

GEOGRAPHY & ENVIRONMENTAL STUDIES

Undergraduate Program Information

The Department of Geography and Environmental Studies emphasizes the interaction of humans with the environment, and the program prepares students for professional positions in the public and private sectors, as well as for graduate work. The Department offers two concentrations for the major:

- The Geographic Information Science and Technology (GIS&T) Concentration emphasizes the acquisition of knowledge and skills in geographic information systems and remote sensing tools and concepts;
- The Human-Environment Relationships (HER) Concentration focuses on the analysis and interpretation of the coupled and complex interactions between people and the environment.

As detailed above, the Department of Geography and Environmental Studies also offers minors in Geography and GIS&T. The requirements for teaching fields in earth sciences are listed under the Department of Curriculum and Instruction in the College of Education.

Note: A grade of "C-" or better is required for all courses taken for the major. Students may not take any of these courses S/U.

Graduate Program Information

The Department of Geography and Environmental Studies offers graduate study leading to the Master of Applied Geography degree and to a Doctor of Philosophy in Geography Degree. Our programs focus on the use of geographic perspectives and tools to examine an array of applied research questions related to land-use change, natural resources, biogeography, desertification, landscape conservation, and urban and transportation planning. A minor in Geographic Information Science and Technology (GIS&T) is also available for all graduate students, regardless of major; details are provided above. Admission to the program is in accordance with the general regulations of the Graduate School. Any applicant who does not have an adequate undergraduate background in geography will be required to make up the deficiencies. Doctoral applicants should have a master's degree in Geography or a closely related field. Applicants must submit three letters of recommendation and a formal statement of intent to the Department as part of the application process. Please contact Dr. Michaela Buenemann, Geography and Environmental Studies Graduate Director (elabuen@nmsu.edu) if you have any questions about the program.

The Geography and Environmental Studies Department is also a participant in the Western Regional Graduate Program (WRGP) supported by the Western Interstate Commission of Higher Education (WICHE). The WRGP is a tuition-reciprocity arrangement that enables students that are legal residents in WICHE states (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming) to attend NMSU and pay the resident tuition rate, instead of the nonresident rate that an out-of-state student would normally pay.

The Department of Geography and Environmental Studies has a contract research laboratory (Spatial Applications Research Center-SpARC) and a state-of-the-art computer teaching laboratory, both of which support the full suite of ESRI and ENVI geospatial analytical software.

In addition, a hand-held spectroradiometer and 2 UAV's provide precise data collection at varying electromagnetic and spatial resolutions. The SpARC laboratory employs graduate students who work with local and state governments and research agencies, as well as with businesses on applied geography projects. Our teaching laboratory includes 18 workstations to support graduate students engaged in course work and research projects. The Department has good working relationships with the Water Resources Research Institute, the Jornada Experimental Range, the Physical Sciences Laboratory, and other units on campus. The Department of Geography and Environmental Studies has its own field equipment and field vehicle, which graduate students can use to support their thesis research. The potential for financial support exists for graduate students in Geography and Environmental Studies through teaching assistantships and research assistantships. Inquiries regarding the program and assistantships should be directed to Dr. Michaela Buenemann, Geography and Environmental Studies Graduate Director (elabuen@nmsu.edu). Financial aid questions should be addressed to the Office of Financial Aid at NMSU.

Degrees for the Department

Bachelor Degree(s)

- Geography (Geographic Information Science & Tech) - Bachelor of Science (<http://catalogs.nmsu.edu/nmsu/arts-sciences/geography/geography-gis-tech-bachelor-science/>)
- Geography (Human/Environment Relationships) - Bachelor of Science (<http://catalogs.nmsu.edu/nmsu/arts-sciences/geography/geography-her-bachelor-science/>)

Master Degree(s)

- Geography - Master of Applied Geography (<http://catalogs.nmsu.edu/nmsu/graduate-school/geography-master-applied-geography/>)

Doctoral Degree(s)

- Geography - Doctor of Philosophy (<http://catalogs.nmsu.edu/nmsu/graduate-school/geography-doctor-philosophy/>)

Minors for the Department

- Geographic Information Systems - Graduate Minor (<http://catalogs.nmsu.edu/nmsu/graduate-school/geographic-information-systems-graduate-minor/>)
- Geographic Information Systems - Undergraduate Minor (<http://catalogs.nmsu.edu/nmsu/arts-sciences/geography/geographic-information-science-technology-undergraduate-minor/>)
- Geography - Undergraduate Minor (<http://catalogs.nmsu.edu/nmsu/arts-sciences/geography/geography-undergraduate-minor/>)

Associate Professor, Carol Campbell, Department Head

Professors Brown **Associate Professors** Buenemann, Campbell; **Assistant Professors** Dugas, Magrane; **Professor Emeritus** Czerniak, DeMers, Wright

C. P. Brown, Ph.D., (California-Santa Barbara/San Diego State)– geographic information systems, water resources, U.S.-Mexico border environmental issues; M. Buenemann, Ph.D. (Oklahoma)– geographic information science and technology, land change science, drylands; C. L. Campbell, Department Head, Ph.D. (UCLA)– biogeography, landscape ecology, remote sensing, sustainability; D. Dugas, Ph.D. (Oregon)– geomorphology, physical geography; E. Magrane, Ph.D. (U of Arizona)- cultural geography and creativity, human-environment geography, geopoetics, art & environment.

Emeritus Faculty– R. J. Czerniak, Ph.D. (Colorado-Boulder)– *land use and transportation planning, Europe, urban geography*; M. N. DeMers, Ph.D. (Kansas)– *geographic information science, landscape ecology, geographic education*; J. B. Wright, Ph.D. (California- Berkeley)– *environmental conservation, cultural geography, American West*.

Geography Courses

GEOG 1110G. Physical Geography

4 Credits (3+3P)

This course introduces the physical elements of world geography through the study of climate and weather, vegetation, soils, plate tectonics, and the various types of landforms as well as the environmental cycles and the distributions of these components and their significance to humans.

Learning Outcomes

1. Define, describe, illustrate, distinguish among or explain the use of maps, map scale, globes, map projections, and remote sensing.
2. Define, describe, illustrate, distinguish among or explain the various elements of the earth's atmosphere, earth's relation to the sun, incoming solar radiation, the ozone layer, the primary temperature controls, and the unequal heating of land and water.
3. Define, describe, illustrate, distinguish among or explain the weather makers (air temperature, air pressure, humidity, clouds, precipitation, visibility, and wind [including pressure gradient, the Coriolis force, and friction]).
4. Define, describe, illustrate, distinguish among or explain air masses, pressure systems, the various fronts and associated types of storms, weather symbols, monsoons, the various forms of precipitation, along with causes and effects of lightning.
5. Define, describe, illustrate or explain the hydrologic cycle, the characteristics and influences of the oceans and continents on the weather, the Southern Oscillation (i.e., El Nino), the effects of land/water distribution, and climates and their global distribution.
6. Define, describe, illustrate or explain the biosphere, including organisms (flora and fauna), food chains, ecosystems and relationships. Define, describe, illustrate or explain soils in terms of soil-forming processes, components, properties, and classification.
7. Define, describe, illustrate or explain the structure of the earth, the internal processes, weathering and mass wasting, fluvial processes, characteristics and processes of arid regions, processes of coastal and Karst topographical regions, the processes and characteristics of glaciation (mountainous and continental).
8. Define, describe, illustrate, distinguish among or explain specific impacts by humans on weather, climate, and on the ecosystem at large.
9. Perform tests and collect data to analyze and classify weather, climate and landforms characteristics, processes, and impacts both quantitatively and qualitatively. This includes reading and extracting basic information from maps, diagrams, remote sensing devices, graphs, and tables. 1
10. Apply critical thinking skills such as inductive, deductive, and mathematical reasoning to solve problems using the scientific method. This includes interpreting maps, graphs and photos. 1
11. Recognize and discuss the effect of human activity on climate, climate change, the greenhouse effect, and on landforms at large. 1
12. Synthesize information from external, current sources and personal observations and discuss their relationships to class material.

GEOG 1120G. World Regional Geography

3 Credits (3)

Overview of the physical geography, natural resources, cultural landscapes, and current problems of the world's major regions. Students will also examine current events at a variety of geographic scales.

Learning Outcomes

1. Identify, describe, illustrate, distinguish among or explain the basic concepts of geography, the major world regions, areal differences and similarities, the processes that shape geography natural and human, the use of maps, and the key topics of geographical interpretation (e.g., location, world importance, population, political status, resources, etc.).
2. Identify, describe, illustrate, distinguish among or explain the regional groups of Europe, its historical background, its languages and religions, major features, the diversified economy, political structures, and impact on globalization.
3. Identify, describe, illustrate, distinguish among or explain the regional groups of Russia and its satellite nations, its historical background, their languages and religions, major features, their diversified economies, political structures, current problems, and impact on globalization.
4. Identify, describe, illustrate or explain the regional nations of Middle East, their historical background, their languages and religions, the major features, the diversified economies and political structures, the current problems.
5. Identify, describe, illustrate, distinguish among or explain the regional groups of Asia, their historical background its languages and religions, major features, the diversified economy and political structures, current problems, and impact on globalization.
6. Identify, describe, illustrate, distinguish among or explain the regional groups of the Pacific World, their historical background its languages and religions, major features, the diversified economy and political structures, current problems, and impact on globalization.
7. Identify, describe, illustrate, distinguish among or explain the regional groups of Africa, their historical background its languages and religions, major features, the diversified economy and political structures, current problems, and impact on globalization.
8. Identify, describe, illustrate, distinguish among or explain the regional groups of Latin America, their historical background its languages and religions, major features, the diversified economy and political structures, current problems, and impact on globalization.
9. Identify, describe, illustrate, distinguish among or explain the regional groups of Anglo-America, their historical background its languages and religions, major features, the diversified economy and political structures, current problems, and impact on globalization. 1
10. Collect data to analyze or classify the region various historical developments and trends relating to globalization 1
11. Apply critical thinking skills in predicting future developments and impacts in economics, cultural diversity, and political stability globally. 1
12. Recognize and discuss current political "hot-spots," their causes, and potential results with regards to globalization. 1
13. Synthesize information the data into a comprehensive world-view.

GEOG 1130G. Human Geography**3 Credits (3)**

This course serves as an introduction to the study of human geography. Human geography examines the dynamic and often complex relationships that exist between people as members of particular cultural groups and the geographical "spaces" and "places" in which they exist over time and the world today.

Learning Outcomes

1. Locate on maps, globes, and other technologies various geo-political spaces and places around the world, including in the United States.
2. Describe the primary concepts, theories, methods and terms prevalent in the field of human geography.
3. Apply core geographic concepts to the spatial patterns demonstrated in real-world scenarios.
4. Identify the relationships that influence human-environment interaction in a specific location at a specific time.
5. Define and utilize key concepts to explain human social and cultural change over time and across geographical space.
6. Explain the geographic context of a current event or conflict.
7. Identify a current event that illustrates a core cultural geographic concept.
8. Think critically, discuss, and write about the relationships of the natural world to human geography.

GEOG 2130. Map Use and Analysis**3 Credits (2+3P)**

Exploration of the cartographic medium. Development of critical map analysis and interpretation skills, and map literacy. Comprised of traditional lecture, labs, and map use projects.

Learning Outcomes

1. Accurately measure bearings and distances on maps.
2. Read and interpret terrain and landform representation.
3. Utilize a magnetic compass for basic land navigation and basic map making.
4. Utilize a GPS instrument for basic land navigation.
5. Recognize and describe basic physical and cultural spatial patterns portrayed on maps.
6. Analyze and interpret the significance of spatial patterns portrayed on maps.
7. Perform elementary spatial statistical analysis on geographic data.
8. Appreciate and utilize the significance of place names and cultural patterns.
9. Critically examine maps for evidence of information misuse or propagandist motives.
10. Recognize and utilize appropriate map categories, symbols, projections, and coordinate systems to effectively and accurately portray, read, analyze, and interpret geographic data.

GEOG 2996. Special Topics**1-3 Credits**

Specific subjects to be announced in the Schedule of Classes. May be repeated for a maximum of 12 credits.

Learning Outcomes

1. Varies

GEOG 315V. World Agriculture and Food Problems**3 Credits (3)**

Survey of food and agricultural issues in the U.S. and other countries. Covers: role of agriculture in economic development; trade in food and agricultural products; global food production, consumption, and marketing patterns; economics of technical change and food assistance; agriculture and the environment. Same as AEEC 315V.

GEOG 325V. New Mexico and the American West**3 Credits (3)**

Examination of the cultural and historical patterns, economic activities, and physical characteristics of New Mexico and the American West. Special focus is given to human, environmental, and cultural landscapes, as well as current issues and challenges in New Mexico, the West, and the border region.

GEOG 326. U.S. National Parks**3 Credits (3)**

Exploration of origins, landscapes, ecosystems, management issues, and conflicts in U.S. National Parks. The regional geography of the United States as seen through the creation and protection of biologically and culturally significant lands.

GEOG 328V. Geography of Latin America**3 Credits (3)**

Explores Latin America from a geographical perspective, integrating environmental, cultural and socioeconomic factors in an in-depth study of the development of the region and contemporary issues and challenges facing the region. Special focus is given to examining applied problems facing Latin America at a range of scales.

GEOG 331V. Europe**3 Credits (3)**

Focus on the cultural continent of Europe. An overview of climate, physical geography, and human geography of Europe, including a brief historical geography of the continent. Current environmental, social, and political issues of Europe will be discussed, with a particular focus on the fate of EU.

GEOG 351. Fundamentals of Biogeography**3 Credits (3)**

Exploration of life in space and time. Floristic and physiognomic characteristics of the Earth's major ecosystems and their distributions; ecosystem dynamics, evolution, and physical environment. Includes an individual research project resulting in a poster presentation. Crosslisted with: GEOG 557.

GEOG 353. Geomorphology**3 Credits (2+3P)**

Examination of the principle theories and concepts of landform creation; exploration of the roles of structure, processes, climate, and time in the formation of various types of landforms. Taught with GEOG 553. Crosslisted with: GEOL 353.

GEOG 357. Climatology**3 Credits (3)**

Elements and controls of climate. Energy and hydrologic cycles, general circulation, climate classification, distribution of climate types, microscale effects, applications.

Learning Outcomes

1. Students will be able to describe the fundamental processes that create climate on Earth.
2. Students will be able to describe the physical laws that comprise the climate system.
3. Students will be able to describe the trends in Earth's climate system.
4. Students will be able to summarize our current knowledge of climate change.

GEOG 361V. Economic Geography**3 Credits (3)**

The geographic relationships of supply and demand resources, population, and transportation. Site analysis and decision-making in different economic systems and cultures and how these decisions affect the environment and the location of economic activities.

GEOG 363V. Cultural Geography**3 Credits (3)**

The world's diverse cultural landscapes. Emphasis on the connections between social, political, religious, and agricultural patterns and the impact of societies on the natural environment.

GEOG 365V. Urban Geography**3 Credits (3)**

The global historical development of urban areas, as well as the changing functions of today's cities. A comparison between the North American city system and cities in Europe, Asia, and South America, including the development of the city form, the internal spatial organization of commercial, residential, and industrial areas, and socio-economic and political factors.

GEOG 373. Introduction to Remote Sensing**4 Credits (3+3P)**

Introduction to the theory, techniques, and applications of remote sensing. Topics include electromagnetic radiation; remote sensing systems; remote sensing of the biosphere, hydrosphere, atmosphere, lithosphere, and cultural landscapes. Course includes lectures and also labs focused on the basic analysis and interpretation of remote sensing products. Taught with GEOG 573.

GEOG 381. Cartography and Geographic Information Systems**4 Credits (3+3P)**

Design and construction of thematic maps. Introduction to cartographic principles in lecture. Emphasis on map-making using GIS software in the labs. Taught with GEOG 571.

GEOG 401. Internship/Co-op**1-3 Credits (1-3)**

Provides an opportunity whereby students work with a local, regional, or federal agency, or private sector firm on applied geographic work, under the supervision of an agency or firm professional and a geography faculty member. Consent of instructor required.

GEOG 435. Environmental Planning**3 Credits (3)**

Exploration of planning tools that advance the management of land and water resources, meeting current societal needs, while also minimizing damage to nature and society. Class activities include applied exercises that explore contemporary planning issues, including land conservation, natural hazards, biophysical analysis, water resource management, Federal land issues, and remediation of Superfund sites. Taught with GEOG 535.

GEOG 441. System Design for Geographic Information Science (GIS)**3 Credits (3)**

A critical aspect of GIS is its ability to provide the necessary products within the organization within which it is implemented. This is an in-depth analysis of currently accepted system design methodologies intended to create a successful implementation of GIS inside organizations. Crosslisted with: GEOG 581.

GEOG 452. Landscape Ecology**4 Credits (3+2P)**

Analysis of the structure, function and change of natural and anthropogenic landscapes. Patches, corridors, matrix and network, spatial organization, landscape dynamics, and role of disturbance in overall functioning of landscapes. Role of landscape heterogeneity in landscape management. Crosslisted with: GEOG 552.

GEOG 455. Southwest Environments**3 Credits (3)**

The U.S. Southwest: physical and human geography, coupled human-environment interactions, causes and consequences of environmental issues, and implications for sustainable development. Taught with GEOG 555.

GEOG 467. Transportation Geography**3 Credits (3)**

Nature and distribution of land, air and water transport facilities and their importance in regional development.

Learning Outcomes

1. Develop familiarity with various transportation theories and concepts.
2. Demonstrate accurate use and application of terms and vocabulary used in the transportation field.
3. Understand and demonstrate familiarity with concepts of urban, inter-urban and rural transport systems.
4. Be able to describe and organize bulk and international Multimodal freight patterns and processes.
5. Demonstrate familiarity and application of transportation laws, rules and regulations at the national and international level.

GEOG 473. Advanced Remote Sensing**4 Credits (3+3P)**

Introduction to advanced topics in digital image processing, analysis, interpretation, and visualization. Topics include geometric and radiometric correction, image enhancement, image classification, change detection, and accuracy assessment. Lectures focus on the discussion of advanced remote sensing concepts, techniques, and applications; labs are applications-oriented. Taught with GEOG 573.

Prerequisite(s): C- or better in GEOG 373.

GEOG 481. Fundamentals of Geographic Information Science (GIS)**4 Credits (3+3P)**

Fundamentals of computer-based systems which organize, analyze, and present spatially referenced data. Crosslisted with: GEOG 578.

GEOG 482. Geodatabase Design**3 Credits (2+3P)**

A practical introduction to designing geodatabases. The course takes you through the eleven steps of geodatabase design divided into four stages: thematic characterization; developing the database elements, relationships and properties; capture and collection; and finally, implementation and documentation. Taught with GEOG 572.

Prerequisite(s): C- or better in GEOG 481.

GEOG 483. Field Explorations in Geography**3 Credits (6P)**

A field-based class where students complete exercises in physical, human, and environmental geography in the Southwest. May be offered as a two-week intensive class where students are away from Las Cruces and camping, or may be offered with weekend field trips depending on the instructor. A lab fee for transportation and other expenses is required. Taught with GEOG 583.

GEOG 488. GIS and Water Resources**3 Credits (3)**

Explores a range of GIS tools, routines, and data structures and then applies them to a range of research questions and management issues in the area of Water Resources. The class has both a lecture and laboratory component, and students will have opportunities to explore a range of GIS tools in formal lab exercises and a project in the student area of interest. Taught with GEOG 588.

GEOG 491. Special Topics**1-3 Credits**

Specific subjects to be announced in the Schedule of Classes. May be repeated for a maximum of 12 credits.

GEOG 493. Special Problem Research**1-3 Credits**

For advanced and exceptional students. Research, and preparation of a paper in some phase of geography. A maximum of 6 credits may be earned. Consent of instructor required.

GEOG 495. Directed Readings**1-3 Credits**

Individual study through selected readings. A maximum of 6 credits may be earned. Consent of instructor required.

GEOG 501. Research Design and History of Geographic Thought**3 Credits (3)**

Understanding and application of the research process, including conceptualization and definition of a research problem, study designs, data sources, data collection, and report writing in development of geographic thought.

GEOG 512. Geohumanities Seminar**3 Credits (3)**

In recent years, artists, writers, and humanities scholars have increasingly engaged with geographic concerns, and geographers have incorporated humanities-based approaches to their work. Broadly known as the geohumanities, these interdisciplinary endeavors offer exciting ways to engage with key geographic concepts such as place, landscape, and nature. This graduate level seminar will examine both critical and creative approaches to the geohumanities. Subtitles indicate unique topics. Taught with GEOG 412. May be repeated up to 6 credits.

Learning Outcomes

1. Articulate their own understanding of the geohumanities as an interdisciplinary field, including its practices and its histories that draw on geography's intersection with multiple humanities fields.
2. Identify key texts, thinkers, and practices in the geohumanities, as well as spaces (such as both scholarly and public-facing journals and digital spaces) where geohumanities work is currently being advanced and developed.
3. Analyze, critique, and engage with current debates and directions within the geohumanities.
4. Apply geohumanities approaches within their own work by developing and producing a creative and/or critical project that advances their own research/scholarly/creative interests.

GEOG 535. Environmental Planning**3 Credits (3)**

Exploration of planning tools that advance the management of land and water resources, meeting current societal needs, while also minimizing damage to nature and society. Class activities include applied exercises that explore contemporary planning issues, including land conservation, natural hazards, biophysical analysis, water resource management, Federal land issues, and remediation of Superfund sites. Taught with GEOG 435.

GEOG 552. Landscape Ecology**4 Credits (3+2P)**

Analysis of the structure, function and change of natural and anthropogenic landscapes. Patches, corridors, matrix and network, spatial organization, landscape dynamics, and role of disturbance in overall functioning of landscapes. Role of landscape heterogeneity in landscape management. Taught with GEOG 452.

GEOG 553. Geomorphology**3 Credits (2+3P)**

Examination of the principle theories and concepts of landform creation; exploration of the roles of structure, processes, climate, and time in the formation of various types of landforms. Taught with GEOG 353.

GEOG 555. Southwest Environments**3 Credits (3)**

The U.S. Southwest: physical and human geography, coupled human-environment interactions, causes and consequences of environmental issues, and implications for sustainable development. Taught with GEOG 455.

GEOG 557. Fundamentals of Biogeography**3 Credits (3)**

Exploration of life in space and time. Floristic and physiognomic characteristics of the Earth's major ecosystems and their distributions; ecosystem dynamics, evolution, and physical environment. Includes an individual research project resulting in a poster presentation. Additional work for graduate students. Crosslisted with: GEOG 351.

GEOG 571. Cartography and Geographic Information Systems**4 Credits (3+3P)**

Graduate level design and construction of thematic maps. Introduction to cartographic principles in lecture. Emphasis on map-making using GIS software in the labs. Taught with GEOG 381.

GEOG 572. Geodatabase Design**3 Credits (2+3P)**

Graduate level introduction to designing geodatabases. The course takes you through the eleven steps of geodatabase design divided into four stages: thematic characterization; developing the database elements, relationships and properties; capture and collection; and finally implementation and documentation. Taught with GEOG 482.

GEOG 573. Introduction to Remote Sensing**4 Credits (3+3P)**

Graduate level introduction to the theory, techniques, and applications of remote sensing. Topics include electromagnetic radiation; remote sensing systems; remote sensing of the biosphere, hydrosphere, atmosphere, lithosphere, and cultural landscapes. Course includes lectures and also labs focused on the basic analysis and interpretation of remote sensing product. Taught with GEOG 373.

GEOG 578. Fundamentals of Geographic Information Science (GIS)**4 Credits (3+3P)**

Graduate level fundamentals of computer-based systems which organize, analyze, and present spatially referenced data. Additional work for graduate students. Crosslisted with: GEOG 481.

GEOG 581. System Design for Geographic Information Science (GIS)**3 Credits (3)**

A critical aspect of GIS is its ability to provide the necessary products within the organization within which it is implemented. This is an in-depth analysis of currently accepted planning methodologies designed to create a successful implementation of GIS inside organizations. Taught with GEOG 441.

GEOG 582. Advanced Remote Sensing**4 Credits (3+3P)**

Graduate level introduction to advanced topics in digital image processing, analysis, interpretation, and visualization. Topics include geometric and radiometric correction, image enhancement, image classification, change detection, and accuracy assessment. Lectures focus on the discussion of advanced remote sensing concepts, techniques, and applications; labs are applications-oriented. May be repeated up to 4 credits.

GEOG 583. Field Explorations in Geography**3 Credits (6P)**

A graduate level field-based class where students complete exercises in physical, cultural, and environmental geography in the Southwest. May be offered as a two-week intensive class where students are away from Las Cruces and camping; or may be offered with weekend field trips depending on the instructor. A lab fee for transportation and other expenses is required. May be repeated up to 3 credits.

GEOG 585. Advanced Spatial Analysis**3 Credits (3+2P)**

Introduction to basic spatial and aspatial descriptive statistics, statistical analysis of point and area patterns, critical review of quantitative research in geography, and exploration of advanced spatial analysis routines including cluster analysis, hot/cold spot analysis, and spatially weighted regression.

Prerequisite(s): Knowledge of basic statistics recommended.

GEOG 588. GIS and Water Resources**3 Credits (3)**

This is a graduate level class that explores a range of GIS tools, routines, and data structures and then applies them to a range of research questions and management issues in the area of Water Resources. The class has both a lecture and laboratory component, and students will have opportunities to explore a range of GIS tools in formal lab exercises and a project in the student's area of interest. Taught with GEOG 488.

GEOG 595. Directed Readings**1-3 Credits**

Advanced individual study through selected readings. May be repeated for a maximum of 6 credits.

GEOG 596. Residency**1-12 Credits (1-12)**

A contractual learning experience in the public or private sector under the supervision of a field supervisor and two faculty members. May be repeated up to 12 credits. Consent of Instructor required. Restricted to: Geography majors.

GEOG 598. Selected Topics**1-3 Credits**

Readings, discussions, lectures or laboratory studies of selected geographic themes. May be repeated for unlimited credit.

GEOG 599. Master's Thesis**1-12 Credits (1-12)**

Supervised individual study of a student's thesis topic. May be repeated for an unlimited number of credits. Thesis/Dissertation Grading.

GEOG 601. Introduction to Geographic Theory & Application**3 Credits (3)**

This course is intended to introduce Ph.D. and Masters level students to the history, theory, methods, and contemporary literature of Geography as a discipline. It also serves to prepare incoming students to engage in an integrative, theoretically informed and applied research project. Crosslisted with: GEOG 501.

Learning Outcomes

1. Students will be able to demonstrate a clear understanding of multiple themes and topics in Geography.
2. Students will be able to demonstrate a clear understanding of multiple methods suitable for geographic research
3. Students will be able to identify and summarize recent scholarship relevant to the student's own research interests.
4. Students will be able to communicate clearly and effectively in an oral format.
5. Students will be able to communicate clearly and effectively in a written format.
6. Students will be able to identify a committee chairperson who will guide her or his graduate work.
7. Students will be able to design an integrative program of studies for the remainder of her or his graduate work.

GEOG 602. Integrative Research Design**3 Credits (3)**

This seminar focuses on the basic elements of research design, guiding students through the development of a formal proposal for original academic research. This course should be taken after GEOG 601 as part of the required course sequence for PhD students in Geography.

Prerequisite: GEOG 601.

GEOG 603. Professional Geographic Practice**3 Credits (3)**

This core course focuses on a variety of professional development topics that prepare students for teaching and applied community engagement projects. All students in this course will receive training in professional communication, professional ethics, and grant proposal writing. Depending on their individual professional goals, the course will allow students to undertake practical training in a variety of areas that range from academic teaching to applied policy work to scientific communication. All students in the joint doctoral program are expected to engage in applied projects as part of their research design, and this course will lay the foundation for these pursuits. Unlike GEOG 601 and GEOG 602, the final core course will be taught independently on each campus, to maximize the potential for faculty-student interaction on specific location-based project planning. This course will be offered every fall semester.

Prerequisite: GEOG 602.

Learning Outcomes

1. Identify professional geography as it relates to project management.
2. Explore professional communication in various settings in a variety of workplace settings.

GEOG 700. Doctoral Dissertation**1-18 Credits (1-18)**

This highly individualized independent study course is for students who have completed their comprehensive exams and are currently working on their doctoral dissertation. May be repeated up to 18 credits. Thesis/Dissertation Grading.

Learning Outcomes

1. Expand their knowledge in a specific area of interest in the discipline of geography.
2. Develop their skills in analyzing, synthesizing, and interpreting geographic data and information.
3. Develop their skills in technical and/or professional writing.
4. Develop their skills in the management and completion of a professional research project.

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