The class is largely conducted through hands-on activities in a GIS laboratory. Cross-listed with GEO 345.

GEO 441 or MPS 552 or instructor permission is a prerequisite for this course.

**GEO 446 | GIS ANALYSIS OF ENVIRONMENTAL AND PUBLIC HEALTH | 4 quarter hours
(Graduate)**

Spatial data visualization and GIS applications are increasingly at the forefront of health data analysis. This course will examine health data using GIS and topics will be drawn from GIS applications that explore epidemiology, local and global health inequalities, and the role of GIS in public health, using data visualization, network and site analysis, and applied GIS research techniques.

GEO 441 or MPS 552 or instructor permission is a prerequisite for this course.

**GEO 447 | WEB GIS AND SPATIAL DATA VISUALIZATION ON THE WEB | 4 quarter hours
(Graduate)**

This project-oriented course will enable students to independently develop Web-based This project-oriented course will give students exposure to a wide variety of customizable web applications that allow for visualization of 2D and 3D geospatial data. The course introduces current developments in Web GIS technologies, their applications, and topics relevant to the creation, manipulation, and hosting of spatial datasets online. Students will learn how to use Web GIS mapping tools and how to configure and publish web-enabled interactive maps using commercial internet map servers. Using data collected using drone photography and other sources, students will additionally be introduced to how to create and host on the web 3D geospatial scenes. In addition to ArcGIS Online, open-source web mapping libraries such as Folium and Leaflet will be introduced, as well as physical 3D printing of GIS maps. Cross-listed with GEO 347.

GEO 441 or MPS 552 or instructor permission is a prerequisite for this course.

**GEO 448 | SPATIAL DATA SCIENCE | 4 quarter hours
(Graduate)**

Data that carry location markers have become prevalent. Examples include demographic data from census, crime incidents through open government, location traces from smartphones, imagery from satellite, and pollution data from sensors. There will be more needs for spatially integrating and analyzing data to make better sense of and make connection among data. The course examines fundamental concepts and methods for spatial data science through a series of activities for creating, exploring, wrangling, and analyzing spatial data. Topics include web scraping, geocoding, exploratory spatial data analysis, spatial data quality, regionalization, and hot spot detection. The course focuses on creating reproducible workflow for spatial data science projects using relevant Python libraries with a Jupyter Notebook that enables interactive computing on the web. GEO 445 or CSC 402 or the permission of instructor is the prerequisite of GEO 448.

GEO 445 or CSC 401 or with instructor permission is a prerequisite of this class.

**GEO 469 | RISKS, HAZARDS AND NATURAL DISASTERS | 4 quarter hours
(Graduate)**

This course is about the interaction of humans with extreme natural and anthropogenic events like storms, earthquakes and climate change. We will examine how people become vulnerable to such events, how they are affected by them, how they contribute to causing them, how they cope - or fail to cope - and what they do when existing adjustments are unsuccessful. You will learn how disasters are the product of multiple and interacting forces; biophysical processes are only part of the equation. We will explore how livelihoods, places and institutions come together to create hazardous situations and disastrous outcomes. We will look at trends in hazards and losses, and the distribution of vulnerability and hazard impacts within and across populations and places. For a variety of global environmental and social reasons, losses from hazards and disasters are projected to increase at increasing rates into the foreseeable future. Hazards and the disasters they generate, thus, are inherently engaging subjects. They also depend on a multidisciplinary approach for their investigation and mitigation, bringing in the insights of natural scientists, social scientists, engineers, planners, emergency managers, first responders, and others. Geography is a very active discipline in the investigation of hazards, with its physical science, social science, and mapping traditions, as well as its ability to integrate these very different conceptual approaches with practical applications at all stages of the disaster cycle.

**GEO 491 | STATISTICAL DATA ANALYSIS FOR GIS | 4 quarter hours
(Graduate)**

This course examines statistical concepts and techniques that are applied to geographic problems. Topics include descriptive statistics and inferential statistics geared toward working with geographic data in GIS. Students will learn techniques for summarizing variables, testing difference of means, spatial autocorrelation, hot spot analysis, and correlation analysis through lectures and hands-on exercises using statistics and GIS software.

GEO 441 or MPS 552 or instructor permission is a prerequisite for this course.

**GEO 499 | INDEPENDENT STUDY [GRADUATE] | 2-4 quarter hours
(Graduate)**

Intensive study of a topic of special interest. Private conferences with instructor of supervised reading and research. Variable credit. Instructor consent required.