

Geography and Geographic Information Science (Geog)

<http://www.arts-sciences.und.edu/Geography>

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The Department of Geography & GISc offers a comprehensive education in Geography leading to the degree of Bachelor of Science in Geography. The Department also administers an interdisciplinary Environmental Studies program leading to the degrees of Bachelor of Arts and Bachelor of Science in Environmental Studies. These degrees are awarded in the College of Arts and Sciences and focus on critical thinking, communication, knowledge and analysis related to these fields. The majors are flexible, and allow students to tailor their courses from many departments within the College and across the university. Students in these programs will be prepared for professional careers in government, industry or education in a wide variety of fields ranging from environmental science to planning and policy analysis. These programs also prepare students for graduate work.

Students in the Geography program have a strong focus on geospatial technologies related to the areas of human geography, physical geography, and geographic education. The Bachelor of Science degree has three options available with emphasis on: community and urban development, environmental geography and geographic education. In addition, the minor in geospatial technologies provides the student with the knowledge and hands-on learning to be successful in using tools such as GIS, remote sensing and global positioning systems (GPS) in many education and professional career paths. The geography minor is flexible and complements related coursework in many programs such as environmental studies, anthropology, atmospheric science, aviation, biology, business, communications, education, geology, history, international business, meteorology, public administration, sociology, space studies or sustainability studies.

Students in the Environmental Studies program can address the issues of the environment from the basic science, social science, or humanistic approach or a combination of these. The Bachelor of Arts is a liberal arts degree with a strong focus on the social sciences and humanities. The Bachelor of Science degree is more focused on science as it relates to environmental issues with the addition of social science and humanities perspectives.

Facilities

The Department of Geography & GISc houses a state-of-the-art computer laboratory for work related to GIS, remote sensing, digital image processing, global positioning systems (GPS), mapping, spatial analysis and field methods. The Department also houses a physical geography lab and has a wide array of laboratory and field equipment, with a focus on tools needed for GPS mapping, water and soil sampling and analysis, and field spectroscopy.

B.S. with a Major in Geography (p.) B.A. with a Major in Environmental Studies (p.) B.S. with a Major in Environmental Studies (p.)

College of Arts and Sciences

B.S. with a Major in Geography

Required: 125 credits (36 of which must be numbered 300 or above, and 60 of which must be from a 4-year institution) including:

I. Essential Studies Requirements (see University ES listing).

II. The following core curriculum courses for A and B options (22 credits):

GEOG 121 & 121L	Global Physical Environment and Global Physical Environment Laboratory	4
GEOG 151	Human Geography	3
GEOG 161	World Regional Geography	3

GEOG 377 & 377L	Quantitative Applications in Geography and Spatial Analysis Laboratory	3
GEOG 454	Conservation and Sustainable Use of Natural Resources	3
GEOG 471 & 471L	Cartography and Visualization and Cartography and Visualization Laboratory	3
GEOG 474 & 474L	Introduction to Geographic Information Systems (GIS) and GIS Laboratory	3
Total Credits		22

* Capstone Course

III. Select one of the following options:

A: Community and Urban Development Emphasis

This program provides an overview of geography as well as a thorough introduction to community and urban development. It is intended for students wishing to pursue graduate work or entry-level jobs in community development, economic development, urban planning, land use planning, transportation, or tourism.

Required		
GEOG 352	Economic Geography	3
GEOG 457	Urban Geography and Planning	3
GEOG 458	Community Development	3
Electives *		5
GEOG 250	Introduction to Geopolitics	
GEOG 262	Geography of North America I	
GEOG 263	Geography of North Dakota	
GEOG 300	Special Topics in Geography	
GEOG 322	Environmental Hazards	
GEOG 374 & 374L	Environmental Remote Sensing and Environmental Remote Sensing Laboratory	
GEOG 378	Global Positioning Systems: Applications and Theory	
GEOG 397	Cooperative Education	
GEOG 452	Selected Topics in Economic Geography	
GEOG 453	Historical Geography	
GEOG 455	Geopolitics	
GEOG 459	Population Geography	
GEOG 463	Regional Geography	
GEOG 476	Selected Topics in Geographic Information Systems	
Required in other departments **		12
Total Credits		26

* Electives chosen in consultation with the faculty adviser (at least 5 credits)

** Any combination of courses from the following fields: Economics, Finance, Public Administration, Anthropology, Sociology, History, and other social sciences.

B: Environmental Geography Emphasis

This program provides an overview of geography and an introduction to the concepts and methods used in environmental management. It is intended for students wishing to pursue graduate work or a professional career in government, industry, or education in a wide variety of environmental fields.

Elective systematic courses *		8
GEOG 134 & 134L	Introduction to Global Climate and Introduction to Global Climate Laboratory	
GEOG 334	Climatology	
GEOG 322	Environmental Hazards	
GEOG 421	Selected Topics in Physical Geography	
Other electives **		6
GEOG 352	Economic Geography	
GEOG 374 & 374L	Environmental Remote Sensing and Environmental Remote Sensing Laboratory	
GEOG 378	Global Positioning Systems: Applications and Theory	

GEOG 397	Cooperative Education	
GEOG 457	Urban Geography and Planning	
GEOG 475	Digital Image Processing	
GEOG 476	Selected Topics in Geographic Information Systems	
Required in other departments ***		12
Total Credits		26

* Elective systematic courses chosen in consultation with the faculty adviser (at least 8 credits).

** Other electives chosen in consultation with the faculty adviser (6 credits)

*** Any combination of courses from the following fields: Atmospheric Science, Biology, Chemistry, Computer Science, Civil Engineering, Geology and Geological Engineering, Math, and Physics.

C: Geographic Education Emphasis (Teacher Licensure)

Through a partnership with the College of Education and Human Development and the Department of Teaching and Learning, students may seek secondary licensure in Geography. This program provides a comprehensive background to geography. It is designed to prepare the student with the geography education necessary for a middle school or secondary school teaching career. The following program of study must be completed:

I. Essential Studies Requirements (see University ES listing).

II. Geographic Education Program of Study:

A. Geographic Education core (26 credits):

GEOG 121 & 121L	Global Physical Environment and Global Physical Environment Laboratory	4
GEOG 151	Human Geography	3
GEOG 161	World Regional Geography	3
GEOG 271	The Power of Maps	3
GEOG 352	Economic Geography	3
GEOG 377 & 377L	Quantitative Applications in Geography and Spatial Analysis Laboratory	3
GEOG 386	Geography Education Field Placement	1
GEOG 419	Methods and Materials of Teaching Middle and Secondary School in Geographic Education	3
GEOG 454	Conservation and Sustainable Use of Natural Resources	3
Total Credits		26

B. Electives (10 credits):

Students must choose a minimum of 10 credits from a combination of the following concentrations, selected with approval of the geography adviser responsible for teacher education.

Human Geography

GEOG 250	Introduction to Geopolitics	3
GEOG 300	Special Topics in Geography	1-3
GEOG 452	Selected Topics in Economic Geography	3-9
GEOG 453	Historical Geography	3
GEOG 455	Geopolitics	3
GEOG 457	Urban Geography and Planning	3
GEOG 458	Community Development	3
GEOG 459	Population Geography	3

Physical Geography

GEOG 134 & 134L	Introduction to Global Climate and Introduction to Global Climate Laboratory	4
GEOG 300	Special Topics in Geography	1-3
GEOG 322	Environmental Hazards	3
GEOG 334	Climatology	3
GEOG 421	Selected Topics in Physical Geography	3-9

Regional Geography

GEOG 262	Geography of North America I	3
GEOG 263	Geography of North Dakota	3
GEOG 362	Geography of Canada	3
GEOG 462	Geography of North America II	3
GEOG 463	Regional Geography	2-9

Geographical Techniques

GEOG 374 & 374L	Environmental Remote Sensing and Environmental Remote Sensing Laboratory	3
GEOG 378	Global Positioning Systems: Applications and Theory	2
GEOG 471 & 471L	Cartography and Visualization and Cartography and Visualization Laboratory	3
GEOG 474 & 474L	Introduction to Geographic Information Systems (GIS) and GIS Laboratory	3

III. Admission to the Secondary Program, normally while taking T&L 250 Introduction to Education. (See College of Education and Human Development (<http://und-public.courseleaf.com/educationandhumandevlopment>) for admission and licensing requirements.)

IV. The program in Secondary Education, to include:

T&L 250	Introduction to Education	3
T&L 339	Technology for Teachers	2
T&L 345	Curriculum Development and Instruction	3
T&L 350	Development and Education of the Adolescent	3
T&L 386	Field Experience (Optional)	1
GEOG 419	Methods and Materials of Teaching Middle and Secondary School in Geographic Education	3
T&L 432	Learning Environments	3
T&L 433	Multicultural Education	3
T&L 486	Field Experience	1
T&L 487	Student Teaching	16
T&L 488	Senior Seminar	1
Total Credits		39

Geography majors seeking secondary licensure must have a geography education adviser in the Geography Department and an adviser in the Department of Teaching and Learning.

* T&L 390 Special Topics, may be taken as an elective.

B.A. with a Major in Environmental Studies

Required 125 credits (36 of which must be numbered 300 or above and 60 of which must be from a 4-year institution) including:

I. Essential Studies Requirements (see University ES guidelines and course listings).

II. The Following Curriculum (45 Major Credits)

Core Required Courses (21 credits)

BIOL 111	Concepts of Biology	3
BIOL 111L	Concepts of Biology Laboratory	1
CHEM 115	Introductory Chemistry	3
CHEM 115L	Introductory Chemistry Laboratory	1
ANTH 171	Introduction to Cultural Anthropology	3
GEOG 121	Global Physical Environment	3
GEOG 121L	Global Physical Environment Laboratory	1
GEOG 454	Conservation and Sustainable Use of Natural Resources	3

PHIL 253	Environmental Ethics	3
or PHIL 250	Ethics in Engineering and Science	

Techniques and Methods (6 credits from the list below, including statistics)

ANTH 350	Ethnographic Methods	3
GEOG 274	Introduction to Geospatial Technologies	3

GEOG 471	Cartography and Visualization	2
GEOG 471L	Cartography and Visualization Laboratory	1
GEOG 474	Introduction to Geographic Information Systems (GIS)	2
GEOG 474L	GIS Laboratory	1
SOC 323	Sociological Research Methods	3
Statistics (one of the following options):		
GEOG 377 & 377L	Quantitative Applications in Geography and Spatial Analysis Laboratory	3-4
or SOC 326	Sociological Statistics	
or PSYC 241	Introduction to Statistics	
Natural Systems (6 credits from the list below)		
ANTH 420	Archaeological Origins of Plant and Animal Use	3
ESSP 320	Land and Water Sustainability	3
ESSP 333	Oceanography	3
GEOG 134	Introduction to Global Climate	3
GEOG 334	Climatology	3
GEOG 421	Selected Topics in Physical Geography	3
GEOL 101	Introduction to Geology	3
GEOL 103	Introduction to Environmental Issues	3
GEOL 205	Surviving on Planet Earth	3
GEOL 322	Geology, Society, and the Environment	3
GEOL 342	Conservation and Environmental Hydrology	3
Social Science and Policy (6 credits from the list below)		
COMM 300	Communication and Society	3
ESSP 460	Global Environmental Policy	3
GEOG 322	Environmental Hazards	3
GEOG 455	Geopolitics	3
GEOG 457	Urban Geography and Planning	3
GEOG 459	Population Geography	3
N&D 335	World Food Patterns	3
POLS 250	Introduction to Public Administration	3
POLS 432	Public Policy Making Process	3
SOC 331	Community Sociology	3
SOC 437	Population	3
TECH 300	Technology and Society	3
Humanities (6 credits from the list below)		
ENGL 227	Introduction to Literature and Culture	3
ENGL 308	The Art of Writing Nonfiction	3
ENGL 369	Literature and Culture	3
PHIL 430	Philosophy of Science and Technology	3
PHIL 450	Philosophy, Economics, and Politics	3
PHIL 451	Citizenship and Political Participation	3
RELS 203	World Religions	3

B.S. with a Major in Environmental Studies

Required 125 credits (36 of which must be numbered 300 or above and 60 of which must be from a 4-year institution) including:

I. Essential Studies Requirements (see University ES guidelines and course listings).

II. The Following Curriculum (45 Major Credits)

Core Required Courses (24 credits)

BIOL 150	General Biology I	3
BIOL 150L	General Biology I Laboratory	1
CHEM 121	General Chemistry I	3
CHEM 121L	General Chemistry I Laboratory	1
GEOG 121	Global Physical Environment	3
GEOG 454	Conservation and Sustainable Use of Natural Resources	3
MATH 146	Applied Calculus I	3
PHIL 253	Environmental Ethics	3

or PHIL 250	Ethics in Engineering and Science	
BIOL 151 & 151L	General Biology II and General Biology II Laboratory	4
or CHEM 122 & 122L	General Chemistry II and General Chemistry II Laboratory	

Techniques and Methods (6 credits from the list below, including statistics)

GEOG 274	Introduction to Geospatial Technologies	3
GEOG 374	Environmental Remote Sensing	2
GEOG 374L	Environmental Remote Sensing Laboratory	1
GEOG 471	Cartography and Visualization	2
GEOG 471L	Cartography and Visualization Laboratory	1
GEOG 474	Introduction to Geographic Information Systems (GIS)	2
GEOG 474L	GIS Laboratory	1
GEOG 475	Digital Image Processing	3

Statistics (one of the following options):

BIOL 470	Biometry	3-4
or GEOG 377 & 377L	Quantitative Applications in Geography and Spatial Analysis Laboratory	
or PSYC 241	Introduction to Statistics	
or SOC 326	Sociological Statistics	

Natural Systems (9 credits from the list below)

BIOL 332	General Ecology	3
BIOL 332L	Gen Ecology Lab	1
BIOL 433	Aquatic Ecology	3
BIOL 439	Conservation Biology	3
CHEM 333	Analytical Chemistry	3
CHEM 333L	Analytical Chemistry Laboratory	1
CHEM 341	Organic Chemistry I	3
CHEM 341L	Organic Chemistry I Laboratory	1
CHEM 342	Organic Chemistry II	3
CHEM 342L	Organic Chemistry II Laboratory	1
ESSP 320	Land and Water Sustainability	3
ESSP 333	Oceanography	3
GEOG 134	Introduction to Global Climate	3
GEOG 334	Climatology	3
GEOG 421	Selected Topics in Physical Geography	3

Social Science and Policy (3 credits from the list below)

ANTH 171	Introduction to Cultural Anthropology	3
ESSP 450	Environmental and Natural Resource Economics	3
ESSP 460	Global Environmental Policy	3
GEOG 455	Geopolitics	3
GEOG 457	Urban Geography and Planning	3
GEOG 459	Population Geography	3
N&D 335	World Food Patterns	3
POLS 116	State and Local Government	3
POLS 432	Public Policy Making Process	3
PSYC 111	Introduction to Psychology	3
SOC 331	Community Sociology	3
SOC 437	Population	3
TECH 300	Technology and Society	3

Humanities (3 credits from the list below)

ENGL 227	Introduction to Literature and Culture	3
ENGL 308	The Art of Writing Nonfiction	3
ENGL 369	Literature and Culture	3
PHIL 430	Philosophy of Science and Technology	3
RELS 203	World Religions	3

Minor in Geography

Required 20 credits including:

GEOG 121 & 121L	Global Physical Environment and Global Physical Environment Laboratory	4
GEOG 151	Human Geography	3
GEOG 161	World Regional Geography	3
Electives		10
Total Credits		20

Students must choose a minimum of 10 credits from one or a combination of concentrations, selected with approval of a geography adviser.

Minor in Geospatial Technologies

This is a 21-credit minor. The courses to be included are as follows (all are existing courses taught on a regular basis as part of normal faculty loads with the exception of GEOG 274, which is new but will be part of a faculty member's normal load):

GEOG 271	The Power of Maps	3
GEOG 274	Introduction to Geospatial Technologies	3
GEOG 374	Environmental Remote Sensing	2
GEOG 374L	Environmental Remote Sensing Laboratory	1
GEOG 471	Cartography and Visualization	2
GEOG 471L	Cartography and Visualization Laboratory	1
GEOG 474	Introduction to Geographic Information Systems (GIS)	2
GEOG 474L	GIS Laboratory	1
GEOG 475	Digital Image Processing	3
GEOG 476	Selected Topics in Geographic Information Systems	3
Total Credits		21

The geography courses that may be used to satisfy the 4-credit Essential Studies laboratory science requirement are Geography 121 and 134.

Geography courses that may be used to satisfy the 9-credit Essential Studies social science requirement include: Geography 151, 161 and 262.

Courses

GEOG 121. Global Physical Environment. 3 Credits.

A study of the pattern of distribution of the physical elements of the global environment. The origin and characteristics of the terrestrial grid, earth-space relations, climate, landforms, vegetation, and soils. F,S,SS.

GEOG 121L. Global Physical Environment Laboratory. 1 Credit.

A basic environmental science laboratory to complement Geography 121. F,S,SS.

GEOG 134. Introduction to Global Climate. 3 Credits.

An introduction to the global climate, emphasizing atmospheric processes, weather and climate elements, and climate change. Emphasis is placed upon the factors that control climate and climatic distributions. S.

GEOG 134L. Introduction to Global Climate Laboratory. 1 Credit.

A basic physical science laboratory focused upon specific atmospheric-climatic phenomenon; wet and dry lab experiments, plus written lab exercises. S.

GEOG 151. Human Geography. 3 Credits.

A systematic analysis of people's cultural regions including settlement patterns and change via migration and diffusion. F,S.

GEOG 161. World Regional Geography. 3 Credits.

Development of the concept of region with analysis of the relationship of physical and cultural features to the contemporary world situation. F,S.

GEOG 250. Introduction to Geopolitics. 3 Credits.

As a branch of political geography, the study of Geopolitics is concerned with the spatial dynamics of power relations especially at the international level. From a geographic perspective, this course surveys changing relations among states and the influences of national and transnational actors and events. The course attempts to help students apply a broad range of theoretical perspectives to the analysis of global and regional issues and events, and develop insights into what is happening in the world today. From war and terrorism to economic globalization, human rights and sustainable development, this course will explore a myriad of important issues and challenges that face the world today. S.

GEOG 262. Geography of North America I. 3 Credits.

A spatial approach to the development of Canada and the United States which emphasizes the transformation of the cultural landscape by exploring the contributions of the diverse peoples who inhabit the two nation-states and deal with a global economy. F.

GEOG 263. Geography of North Dakota. 3 Credits.

Study of the interrelationships that exist between North Dakota's physical and cultural environments. Specific topics include physiography, climate, flora, prehistoric occupation, historic development, demography, and economic structures. S.

GEOG 271. The Power of Maps. 3 Credits.

Maps are essential and powerful tools for those who study geographical phenomena. Improvements in GIS and the World Wide Web (WWW) have empowered more people to make and use maps in highly varied and creative ways. This course serves as an introduction to maps and cartography, with emphasis on their role in GIS and on the WWW. Course content includes the characteristics of geographic data, the map abstraction and generalization process, map types and uses, and map interpretation. The course covers technical and social issues relevant to mapping, as well as a survey of map application. S, even years.

GEOG 274. Introduction to Geospatial Technologies. 3 Credits.

Students engage with a range of geospatial technologies to explore, analyze, and represent geographical phenomena and data through a series of field-based exercises. Students will learn about the types of societal problems that geospatial scientists are uniquely positioned to solve. Through guest speakers, readings, and discussions, they will learn about the knowledge and skills required to enter this rapidly-expanding career field and the courses in the geography curriculum that will help them to acquire these skills. F.

GEOG 300. Special Topics in Geography. 1-3 Credits.

Topic of course will change from semester to semester but will typically emphasize recent developments in geography. Repeatable to six credits. Repeatable to 6 credits. F,S,SS.

GEOG 314. Conservation Of Resources. 3 Credits.

GEOG 322. Environmental Hazards. 3 Credits.

An overview of the field of environmental hazards emphasizing risk assessment, hazard impacts, human vulnerability, and hazard mitigation. Prerequisites: GEOG 121 and GEOG 161 or consent of instructor. F, even years.

GEOG 334. Climatology. 3 Credits.

An overview of the field of climatology, emphasizing surface transfers of energy and water, the general circulation of the atmosphere, and climate change. Prerequisites: GEOG 134 or ATSC 110. S, odd years.

GEOG 352. Economic Geography. 3 Credits.

A study of the local, national, and global economic life describing and explaining the geographic factor involved in the production, distribution, and consumption of the major commodities and resources of the world. Special emphasis is placed upon the global issue of the underdeveloped or Third World countries and theories, which have been, developed to explain spatial structure. Prerequisite: Sophomore standing or consent of instructor. F.

GEOG 362. Geography of Canada. 3 Credits.

A regional and topical analysis of the physical, cultural and economic features of Canada. S.

GEOG 374. Environmental Remote Sensing. 2 Credits.

A thorough examination of optical, infrared, and microwave methods for remote observation of Earth systems, with a focus on the use of aircraft and satellite data for addressing environmental problems. The course includes an overview of modern remote sensing systems for data collection at a variety of scales, as well as an introduction to digital image processing. Corequisite: GEOG 374L. F.

GEOG 374L. Environmental Remote Sensing Laboratory. 1 Credit.

A systematic coverage of visual and digital laboratory techniques used to interpret aerial photography and satellite imagery. Students gain hands-on experience assessing environmental problems using remotely sensed data. Corequisite: GEOG 374. F.

GEOG 377. Quantitative Applications in Geography. 2 Credits.

Application of statistical and mathematical techniques to research topics in geography. Prerequisite: MATH 103 or consent of instructor. F.

GEOG 377L. Spatial Analysis Laboratory. 1 Credit.

Practical applications of statistical and mathematical techniques for geographic problems. Students work on projects which involve solving problems by spatial-oriented computations. Use of relevant statistical programs on computers are emphasized. Prerequisite: MATH 103. Corequisite: GEOG 377. F.

GEOG 378. Global Positioning Systems: Applications and Theory. 2 Credits.

This course examines the equipment, procedures, and techniques related to GPS technology, as well as its integration with Geographic Information Systems. Foci include the fundamentals of satellite navigation, the history of GPS, and applications related to mapping and analysis in the environmental sciences. Strong emphasis is placed on providing hands-on experience. S, even years.

GEOG 386. Geography Education Field Placement. 1-3 Credits.

A variable credit course with amount of credit depending upon the extent of the geographic education work of the student in a K-12 school setting. Recommended for secondary education social studies majors interested in how geography is taught at the high school level and for elementary/middle school social studies majors concerned about how federal legislation is affecting teaching grades K-8. Prerequisite: Department approval. Repeatable. F,S,SS.

GEOG 397. Cooperative Education. 1-6 Credits.

A practical work experience with an employer closely associated with geography. May be repeated to a maximum of 6 credits. Prerequisites: 60 credits completed and a minimum GPA of 2.75 or consent of Department Co-op Coordinator and Chair. Repeatable to 6 credits. S/U grading. F,S,SS.

GEOG 419. Methods and Materials of Teaching Middle and Secondary School in Geographic Education. 3 Credits.

Various teaching methods, strategies and the materials used in teaching middle and secondary school geographic education. Prerequisites: T&L 250 and T&L 345. Corequisite: T&L 486. S.

GEOG 421. Selected Topics in Physical Geography. 3 Credits.

An examination of an advanced physical geography topic chosen from field methods, biogeography, human impact on the environment, physiography, or others. Repeatable to nine credits if different topics are examined. Prerequisite: GEOG 121 or consent of instructor. Repeatable to 9 credits. F,S.

GEOG 452. Selected Topics in Economic Geography. 3 Credits.

Selected topics in economic geography including but not limited to industrial location, transportation, rural economic development, and others. Repeatable to nine credits if different titles are examined. Prerequisite: GEOG 151 or consent of instructor. Repeatable to 9 credits. On demand.

GEOG 453. Historical Geography. 3 Credits.

Using the spatial approach, landscape change is analyzed over time in various regions of the world using a variety of scales of study. Emphasis is placed upon the relationship of historical geography to historic preservation and tourism. On demand.

GEOG 454. Conservation and Sustainable Use of Natural Resources. 3 Credits.

Geographic principles applied to the analysis of natural resources and their efficient utilization. Emphasis is on sustainable development. S.

GEOG 455. Geopolitics. 3 Credits.

Geographic analysis of the global political system and the significance of the nation-state, intergovernmental organizations, globalization, free trade, and terrorism with consideration of the broad political, social cultural, and economic contexts of world disputes. Prerequisite: GEOG 250 or consent of instructor. On demand.

GEOG 457. Urban Geography and Planning. 3 Credits.

This course examines the internal workings of cities from political, economic, and social perspectives. Geographic approaches to urban analysis are discussed, as are various methods for contemporary urban planning. Students learn to view the city as a geographic phenomenon created by human effort. S.

GEOG 458. Community Development. 3 Credits.

This course examines the historical evolution, conceptual framework, and implementation of community development. Students will be introduced to a broad range of community development issues from a geographical perspective with emphasis on local and statewide scales of study. Prerequisite: GEOG 151 or consent of instructor. F.

GEOG 459. Population Geography. 3 Credits.

The core components of population change (fertility, mortality, migration) are explored in the context of contemporary and historical population debates. The course focuses on understanding and critically assessing global, regional, national, and local population trends and issues. Topics include the impact of population growth, spatial diffusion processes, migration trends and theories, aging of societies, and population policies. S, even years.

GEOG 462. Geography of North America II. 3 Credits.

A regional analysis of the physical, cultural, and economic features of a selected region or group of regions within North America. May be repeatable to six credits if a different region is examined. Prerequisite: GEOG 262 or consent of instructor. On demand.

GEOG 463. Regional Geography. 2-3 Credits.

A regional and topical analysis of the physical and cultural features with emphasis on one continent or region. May be repeated up to nine credits provided different regions and approaches are involved. Repeatable to 9 credits. S.

GEOG 471. Cartography and Visualization. 2 Credits.

This course examines the art, science, and technology of cartography and visualization. It familiarizes students with basic cartographic principles and with GIS, both of which are applicable to a wide range of professional fields and academic disciplines. Students learn how maps are designed and used to accurately represent and effectively communicate spatial phenomena and relationships. The course also includes a discussion of selection of proper thematic mapping techniques. Corequisite: GEOG 471L. F.

GEOG 471L. Cartography and Visualization Laboratory. 1 Credit.

Students apply concepts learned in GEOG 471 to produce accurate, appropriate and well-designed maps using GIS software. Lab activities hone the ability of students to be informed producers and consumers of maps and provide hands-on experience that demonstrates how maps function as a communicative visual medium. Corequisite: GEOG 471. F.

GEOG 474. Introduction to Geographic Information Systems (GIS). 2 Credits.

An introductory course that examines the digital representation, manipulation, and analysis of geographic data, with emphasis on the analytical capabilities that GIS brings to bear on the solution of geographic problems. Prerequisites: GEOG 471 and 471L or equivalent or consent of instructor. Corequisite: GEOG 474L. F,S.

GEOG 474L. GIS Laboratory. 1 Credit.

Hands-on application of theory and methods associated with digital spatial data representation, manipulation, and analysis. Corequisite: GEOG 474. F,S.

GEOG 475. Digital Image Processing. 3 Credits.

A course focused on the concepts and principles involved in the use of digital remotely sensed data as they are applied to environmental monitoring and natural resource management. Emphasis is placed on algorithm development and 'hands-on' application of digital techniques to select imagery. Prerequisites: GEOG 374 and 374L. S.

GEOG 476. Selected Topics in Geographic Information Systems. 3 Credits.

An examination of a specific application area or set of techniques in GIS including, but not limited to, Business GIS, Environmental GIS, GIS Databases, GIS Scripting and Web-Based GIS. Repeatable to six credits if different topics are examined. Prerequisites: GEOG 474 and GEOG 474L, or instructor consent. Repeatable to 3 credits. On demand.

GEOG 494. Directed Studies in Geographical Problems. 1-3 Credits.

Designed for students who wish to explore advanced topics in Geography on an individual or small group basis. May be repeated to a maximum of six credit hours. Prerequisites: Upper division status and consent of instructor. Repeatable to 6 credits. F,S,SS.

GEOG 497. Geography Internship. 1-3 Credits.

Must involve work of a geographical nature performed as an unpaid volunteer to a PVO, NGO, youth organization, service organization or other not-for-pay jobs either on or off campus. May be repeated to a maximum of three credit hours. Prerequisite: Geography major or minor or consent of the supervising faculty member. Repeatable to 3 credits. S/U grading. F,S,SS.