GEOGRAPHY AND THE ENVIRONMENT

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Geography is an academic discipline that focuses on the spatial distribution of human and physical features around the Earth and changes over time of those phenomena. Because geography bridges the boundary between the natural world and human societies, geographers often collaborate with colleagues in related disciplines in the natural and social sciences. Geographers are taught to think in spatial and chronological terms and to analyze landscapes for indications of physical and cultural features. Geographers also create maps to illustrate spatial relationships and use geographically based data sets to answer spatial questions and analyze spatial data. The field is often subdivided into physical geography, human geography, human-environment interaction and geographic information science (GISc). Our undergraduate majors are required to take introductory coursework in each of these subdisciplines, followed by more advanced courses in each of the main fields.

The central goal of the undergraduate curriculum in geography is to produce students with a solid foundation in geographic principles and perspectives, and the professional skills to put them into practice. More specifically, the program aims to provide students with skills and techniques that will allow them to apply what they learn in the classroom, laboratory and field. Students are provided with skills in problem identification and solution; training in geotechnical tools, including geographic information systems, cartography, remote sensing, geographic statistics and spatial analysis; and experience in field and laboratory techniques. The discipline of geography is, by nature, integrative and broadly based, so interdisciplinary approaches to problem solving are also emphasized. Our ultimate goal is to provide graduates with training and preparation for employment as professional geographers in government, private industry, education and nongovernmental agencies, and to prepare students for graduate school.

The environmental science program is an interdisciplinary program with the mission of preparing students with the knowledge and skills to identify, analyze and resolve environmental issues. Atmospheric pollution, water supply and quality, global climate change, waste management, species extinction—these are just a few of the better-known issues encompassed by environmental science, a field that addresses the totality of relationships between humans and the natural environment. Through a combination of small lecture, lab and field-oriented courses, students are given hands-on experience with environmental questions and problem solving. Extended field experiences, including alpine ecology at our field station at Mount Evans, are integrated into courses. Students also have the opportunity to participate in the field quarter, spending 10 weeks traveling throughout the western United States, Baja Mexico and other international destinations to study environmental problems and issues.

Geography

Bachelor of Arts Major Requirements

(183 credits required for the degree (http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofarts/))

Students majoring in geography may not also major in environmental science.

Courses taken as part of the Field Quarter program are exempt from the 60 hour rule.

Students majoring in geography and minoring in sustainability may take up to 72 hours of departmental courses.

45 credits of geography. Requirements include the following:

Code	Title	Credits
GEOG 1410	People, Places & Landscapes	4
GEOG 2000	Geographic Statistics [1]	4
GEOG 2020	Computer Cartography	4
GEOG 2100	Introduction to Geographic Information Systems (GIS)	4
GEOG 2990	Professional Development for Geography & Environmental Science [2]	0
Select one of the following sequences:		**12**
GEOG 1201 & GEOG 1202 & GEOG 1203	Environmental Systems: Weather and Environmental Systems: Hydrology and Environmental Systems: Landforms [3]	
GEOG 1216 & GEOG 1217 & GEOG 1218	Our Dynamic Earth I and Our Dynamic Earth II and Our Dynamic Earth III	
GEOG 1264 & GEOG 1265 & GEOG 1266	Global Environmental Change I and Global Environmental Change II and Global Environmental Change III	

Upper-division credits (2000- or 3000-level courses); at least one physical geography, one human geography and one GIScience course [4]	17
Total Credits	**45**

1 May be satisfied with BIOL 2090 or PSYC 2300
2 Must be completed during senior year.
3 GEOG 1264, 1265, 1266 are for Honors Program students only.
4 A list of geography courses by category is available on the course categories tab

The student may choose one of the following tracks of emphasis:

- natural resource management
- atmosphere and climate
- cultural and regional geography
- earth processes
- geographic analyses
- land use or urban planning

Students preparing for entrance to graduate school or intending to use geography professionally should consult regularly with their departmental advisors.

Minor Requirements

20 credits of geography at the 2000- or 3000-level.

Geographic Information Science

The Geographic Information Science (GIS) major prepares students to collect and manage geospatial data, analyze and quantify spatial relationships, evaluate and design maps, and develop geospatial applications. Students completing this degree will be prepared to solve a diverse set of geospatial problems and adapt to a rapidly changing industry.
Students majoring in GIS may not also major in Environmental Science or Geography.

Bachelor of Science Major Requirements

(183 credits required for the degree (http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofscience/))

Minimum of 60 credits of geography/GIS coursework. Requirements include the following:

Code	Title	Credits
Geography Core Required Courses		**28**
GEOG 1410	People, Places & Landscapes [1]	4
One of the following sequences: [2]		12
GEOG 1201 & GEOG 1202 & GEOG 1203	Environmental Systems: Weather and Environmental Systems: Hydrology and Environmental Systems: Landforms	
GEOG 1216 & GEOG 1217 & GEOG 1218	Our Dynamic Earth I and Our Dynamic Earth II and Our Dynamic Earth III	
GEOG 1264 & GEOG 1265 & GEOG 1266	Global Environmental Change I and Global Environmental Change II and Global Environmental Change III	
GEOG 2000	Geographic Statistics [3]	4
GEOG 2020	Computer Cartography	4
GEOG 2100	Introduction to Geographic Information Systems (GIS)	4
GEOG 2990	Professional Development for Geography & Environmental Science	0
GIS Core Required Courses		**16**
GEOG 3010 or GEOG 3120	Geographic Information Analysis Environmental/GIS Modeling	4
GEOG 3140	GIS Database Design	4
GEOG 3200	Remote Sensing	4
GEOG 3130	GIS Programming with Python	4

or GEOG 3135	Advanced GIS Programming with Python	
Experiential Learning Requiremnt		**4**
In addition to more traditional coursework, students are required to complete at least one of the following options for extended experiential, hands-on learning opportunities:		
GEOG 3170	Geospatial Analysis Project	4
GEOG 3991	Independent Study	4
GEOG 3999	Geographic Internship	4
Geography Electives [4]		**12**
A minimum of 12-quarter hours of 2000- or 3000-level elective courses in geography must be completed, include one physical (P) and one human (H) course.		
Total Credits		**60**

1 Counts towards Common Curriculum requirement for Scientific Inquiry: Society and Culture
2 Fulfills Common Curriculum requirement for Scientific Inquiry: The Natural and Physical World
3 Can be substituted with BIOL 2090 or PSYC 2300
4 A list of geography courses by category is available on the course categories tab

Additional Requirements

Code	Title	Credits
Required Minors		
In addition to major course work, two minors are required for the BS degree. The first minor must be in either computer science (21 credit hours) or mathematics (20 quarter hours). A double major fulfills second minor requirement.		
Additional Coursework		
Students are required to complete a minimum of two quarters (8-10 credit hours) of introductory coursework in the cognate subject, specifically:		
Computer Science minors, complete the following (8 credits):		
MATH 1951	Calculus I	4
or MATH 1200	Calculus for Business and Social Sciences	
MATH elective numbered higher than 1951		4
Mathematics minors, complete the following (10 credits):		10
COMP 1201	Introduction to Computer Science I	2
COMP 1202	Introduction to Computer Science II	2
COMP 1351	Introduction to Programming I	3
COMP 1352	Introduction to Programming II	3

Minor Requirements

20 credits of coursework. Requirements include the following.

Note: As geography majors may emphasize GISc as part of their degree program, they are not eligible to complete the minor in GISc.

Code	Title	Credits
Required courses:		
GEOG 2100	Introduction to Geographic Information Systems (GIS)	4
GEOG 3200	Remote Sensing	4
Electives		
Select from the following:		12
GEOG 2000	Geographic Statistics [1]	
GEOG 2020	Computer Cartography	
GEOG 3000	Advanced Geographic Statistics	
GEOG 3010	Geographic Information Analysis	
GEOG 3120	Environmental/GIS Modeling	
GEOG 3130	GIS Programming with Python	
GEOG 3140	GIS Database Design	
GEOG 3170	Geospatial Analysis Project	

GEOG 3190	Lidar: Theory and Applications	
GEOG 3230	Advanced Remote Sensing	
GEOG 3410	Urban Applications in GIS	
GEOG 3701	Topics in Geographic Information Science	
GEOG 3860	GIS Applications and Natural Resources	
GEOG 3920	Remote Sensing Seminar	
Total Credits		**20**

[1] Students are expected to have completed the Analytical Inquiry-Natural Science requirement or equivalent prior to enrolling in this course. Completion of an introductory course in geography such as GEOG 1410 People, Places & Landscapes, GEOG 1201 Environmental Systems: Weather or GEOG 1216 Our Dynamic Earth I is encouraged but not required.

Geology

A minor in geology may be arranged by consultation with the faculty of the Department of Geography and the Environment.

Minor Requirements

Minimum of 20 credits of geology.

Environmental Science

Bachelor of Arts Major Requirements

(183 credits required for the degree (http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofarts/))

Students majoring in environmental science may not also major in geography.

75 credits. Requirements include:

Code	Title	Credits
Complete one of the following sequences:		12
GEOG 1201 & GEOG 1202 & GEOG 1203	Environmental Systems: Weather and Environmental Systems: Hydrology and Environmental Systems: Landforms	
or		
GEOG 1264 & GEOG 1265 & GEOG 1266	Global Environmental Change I and Global Environmental Change II and Global Environmental Change III	
BIOL 1011 & BIOL 1021	Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab	5
BIOL 1010 & BIOL 1020	Physiological Systems and Physiological Systems Lab	5
BIOL 2010 & BIOL 2011	General Ecology and General Ecology Lab	5
CHEM 1010 & CHEM 1240	General Chemistry I and General Chemistry I Laboratory	4
CHEM 1020 & CHEM 1250	General Chemistry II and General Chemistry II Laboratory	4
CHEM 2240	Introduction to Environmental Chemistry	4
GEOG 2990	Professional Development for Geography & Environmental Science [1]	0
Select one of the following:		4
BIOL 2090	Biostatistics	
GEOG 2000	Geographic Statistics	
PSYC 2300	Introduction to Statistics	
Environmental Science Electives [2]		
Biology		8
Geography/Geology/Envi		8

Additional Electives	16
Total Credits	**75**

1 Must be completed during senior year.
2 A list of acceptable courses is available from the Department of Geography and the Environment.

Additional Requirements

20 credits in a minor field of study

No more than five credits taken as independent study, internship or independent research may be counted toward the minimum hours required in the major.

Bachelor of Science Major Requirements

(183 credits required for the degree (http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofscience/))

Students majoring in environmental science may not also major in geography.

45 credits. Requirements include:

Code	Title	Credits
Environmental Science BS Core		
Complete one of the following sequences:		12
GEOG 1201 & GEOG 1202 & GEOG 1203	Environmental Systems: Weather and Environmental Systems: Hydrology and Environmental Systems: Landforms	
or		
GEOG 1264 & GEOG 1265 & GEOG 1266	Global Environmental Change I and Global Environmental Change II and Global Environmental Change III	
GEOG 2500	Sustainability & Human Society	4
or GEOG 2700	Contemporary Environmental Issues	
ENVI 3000	Environmental Law	4
or GEOG 2401	The Human Population	
GEOG 2100	Introduction to Geographic Information Systems (GIS)	4
or GEOG 3200	Remote Sensing	
GEOG 2000	Geographic Statistics	4
or PSYC 2300	Introduction to Statistics	
or BIOL 2090	Biostatistics	
GEOG 2990	Professional Development for Geography & Environmental Science [1]	0
Environmental Science BS Electives [2]		
A minimum of 17-quarter hours of 2000- or 3000-level elective courses in GEOG, GEOL, or ENVI.		17
Total Credits		**45**

1 Must be completed during senior year.
2 A list of acceptable courses is available from the Department of Geography and the Environment.

Additional Requirements

Code	Title	Credits
BIOL 1011	Evolution, Heredity and Biodiversity	4
BIOL 1021	Evolution, Heredity and Biodiversity Lab	1
BIOL 1010	Physiological Systems	4
BIOL 1020	Physiological Systems Lab	1
BIOL 2010	General Ecology	4
BIOL 2011	General Ecology Lab	1

CHEM 1010	General Chemistry I	3
CHEM 1240	General Chemistry I Laboratory	1
CHEM 1020	General Chemistry II	3
CHEM 1250	General Chemistry II Laboratory	1
CHEM 2240	Introduction to Environmental Chemistry	4
PHYS 1111	General Physics I	5
PHYS 1112	General Physics II	5
PHYS 1113	General Physics III	5
MATH 1951	Calculus I	4
MATH 1952	Calculus II	4
or MATH 1962	Honors Calculus II	
Total Credits		**50**

No more than five credits taken as independent study, internship or independent research may be counted toward the minimum hours required in the major.

Minor Requirements

Two minors are required. The first minor must be in either Biological Sciences or Environmental Chemistry. The second minor can be in any discipline, except Geography. Students may use credits from the "Additional Requirements" category toward an applicable minor.

Minor Requirements

26 credits. Requirements include:

Code	Title	Credits
GEOG 1201 & GEOG 1202 & GEOG 1203	Environmental Systems: Weather and Environmental Systems: Hydrology and Environmental Systems: Landforms	12
BIOL 1011 & BIOL 1021	Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab [1]	5
BIOL 2010 & BIOL 2011	General Ecology and General Ecology Lab [1]	5
GEOG 2500	Sustainability & Human Society	4
or GEOG 2700	Contemporary Environmental Issues	

[1] Students may substitute these 5-credit courses with 4-credit courses from an approved list from the geography department when they are being used to satisfy requirements in another degree program. This will reduce the number of credits required for this minor to 24.

Sustainability Science

Bachelor of Arts Major Requirements

(183 credits required for the degree (http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofarts/))

The Sustainability Science major combines coursework from the natural sciences, social sciences, and applied sciences to engage students in identifying and addressing complicated issues of environmental, social, and economic change. Students completing this degree will be skilled at working across multiple disciplines to apply systems-thinking in addressing complex sustainability problems in many different employment contexts.

Students majoring in Sustainability Science may not also major in Geography or Environmental Science.

58-64 credits. Requirements include:

Code	Title	Credits
Core Requirements (28 hours)		
Complete one of the following sequences:		**12**
GEOG 1201 & GEOG 1202 & GEOG 1203	Environmental Systems: Weather and Environmental Systems: Hydrology and Environmental Systems: Landforms	
or		

GEOG 1264	Global Environmental Change I	
& GEOG 1265	and Global Environmental Change II	
& GEOG 1266	and Global Environmental Change III	
Complete one of the following sustainability courses:		
GEOG 2500	Sustainability & Human Society	4
or GEOG 2511	Principles of Sustainability - Honors	
Complete one of the following statistics courses:		
GEOG 2000	Geographic Statistics	4
or BIOL 2090	Biostatistics	
or PSYC 2300	Introduction to Statistics	
Select two from the following:		**8**
GEOG 2401	The Human Population	
GEOG 2410	Economic Geography	
GEOG 3890	Ecological Economics	
ENVI 3000	Environmental Law	
GEOG 3930	Cultural Geography Seminar [1]	
Additional Requirements		**10-12**
Select either BIOL or CHEM sequence below:		
BIOL 1011	Evolution, Heredity and Biodiversity	
& BIOL 1021	and Evolution, Heredity and Biodiversity Lab	
& BIOL 2010	and General Ecology	
& BIOL 2011	and General Ecology Lab	
or		
CHEM 1010	General Chemistry I	
& CHEM 1240	and General Chemistry I Laboratory	
& CHEM 1020	and General Chemistry II	
& CHEM 1250	and General Chemistry II Laboratory	
& CHEM 2240	and Introduction to Environmental Chemistry	
Integrative and Applied Capstone (0-4 hours)		**0-4**
Complete one of the following:		
GEOG 2550	Issues in Sustainabilities [2]	
or GEOG 3991	Independent Study	
or GEOG 3999	Geographic Internship	
and		
GEOG 2990	Professional Development for Geography & Environmental Science	
Electives (20 hours)		**20**
Requires a minimum of one class from each category (Environmental, Human/Society, and Applied Skills); one elective must come from a course subject code other than GEOG/GEOL/ENVI. Additional electives may be available as approved by the program director.		
Environmental		
BIOL 3035	Invasive Species Ecology	
BIOL 3044	Coral Reef Ecology	
BIOL 3045	Coral Reef Ecology Lab	
BIOL 3055	Ecology of the Rockies	
BIOL 3085	Insect Ecology	
BIOL 3095	Global Change Ecology	
BIOL 3350	Conservation Biology	
BIOL 3700	Topics in Ecology	
CHEM 3410	Atmospheric Chemistry	
CHEM 3411	Aquatic Chemistry	
CHEM 3413	Aerosol Science	
EALC 2001	ESLLC: Local and Regional Environmental Issues	
EALC 2002	ESLLC: The Impact of Development on the Environment	
EALC 2003	ESLLC: Energy in American Society	
GEOG 2320	Andean Landscapes	

GEOG 2730	Geography of Surfing
GEOG 2835	Biogeographies of Conservation: Safari landscapes and protected areas (Tanzania)
GEOG 2880	Geographies of South Africa
GEOG 3520	Geography of Soils
GEOG 3610	Climatology
GEOG 3720	Mountain Environments and Sustainability
GEOG 3800	Geography of Colorado
GEOG 3820	Kiwis and Kauris: Sustainability in New Zealand
GEOG 3835	Sustainability in South Florida: The Everglades and Florida Keys
GEOG 3870	Water Resources & Sustainability
GEOL 3100	Environmental Geology
PHYS 2610	Physics of Climate
PHYS 2710	The Nanoscale Physics of Energy, Information, and Environment
Human/Society	
ANTH 2011	Religion, Environmentalism, and Politics
ANTH 2420	Science, Technology and Human Values
ANTH 3040	Anthropologies of Place
ANTH 3255	Ancient North America
ANTH 3310	Indigenous Environment
ANTH 3500	City and Society
ANTH 3510	The Ancient City
ANTH 3880	Culture, Ecology, Adaptation
ARTH 3813	Arts of the American West
ARTH 3867	The Circle and the Four Corners: Native North American Art
ECON 2360	Economics, Ecology, and Social Welfare
ECON 2450	Race in the Economy
ECON 2540	Law and Economics
ECON 3590	Urban Economics
ECON 3970	Environmental Economics
ENGL 2715	Native American Literature
ENGL 3706	Writing the American West
GEOG 3310	Culture/Nature/Economics-Human Ecology
GEOG 3340	Geographies of Migration
GEOG 3400	Urban Landscapes
GEOG 3420	Urban and Regional Planning
GEOG 3425	Urban Sustainability
GEOG 3440	Urban Transportation Planning
GEOG 3445	Sustainability and Transportation
GEOG 3640	Climate Change and Society
GEOG 3755	Geography of Health
GEOG 3825	Geographies of International Development in Africa
HIST 2531	Twentieth Century Native American History
HIST 2551	The American West Since 1860
HIST 2710	From Sea to Shining Sea: Nature in American History to 1900
HIST 2720	Paved Paradise? Nature and History in Modern America
HIST 3650	Native Crude: Indigenous Oil Politics and Activism
HIST 3680	The Strange History of American Suburbia
INTS 2275	Introduction to the Environmental Crisis
INTS 2380	Comparative Development Strategies
INTS 2490	Introduction to Global Health
INTS 3420	Climate Security
INTS 3421	Environmental Justice and Policy

INTS 3530	Politics and Economics of Food/Agriculture
INTS 3630	Global Environment
LDRS 2400	Leadership and Sustainability in Belize
LGST 3701	Topics in Legal Studies
MGMT 3100	Business Ethics and Social Responsibility
PHIL 2180	Ethics
PHIL 2200	Social & Political Philosophy
PHIL 2785	Environmental Ethics
PHIL 2401	Theories of Justice
PLSC 2840	International Law & Human Rights
WELL 2700	Leveraging Eco-Distress to Create a Regenerative Future
Applied Skills	
GEOG 2020	Computer Cartography
GEOG 2100	Introduction to Geographic Information Systems (GIS)
GEOG 3000	Advanced Geographic Statistics
GEOG 3010	Geographic Information Analysis
GEOG 3120	Environmental/GIS Modeling
GEOG 3130	GIS Programming with Python
GEOG 3140	GIS Database Design
GEOG 3200	Remote Sensing
GEOG 3230	Advanced Remote Sensing
GEOG 3410	Urban Applications in GIS
GEOG 3630	Dendroclimatology
GEOL 2400	Geology and Ecology of the Southwest
GEOL 3540	Hydrology
Total Credits	**58-64**

1 When taught as "Political Ecology"

2 GEOG 3991 and GEOG 3999 must be approved as appropriate by the director of the major. Such approval is not required for GEOG 2550.

Minor Requirements

One minor is required. Students may use credits from the "additional requirements" category towards an applicable minor. Students may not minor in Geography, Environmental Science, or Sustainability due to curricular overlaps.

No more than ten credits taken as independent study, internship or independent research may be counted toward the minimum hours required in the major.

Sustainability Minor

The program requirements for the Sustainability Minor are listed on the Sustainability Program (http://bulletin.du.edu/undergraduate/majorsminorscoursedescriptions/traditionalbachelorsprogrammajorandminors/sustainability/#text) bulletin page.

Requirements for Distinction in the Major

- Minimum 3.5 cumulative GPA
- Minimum 3.75 major GPA
- Completion of a thesis

Distinction is optional and open to students in all departmental majors. Consult with the Department or faculty advisor for futher details.

Bachelor of Arts in Geography

This course sequence is recommended, but not required.

First Year

Fall	Credits	Winter	Credits	Spring	Credits
FSEM 1111	4	WRIT 1122	4	WRIT 1133	4
GEOG 1201	4	GEOG 1202	4	GEOG 1203	4
GEOG 1410[1]	4	SI Society	4	AI Natural[2]	4
Language sequence	4	Language sequence	4	Language sequence	4
	16		**16**		**16**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
GEOG 2020	4	GEOG 2100	4	GEOG 2000	4
AI Society	4	AI Society	4	Minor/General Electives	12
Minor/General Electives	8	Minor/General Electives	8		
	16		**16**		**16**

Third Year

Fall	Credits	Winter	Credits	Spring	Credits
Study Abroad	18	Major Electives	8	Major Electives	4
		Minor/General Electives	8	Minor/General Electives	12
	18		**16**		**16**

Fourth Year

Fall	Credits	Winter	Credits	Spring	Credits
Field Quarter	17	Major Elective	4	GEOG 2990	0
		Minor/General Electives	8	Major Elective	4
				Minor/General Electives	4
	17		**12**		**8**

Total Credits: 183

1 GEOG 1410 is offered Fall, Winter, and Spring quarters and only needs to be taken once. It is recommended that you complete GEOG 1410 by the end of your first year.

2 MATH 1200 or MATH 1951

Bachelor of Science in Geographic Information Science with Computer Science Minor

First Year

Fall	Credits	Winter	Credits	Spring	Credits
GEOG 1201, 1216, or 1264	4	GEOG 1202, 1217, or 1265	4	GEOG 1203, 1218, or 1266	4
Language sequence	4	Language sequence	4	Language sequence	4
FSEM 1111	4	WRIT 1122	4	WRIT 1133	4
Common Curriculum	4	GEOG 1410 or GEOG 2020 or Common Curriculum	4	GEOG 1410 or GEOG 2100 or Common Curriculum	4
	16		**16**		**16**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
GEOG 2020, 2100, or 3200	4	GEOG 2020, 2100, or 3200	4	GEOG 2100 or 3200	4
COMP 1201	2	COMP 1202	2	COMP 1353	3
COMP 1351	3	COMP 1352	3	GIS/Geography Elective or MATH 1952 or MATH (>1951) Elective	4
Common Curriculum	4	GIS/Geography Elective or MATH 1951 or MATH 1200	4	Minor	4
Minor	4	INTZ 2501	1-2		
	17		**14-15**		**15**

Third Year

Fall	Credits	Winter	Credits	Spring	Credits
Study abroad or field quarter	16-18	GEOG 2000	4	GEOG 3010	4
		GEOG 3130	4	Comp Minor Elective	4
		Comp Minor Elective	4	GIS/Geography Elective Or MATH 1952 Calculus 2 Or MATH (>1951) Elective	4
		GIS/Geography Elective or MATH 1951 or MATH 1200	4	Minor	4
	16-18		**16**		**16**

Fourth Year

Fall	Credits	Winter	Credits	Spring	Credits
GEOG 3140	4	ASEM	4	GEOG 2990	0
GEOG 3170 (or other Experiential Learning Option)	4	Electives	12	Electives	12
GIS/Geography Elective	4			Minor	4
Minor	4				
	16		**16**		**16**

Total Credits: 190-193

Bachelor of Science in Geographic Information Science with Mathematics Minor

First Year

Fall	Credits	Winter	Credits	Spring	Credits
GEOG 1201, 1216, or 1264	4	GEOG 1202, 1217, or 1265	4	GEOG 1203, 1218, or 1266	4
Language sequence	4	Language sequence	4	Language sequence	4
FSEM 1111	4	WRIT 1122	4	WRIT 1133	4
Common Curriculum	4	GEOG 1410 or GEOG 2020 or Common Curriculum	4	GEOG 1410 or GEOG 2100 or Common Curriculum	4
	16		**16**		**16**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
GEOG 2020, 2100, or 3200	4	GEOG 2020, 2100, or 3200	4	GEOG 2100 or 3200	4
COMP 1201	2	COMP 1202	2	MATH 1953	4
COMP 1351	3	COMP 1352	3	GIS/Geography Elective	4
Common Curriculum	4	MATH 1952	4	Minor	4
MATH 1951	4	INTZ 2501	1-2		
	17		**14-15**		**16**

Third Year

Fall	Credits	Winter	Credits	Spring	Credits
Study Abroad or Field Quarter	16-18	GEOG 2000	4	GEOG 3010	4
		GEOG 3130	4	Math Minor	4
		Math Minor	4	GIS/Geography Elective	4
		GIS/Geography Elective	4	Minor	4
	16-18		**16**		**16**

Fourth Year

Fall	Credits	Winter	Credits	Spring	Credits
GEOG 3140	4	ASEM	4	GEOG 2990	0
GEOG 3170 (or other Experiential Learning Option)	4	Elective	12	GIS/Geography Elective	4
Minor	4			Electives	8-12
Elective	4				
	16		**16**		**12-16**

Total Credits: 187-194

Bachelor of Arts in Environmental Science

This course sequence is recommended but not required.

First Year

Fall	Credits	Winter	Credits	Spring	Credits
FSEM 1111	4	WRIT 1122	4	WRIT 1133	4
GEOG 1201	4	GEOG 1202	4	GEOG 1203	4
GEOG 1410[1]	4	BIOL 1011	4	BIOL 1010	4
Language sequence	4	Language sequence	4	Language sequence	4
	16		**16**		**16**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
BIOL 2010	4	CHEM 1020	3	CHEM 2240	4
BIOL 2011	1	CHEM 1250	1	Major Elective or MATH[2]	4
CHEM 1010	3	Major Elective or MATH[2]	4	Statistics	4
CHEM 1240	1	SI Society	4	Minor/General Elective	4
AI Society	4	AI Society	4		

Major Elective	4				
	17		**16**		**16**

Third Year

Fall	Credits	Winter	Credits	Spring	Credits
Study Abroad	17	Major Electives	8	Major Electives	8
		Minor/General Electives	8	Minor/General Electives	8
	17		**16**		**16**

Fourth Year

Fall	Credits	Winter	Credits	Spring	Credits
Field Quarter	17	ASEM	4	GEOG 2990	0
		Major Elective	4	Major Elective	4
		Minor/General Elective	4	Minor/General Elective	4
	17		**12**		**8**

Total Credits: 183

1 Recommended as one of the Scientific Inquiry: Society and Culture Common Curriculum courses.
2 MATH 1200 or MATH 1951

Bachelor of Science in Environmental Science

This course sequence is recommended but not required.

First Year

Fall	Credits	Winter	Credits	Spring	Credits
FSEM 1111	4	WRIT 1122	4	WRIT 1133	4
GEOG 1201	4	GEOG 1202	4	GEOG 1203	4
GEOG 1410[1]	4	BIOL 1011	4	BIOL 1010	4
Language sequence	4	BIOL 1021	1	BIOL 1020	1
		Language sequence	4	Language sequence	4
	16		**17**		**17**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
BIOL 2010	4	CHEM 1020	3	CHEM 2240	4
BIOL 2011	1	CHEM 1250	1	Major Elective	4
CHEM 1010	3	GEOG 2500 or 2700	4	AI Society	4
CHEM 1240	1	Major Elective	4	General Elective	4
Major Elective	4	SI Society	4		
AI Society	4				
	17		**16**		**16**

Third Year

Fall	Credits	Winter	Credits	Spring	Credits
Study Abroad or Field Quarter	17	MATH 1951	4	MATH 1952	4
		Major Electives	8	ENVI 3000	4
		Biology Elective	4	Major Elective	4
				Statistics	4
	17		**16**		**16**

Fourth Year

Fall	Credits	Winter	Credits	Spring	Credits
PHYS 1111	5	PHYS 1112	5	PHYS 1113	5
ASEM	4	Major Elective	4	GEOG 2990	0
Major Elective	4	Biology Elective	4	Major Elective	4
	13		**13**		**9**

Total Credits: 183

1 Recommended as one of the Scientific Inquiry: Society and Culture Common Curriculum courses.
2 Or GEOG 2500 Sustainability and Human Society.

This section lists courses within Geography and the Environment by the following categories to assist students in meeting distribution requirements within majors and minors: GIScience courses, human geography courses, physical geography courses. Please note that some courses are listed in multiple categories.

GIScience Courses

GEOG 2000	Geographic Statistics	4
GEOG 2020	Computer Cartography	4
GEOG 2100	Introduction to Geographic Information Systems (GIS)	4
GEOG 3000	Advanced Geographic Statistics	4
GEOG 3010	Geographic Information Analysis	4
GEOG 3100	Geospatial Data	4
GEOG 3120	Environmental/GIS Modeling	4
GEOG 3130	GIS Programming with Python	4
GEOG 3140	GIS Database Design	4
GEOG 3150	GIS Project Management	4
GEOG 3170	Geospatial Analysis Project	4
GEOG 3190	Lidar: Theory and Applications	4
GEOG 3200	Remote Sensing	4
GEOG 3230	Advanced Remote Sensing	4
GEOG 3410	Urban Applications in GIS	4
GEOG 3701	Topics in Geographic Information Science	1-4
GEOG 3920	Remote Sensing Seminar	4

Human Geography Courses

ENVI 3000	Environmental Law	4
GEOG 2030	Field Methods	4
GEOG 2401	The Human Population	4
GEOG 2410	Economic Geography	4
GEOG 2430	World Cities	4
GEOG 2500	Sustainability & Human Society	4
GEOG 2550	Issues in Sustainabilities	4
GEOG 2700	Contemporary Environmental Issues	4
GEOG 2810	Geography of Latin America	4
GEOG 3330	Political Geography	4
GEOG 3310	Culture/Nature/Economics-Human Ecology	4
GEOG 3340	Geographies of Migration	4
GEOG 3350	Qualitative Methods in Geography	4
GEOG 3400	Urban Landscapes	4
GEOG 3410	Urban Applications in GIS	4
GEOG 3420	Urban and Regional Planning	4
GEOG 3425	Urban Sustainability	4
GEOG 3440	Urban Transportation Planning	4
GEOG 3445	Sustainability and Transportation	4
GEOG 3720	Mountain Environments and Sustainability	4
GEOG 3750	Topics in Human-Environment Interactions	1-4
GEOG 3755	Geography of Health	4
GEOG 3800	Geography of Colorado	4
GEOG 3870	Water Resources & Sustainability	4
GEOG 3890	Ecological Economics	4

Physical Geography Courses

ENVI 2660	Environmental History of Sonora & Baja Mexico	5
ENVI 3000	Environmental Law	4
GEOG 2500	Sustainability & Human Society	4
GEOG 2550	Issues in Sustainabilities	4
GEOG 2700	Contemporary Environmental Issues	4
GEOG 2750	Paleoenvironmental Field Methods	3
GEOG 2810	Geography of Latin America	4
GEOG 2880	Geographies of South Africa	4
GEOG 3310	Culture/Nature/Economics-Human Ecology	4
GEOG 3340	Geographies of Migration	4
GEOG 3500	Reconstructing Quaternary Environments	4
GEOG 3510	Biogeography	4
GEOG 3520	Geography of Soils	4
GEOG 3560	Fluvial Geomorphology	4
GEOG 3600	Meteorology	4
GEOG 3610	Climatology	4
GEOG 3630	Dendroclimatology	2-4
GEOG 3720	Mountain Environments and Sustainability	4
GEOG 3750	Topics in Human-Environment Interactions	1-4
GEOG 3755	Geography of Health	4
GEOG 3800	Geography of Colorado	4
GEOG 3820	Kiwis and Kauris: Sustainability in New Zealand	4
GEOG 3835	Sustainability in South Florida: The Everglades and Florida Keys	4
GEOG 3870	Water Resources & Sustainability	4
GEOG 3890	Ecological Economics	4
GEOG 3955	Pollen Analysis Seminar	3
GEOG 3910	Geomorphology	4
GEOL 2020	Historical Geology	4
GEOL 2400	Geology and Ecology of the Southwest	5
GEOL 3100	Environmental Geology	4
GEOL 3200	Sedimentology/Stratigraphy	4
GEOL 3540	Hydrology	4

Environmental Science (ENVI)

ENVI 2660 Environmental History of Sonora & Baja Mexico (5 Credits)
Geography and ecology of desert southwest emphasizing Mexican states of Sonora, Baja California del Sur and Baja California. Traveling by van and lodging in tents, trip covers 3,500 miles, offers hands-on experience with principles and problems of physical geography and ecology in desert environments. Offered only during Interterm.

ENVI 2950 Topics in Env. Science (1-4 Credits)
An in-depth coverage of a specific environmental issue, topic, or problem. Topics vary with instructor.

ENVI 3000 Environmental Law (4 Credits)
Purpose and applications of federal laws pertaining to environmental protection, including NEPA, RCRA, CERCLA, and Clean Water and Clean Air Acts; addresses role of states in implementation of federal environmental laws.

ENVI 3991 Independent Study (1-5 Credits)
Study of a topic not covered in existing course offerings. May be used for work completed in off-campus internships that focus primarily on the mastery of existing knowledge.

ENVI 3995 Independent Research (1-5 Credits)
Original research in environmental science topic under sponsorship of a faculty member; applicable to studies that focus primarily on discovery of new knowledge through application of scientific method.

ENVI 3999 Environmental Science Internship (1-5 Credits)
Supervised internship in a state, local, or federal office or in the private sector. Prerequisites: 15 quarter hours in the environmental science major and approval of supervising faculty. Maximum of 5 quarter hours total.

Geography (GEOG)

GEOG 1201 Environmental Systems: Weather (4 Credits)
First class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; introduction to the fundamentals of the environmental system and the various processes that control weather and climate. The student will have a fundamental understanding of the basic components of the environmental system, familiarity with the role of energy in the atmosphere and its control over cycles of air temperature, a sound foundation in the mechanisms governing cloud formation and precipitation, a basic understanding of the atmospheric circulation and the storm systems which develop within it, and an introduction to the regional variation of climate. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

GEOG 1202 Environmental Systems: Hydrology (4 Credits)
Second class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; the role of water in the environment. This course focuses on the matter and energy flows through the hydrologic cycles, together with the resulting spatial distribution and work of water. Various environmental issues concerning water including drought, water pollution, and human impacts on water supplies are included. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1201.

GEOG 1203 Environmental Systems: Landforms (4 Credits)
Third class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; geological phenomena in various places in the world. Topics include maps and air photos; rocks and minerals; plate tectonics and volcanoes; landforms produced by wind, water, earth forces and ice; and biogeography. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1201 and GEOG 1203.

GEOG 1216 Our Dynamic Earth I (4 Credits)
This is the first quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. Natural processes become hazards when they have the potential to have an adverse effect on humans and their property, or the natural environment. This first quarter of the sequence introduces students to the physical processes associated with atmospheric natural hazards (tornados, hurricanes, severe storms) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

GEOG 1217 Our Dynamic Earth II (4 Credits)
This is the second quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. In this course, students investigate the physical processes that result in geologic natural hazards (earthquakes, landslides, volcanoes) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1216.

GEOG 1218 Our Dynamic Earth III (4 Credits)
This is the third quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. In this course, students investigate the physical processes that result in hydrologic natural hazards (floods, drought, tsunamis) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1217.

GEOG 1264 Global Environmental Change I (4 Credits)
First class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

GEOG 1265 Global Environmental Change II (4 Credits)
Second class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1264.

GEOG 1266 Global Environmental Change III (4 Credits)
Third class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1265.

GEOG 1410 People, Places & Landscapes (4 Credits)
In this course, students will study the location of people and activities across the surface of the Earth. Describing the locations and patterns of human activity only lays the foundation for exploring how and why such patterns have developed historically, and how they relate to the natural environment and other aspects of human behavior. This course counts toward the Scientific Inquiry: Society and Culture requirement.

GEOG 1988 Study Abroad Resident Credit (0-18 Credits)

GEOG 2000 Geographic Statistics (4 Credits)
An introduction to statistics primarily for geography and environmental science students focusing on the scientific method, the nature of data, descriptive statistics, and analytical or inferential statistics. Enrollment restricted to Juniors and Seniors.

GEOG 2020 Computer Cartography (4 Credits)
Basic map design and execution using existing maps. Topics include map projections, symbolizing quantitative data, use of space, layout, compilation, verbal content, and the use of computer technology in design and production of maps.

GEOG 2030 Field Methods (4 Credits)
Part I, outdoor instruction in use of Brunton compass, level, plane table, and alidade; Part 2, data-gathering techniques and preparation for field work in urban problems.

GEOG 2100 Introduction to Geographic Information Systems (GIS) (4 Credits)
Overview of GIS, including background, development, trends, and prospects in this technological field; software package and hands-on exercises used to examine basic geographic concepts and spatial data characteristics associated with automated mapping, projections, scales, geocoding, coordinate referencing, and data structures for computerized land-based data bases.

GEOG 2320 Andean Landscapes (4 Credits)
This class introduces students to intensive field activities pertinent to the study of Andean individuals and societies. Students study the characteristics of people, activities, as well as landscapes across the locations of Lima, Cusco and Puno in Peru. This course focuses on geography, history, archaeology, anthropology, biology, ecology and sustainability issues surrounding the above mentioned destinations. This course involves moderate physical activity (Inca Trail hike).

GEOG 2401 The Human Population (4 Credits)
This course covers the fundamental concepts of demography with an emphasis on its relevance to inquiry in disciplines including economics, business, geography, environmental science, political science and sociology. This course includes computer laboratory work involving the exploration and analysis of census data using geographic information systems This course counts toward the Scientific Inquiry: Society and Culture requirement.

GEOG 2410 Economic Geography (4 Credits)
Economic elements as spatially arranged, distribution of economic activities on the Earth's surface; market, resource and transportation factors in location theory.

GEOG 2430 World Cities (4 Credits)
The study of world cities from a geographical perspective emphasizes the following general topics: 1) worldwide urbanization and globalization processes; 2) the study of cities as nodes within global, regional, and national urban systems; 3) the internal spatial structure of land uses within cities; 4) the spatial dimensions of economic, social, political, and cultural processes in cities; and 5) environmental elements, involving human interrelationships with the natural environment in an urban setting. Urban patterns and processes are examined in each of the world's major regions, including in-depth analysis of focus case study cities.

GEOG 2500 Sustainability & Human Society (4 Credits)
Sustainability has become a catch phrase in discussions concerning the long-term viability of a number of phenomena, from the environment to the economy. Sustainability is commonly defined as meeting the needs of the current generation without compromising the ability of future generations to meet their needs. Students are introduced to issues inherent in discussions of sustainability. The major areas of focus include definitions of ecological and environmental sustainability, economic and political sustainability, and social justice, and various metrics used to assess sustainable behavior and practices. Students study the theory, principles and practices of sustainability, and participate in discussion and writing exercises based on lecture and readings.

GEOG 2511 Principles of Sustainability - Honors (4 Credits)
Principles of Sustainability introduces students to fundamental issues and concepts of Sustainability. This topic concerns the long-term viability of a number of phenomena, from the environment to the economy. Sustainability is commonly defined as meeting the needs of the current generation without compromising the ability of future generations to meet their needs. Students will be introduced to issues inherent in discussions of sustainability. The major areas of focus include definitions of ecological and environmental sustainability, economic and political sustainability, social justice, and various metrics used to assess sustainable behavior and practices. Students will study the theory, principles and practices of sustainability, and participate in discussion and writing exercises based on lecture and readings. This course counts toward the Scientific Inquiry: Society and Culture requirement. Enrollment restricted to students in the Honors Program.

GEOG 2550 Issues in Sustainabilities (4 Credits)
The capstone seminar focuses on a particular problem related to sustainability. Seminar topics vary by instructor, but include a combination of readings, discussion, guest speakers, a group project (either service learning or research), and individual research presentations. Prerequisite: GEOG 2500 and completion of all other requirements for the sustainability minor.

GEOG 2700 Contemporary Environmental Issues (4 Credits)
Principles, practices, issues, and status of care of environment; lectures, readings, and discussions focus on causes, effects, and mitigation of a selection of topical regional, national, and international environmental problems including Denver's air pollution, acid deposition, hazardous waste management, global warming, and tropical deforestation.

GEOG 2701 Special Topics in Geography & Environmental Science (4 Credits)
Special topics in geography and environmental science.

GEOG 2730 Geography of Surfing (4 Credits)
Surfing is often viewed simply as a recreational sport. But it is also so, so, much more. It is a multi-billion dollar global industry, a reflection of global climate patterns interacting with sedimentation regimes and the land, a globalizing culture diffusing from strong regional identities, and a reason to travel to exotic locations and explore the planet. This course uses geographic perspectives to study the many facets of the sport. Geography provides a perfect set of tools to study surfing ranging from the propagation of swells to the diffusion of culture. The goal of the course is to introduce students to the core analytical approaches used in Geography as well as for students to understand that surfing is much more than a recreational sport.

GEOG 2750 Paleoenvironmental Field Methods (3 Credits)
Paleoenvironmental Field Methods is a short course that focuses on the use of Quaternary paleoenvironmental research techniques, including extracting and interpreting sediment cores from wetlands and lakes to reconstruct and understand paleoclimatic events.

GEOG 2810 Geography of Latin America (4 Credits)
This course studies the countries and islands of Middle America; the interrelationships of peoples, resources and physical features. Cross listed with GEOG 4810.

GEOG 2815 Geographies of Conquest: Christian, Jewish, and Islamic Societies in Andalusia (4 Credits)
This course introduces students to the cultural landscapes, former and current, of the different societies that converged in Iberia. The class will focus on medieval Al-Andaluz, the Islamic kingdoms that flourished there. During medieval times, Christian, Islamic, and Jewish societies lived side by side in an environment that oscillated between tolerance and open persecution. Science, art, scholarship, and political strategy motivated tolerance while religious fundamentalism and geopolitical considerations motivated persecution. This class will cover the human-environment interactions in the landscapes of Andalusia through an immersive field study and travel experience. This field class equals 4 academic credits. Over a period of 8 days we will visit the cities and surroundings of Madrid, Cordoba, Seville, and Granada in Spain where we will examine and compare cultural geography (past and present), history, and anthropological issues surrounding the communities that interacted in Al-Andalu.

GEOG 2830 Geography of Europe (4 Credits)
A field course that examines relationships between humans and the environment in Europe. We study both urban and rural environments to understand the following questions: What are the elements (climate, vegetation, landforms) that characterize European natural landscapes? How have humans modified these natural landscapes? How have environmental conditions influenced human activities (e.g. agriculture, architecture, economic development)? How are these human activities manifested at the landscape scale, and how are they organized in geographic space? How have humans attempted to preserve natural landscapes? Prerequisites: GEOG 1201, GEOG 1202, GEOG 1203 and field quarter application process through the geography department.

GEOG 2835 Biogeographies of Conservation: Safari landscapes and protected areas (Tanzania) (4 Credits)
This course introduces students to the landscapes, biodiversity, societies, and human-environment interactions in Tanzania mainland through an intensive and immersive field study and travel experience. This field intensive class equals 4 academic credits. Over a period of 9 days we will visit the greater Serengeti ecosystem, Tanzania where we will examine and compare geography, cultures, history, archaeology, ecology, biodiversity, and sustainability issues. The environment in this part of East Africa offers unique challenges for wildlife and societies. By understanding the locations and patterns of human and animal activity there, students can better appreciate the circumstances affecting individuals and countries other than our own. Through observations, lectures, discussions, readings, assignments and immersion, the course will stress the development of in-situ critical thinking skills and the promotion of environmental sustainability, cultural diversity, and global awareness.

GEOG 2880 Geographies of South Africa (4 Credits)
This travel course is designed to give students a first-hand look at the physical and cultural landscapes of South Africa. We will study the varied natural landscapes that produce the commodities (e.g., gold, diamonds, wine, and agriculture) that have attracted the interest of outsiders for centuries and that have influenced the cultural landscapes particular to South Africa. A systematic presentation of the geology of South Africa, and its human history, will unfold throughout our travels.

GEOG 2988 Study Abroad Resident Credit (0-18 Credits)

GEOG 2990 Professional Development for Geography & Environmental Science (0 Credits)
This course is designed to prepare graduating seniors for the transition to the working world or gradaute study. Lectures and workshops focus on the use of LinkedIn and social media as a means of career networking, employment opportunities, professional development, and resume writing and related career services.

GEOG 2995 Independent Research (1-10 Credits)

GEOG 3000 Advanced Geographic Statistics (4 Credits)
The second in a sequence of two courses that address general statistical applications particular to geography, environmental science and other disciplines dealing with a spatial dimension in the data they work with. The focus of this second course is on the more advanced multivariate statistical techniques. The course has a strong applied orientation as particular attention is given to which technique is the most appropriate to use for a given type of problem and how to interpret and apply the resulting statistics. Extensive use is made of computer statistics packages. Homework exercises involving such statistical techniques as multiple correlation and regression analysis, principle components analysis, discriminate analysis and canonical correlation. Prerequisite: GEOG 2000.

GEOG 3010 Geographic Information Analysis (4 Credits)
Reviews many basic statistical methods and applies them to various spatial datasets. In addition, several spatial statistical methods are applied to spatial datasets. This course is an in-depth study of the interface between GIS, spatial data, and statistical analysis. Preferred prerequisite: GEOG 2000. Prerequisite: GEOG 2100.

GEOG 3030 Advanced Field Methods (4 Credits)
Various field methods used by researchers in physical geography; techniques include field mapping, laboratory analyses, geologic field methods. Prerequisite: GEOG 1201 or equivalent.

GEOG 3040 GPS for Resource Mapping (4 Credits)
This course is an introduction to GPS (Global Positioning Systems) concepts, techniques, and applications as they relate to GIS data collection. Lectures focus on satellite surveying, GPS technology, error sources, program planning, data collection design, and Quality Control and Quality Assurance issues for data collection programs. Hands-on lab exercises include navigation, mission planning for a GPS survey, designing a field data collection plan and associated data dictionary, field data collection, differential correction, and data integration into a GIS and map production.

GEOG 3100 Geospatial Data (4 Credits)
This graduate-level course is designed to provide graduate students from a broad range of disciplines with the skills to carry out applied research tasks and projects requiring the integration of geographic information system technologies and geospatial data. Students are introduced to a collection of techniques and data sources with a focus on acquiring and integrating data. Legal, ethical, and institutional problems related to data acquisition for geospatial information systems are also discussed.

GEOG 3120 Environmental/GIS Modeling (4 Credits)
Facing challenges brought by the dramatically changing global environment, environmental modeling is increasingly used to support geographical and environmental decision making (e.g., spatial conservation prioritization). Environmental modeling is concerned with the characterization, modeling and simulation of environmental phenomena and processes using conceptual and mathematical models. Environmental phenomena and processes taking place in the geographic space are regulated by spatial principles. They also interact with other phenomena or processes in the attribute space. For example, species distribution is not only constrained by spatial factors such as proximity to other species, but also influenced by environmental factors such as terrain and climatic conditions. Due to its superior capabilities of handling spatial data and modeling spatial and attribute relationships, geographic information system (GIS) provides the ideal tools for environmental modeling. This upper-level undergraduate/graduate-level course surveys the concepts and techniques of GIS supported environmental modeling in three general categories: 1) Modeling in the spatial domain where the focus is on modeling spatial principles (e.g., spatial autocorrelation); 2) Modeling in the attribute domain where the emphasis is on environmental correlations (e.g., environmental niche modeling); 3) Modeling in the combined spatial and attribute domain where both spatial principles and environmental correlations are exploited (e.g., geographically weighted regression). Throughout this course, several real-world applications are used to demonstrate the ideas, concepts, and techniques of GIS supported environmental modeling, including crime spatial pattern modeling, species distribution modeling, and soil-landscape modeling and mapping. Prerequisites: GEOG 2000 and GEOG 2100.

GEOG 3130 GIS Programming with Python (4 Credits)
This advanced course explores the more technical aspects of GIS functions and data structures. Students have hands-on access to both raster (grid-cell) and vector-based software packages in the form of lab exercises that culminate in a small student-designed GIS project. Prerequisite: GEOG 2100.

GEOG 3135 Advanced GIS Programming with Python (4 Credits)
This advanced course in Geographic Information Science (GIS) focuses on developing Python scripts for data manipulation, geospatial analysis, and thematic mapping. Students will explore advanced spatial data structures, 3D and temporal geospatial data, database operations, and spatial analysis, applying these techniques to solve real-world geospatial problems. Through practical exercises, assignments, and a capstone project, students will gain hands-on experience with Python and advanced GIS tools. These activities will equip students with the skills to design, implement, and present customized and automated solutions for geospatial challenges.

GEOG 3140 GIS Database Design (4 Credits)
Designing databases to provide a foundation for GIS functions and applications, including investigating techniques used for designing databases in non-spatial environments and learning the applicability to GIS problems. Building on concepts and techniques introduced in the first half to extend traditional techniques and methodologies to model the requirements of spatial problems. Students learn to translate the conceptual spatial model into a physical implementation specific to GIS products. Prerequisite: GEOG 2100 or GEOG 3100.

GEOG 3165 Geospatial Artificial Intelligence (4 Credits)
Geospatial Artificial Intelligence (GeoAI) combines geospatial data with artificial intelligence (AI) techniques to analyze, interpret, and model spatial patterns and processes. This interdisciplinary field integrates machine learning and deep learning with geographic information systems (GIS) and remote sensing technologies to extract meaningful insights from geospatial data. GeoAI enables more accurate mapping, modeling and prediction of geographic phenomena to support decision-making, and has been widely adopted in various domains, including environmental monitoring, disaster response, agriculture, urban planning, energy, transportation, etc. In this course, students will dive into the core principles and building blocks of GeoAI with a strong emphasis on real-world applications. Key topics include the use of machine learning and deep learning methods to analyze geospatial data such as satellite imagery and LiDAR point cloud data for image classification, object detection and feature extraction. Example applications include leveraging GeoAI models for land cover mapping, electric power lines identification, flood mapping, fire damage assessment, landslide susceptibility evaluation, etc. Students will also explore advanced GeoAI topics such as geo-foundation models and the most recent ChatGPT-like tools that are developed to automate spatial analysis and map-making workflows. Hands-on exercises, assignments and student projects in this class will involve using GIS tools (e.g., ArcGIS Pro), and AI frameworks to fine-tune existing, or develop and train new, GeoAI models and apply them for various case studies, such as detecting wind turbines, monitoring floods, and analyzing wildfire damages. Through this course, students gain experiences on using GeoAI methods to improve geospatial data analysis to support decision-making in application scenarios such as resource management and disaster response. Prerequisites: GEOG 3130 AND (GEOG 2100 or GEOG 3100 or GEOG 4110) or instructor's permission.

GEOG 3170 Geospatial Analysis Project (4 Credits)
This course provides an opportunity for students to apply geospatial data analysis to real-world applications. Students will work as a team to develop a project that requires GIS analysis and/or application development, design a project work flow and management plan, and implement a solution. Students will demonstrate competence in GIS techniques, geospatial data analysis, and project management at a professional level. Instructor permission required.

GEOG 3190 Lidar: Theory and Applications (4 Credits)
Overview: Lidar (Light Detection and Ranging) is an active remote sensing system that uses laser pulses to measure the distance between the sensor and a surface or objects. Lidar as become an established method for collecting very dense and accurate elevation values, as well as for characterizing the three-dimensional structure of vegetation and urban land cover. In this course, we will build an understanding of the physical principles behind lidar, develop experience working with Lidar datasets, and survey a wide array of lidar applications for mapping and natural resource management. The course will cumulate with a student-directed final projects. Prerequisites: GEOG 2100 or GEOG 3200.

GEOG 3200 Remote Sensing (4 Credits)
This course acquaints students with the basic techniques of the collection, processing and interpretation of information about the character of the earth's surface from remote locations. Students become familiar with the use of the visible, infrared, thermal and microwave portions of the electromagnetic spectrum as a means of determining land cover and/or land use. Both manual and computer-assisted techniques are discussed and include hands-on applications.

GEOG 3230 Advanced Remote Sensing (4 Credits)
This course will build on the basic remote sensing concepts presented in GEOG 3200. Students will explore more in-depth concepts relevant to satellite and airborne remote sensing, including radiative transfer and information extraction. In addition, students will be introduced to two cutting-edge sources of data about the Earth's surface: hyperspectral and lidar (Light Detection and Ranging) sensors. Students will study specific applications of advanced digital image processing techniques for environmental monitoring, natural resource management, and land-use planning. Finally, students will integrate remote sensing and other spatial datasets in the context of Geographic Information System (GIS) analysis. Prerequisite: GEOG 3200.

GEOG 3300 Cultural Geography (4 Credits)
Themes and methods of cultural geography including cultural area, landscape, history and ecology.

GEOG 3310 Culture/Nature/Economics-Human Ecology (4 Credits)
Cultural adaptation, livelihood strategies and environmental modification among subsistence and peasant societies: responses of such groups to technological change and economic integration.

GEOG 3330 Political Geography (4 Credits)

GEOG 3340 Geographies of Migration (4 Credits)
This course explores contemporary movement of people across international borders and the social, cultural, political, economic, and environmental repercussions of such movements. The class looks at the global flow of people across national boundaries and the ways in which these dispersed peoples build and maintain social networks across national borders. While doing so, we address the role of globalization in international migration processes. What motivates people to move long distances, often across several international borders and at considerable financial and psychological cost? How do migrants change--and how in turn do they bring change, social as well as economic, to new destinations as well as places left behind? This course examines politics and patterns of migration, transnational migration, and immigration to the United States.

GEOG 3350 Qualitative Methods in Geography (4 Credits)
This course focuses upon qualitative methods in the production of geographic knowledge. Qualitative methods are widely employed by geographers to understand patterns and underlying processes of human and human-environment issues in society. The course is designed to expose participants to the theories, purpose, scope, and procedures of qualitative research. Specific topics include: epistemological theories (ways of knowing); ethics and power in research; research design; data collection techniques in interviewing, participant observation and landscape interpretation, discourse and archive analysis, and case studies; data analysis; and writing and disseminating qualitative findings.

GEOG 3400 Urban Landscapes (4 Credits)
Urbanization as a process; national urban systems; internal spatial structure of cities; role of transportation in urban development; location of residential, commercial and industrial activities; agglomeration economies; residential congregation and segregation; environmental justice; urban growth and growth coalitions; decentralization and urban sprawl; edge cities; impacts on the urban environment; world cities; globalization.

GEOG 3410 Urban Applications in GIS (4 Credits)
This course uses the tools of geographic information systems (GIS) to explore concepts of traditional urban geography, including defining cities/metropolis, internal urban structures, urban systems, industrial location, social and residential patterns, urban form, environmental problems, and urban planning. The course allows students to practice fundamental skills in GIS (e.g., working with attribute tables, spatial analysis, spatial queries) and cartography (map design, color theory, display of information). Depending on the quarter, students pursue individual projects of interest or client-based projects. Prerequisite: GEOG 2100 or GEOG 3100 or equivalent.

GEOG 3420 Urban and Regional Planning (4 Credits)
Historical evolution of planning theory and practices; comprehensive planning process; legal, political, economic, social, environmental aspects of urban planning; urban design; urban renewal and community development; transportation planning; economic development planning; growth management; environmental and energy planning; planning for metropolitan regions; national planning.

GEOG 3425 Urban Sustainability (4 Credits)
The 21st century is being called the 'century of the city.' Now more than ever, humans across the globe call the city their home. Many of the world's most pressing crises are manifest in cities, including: greenhouse gas emissions, land degradation, high mass production and consumption, widespread poverty and hunger, and expanding socio-economic disparities. As 'sustainability' becomes part of mainstream discourse, this course explores what sustainability means for urban contexts around the globe. Arguably, the city has the potential to be the most efficient, equitable, and environmental form of modern human settlement. Covering all dimensions of sustainability from a social science perspective, this course focuses on theoretical groundings, practices of urban sustainability, and new research agendas. Major topics include cities and nature; planning and land use; urban form; community and neighborhoods; transportation systems and accessibility; livelihood and urban economies; and social justice and the city.

GEOG 3440 Urban Transportation Planning (4 Credits)
A specialized course in the urban planning sequence focusing on issues, practices and policies of urban transportation planning. Recommended for anyone interested in timely transportation topics, such as the feasibility and impacts of light rail transit, the planning and implementation of highway projects, and the role of freight and passenger transportation companies in transportation planning.

GEOG 3445 Sustainability and Transportation (4 Credits)
Sustainable transportation aims at promoting better and healthier ways of meeting individual and community needs while reducing the social and environmental impacts of current mobility practices. Given the importance of transport for economic growth, the uncertainties surrounding the availability and price of future sources of energy for transport use, as well as the social and environmental externalities of currently-utilized transport modes, it is imperative that more sustainable ways of providing transportation be developed and utilized.

GEOG 3460 Air Transportation, High-Speed Rail and Tourism (4 Credits)
This course delves into the world of commercial air passenger transportation, studying the foundations of the industry, its role in the travel and tourism, and strategies for the future. Foundational topics include the history and geography of air transportation, air travel and tourism, the geography of tourism, airline corporate cultures, the role of government, aviation law, regulation, deregulation, and globalization. Study of the principal elements of airline economics, finance, planning, management, operations, pricing, promotion, cost containment, marketing, and policy provide the opportunity for consideration of strategic options within the contemporary airline industry. Further discussion focuses on the planning and management of airport and airway system infrastructure, the issue of sustainable air transportation, and the role of the airline industry within the context of intermodalism. Cross listed with GEOG 4460.

GEOG 3500 Reconstructing Quaternary Environments (4 Credits)
Nature, magnitude, sequence and causes of Pleistocene and Holocene climatic changes; effects of climatic change on plant/animal distributions and human populations; paleoclimatic research methods. Laboratory and field trips. Prerequisites: GEOG core, ENVI 3000.

GEOG 3510 Biogeography (4 Credits)
Biogeography focuses on present and past distributions of plants and animals. In this course we consider a number of themes central to biogeography, including plate tectonics and biogeography, the effects of climate change of plant and animal distributions, biogeographic realms, island biogeography, biodiversity, human impacts on plants and animals, and the origins of agriculture.

GEOG 3520 Geography of Soils (4 Credits)
Spatial variation in soil characteristics; soil processes, soil morphology, their application in soil studies. Prerequisite: GEOG 1201-1203 Environmental Systems or instructor's permission.

GEOG 3550 Topics in Physical Geography (1-5 Credits)
Investigations into various aspects of physical environment.

GEOG 3560 Fluvial Geomorphology (4 Credits)
Examines how water and sediment interact at Earth's surface to create a variety of landforms ranging from small rills to continental-scale river systems. Introduces fundamental fluvial processes or channel hydraulics and sediment transport. Examines common fluvial landforms including alluvial streams, bedrock streams, floodplains and alluvial fans. Combines traditional lectures and in-class discussions with numerous field excursions to rivers in the Rocky Mountains and Great Plains. Prerequisite: GEOG 1203, GEOG 1218, or GEOG 1266.

GEOG 3600 Meteorology (4 Credits)
The basic theory and skills of weather forecasting. Topics include thorough coverage of atmosphere dynamics and thermodynamics, the evolution of various weather types, the mechanics of storm systems (cyclones, severe storms, hurricanes), creation and interpretation of weather maps, and forecasting techniques.

GEOG 3610 Climatology (4 Credits)
Climatology is the study of the processes that result in spatial and temporal variation of weather. This course introduces the student to the processes responsible for the transfer of matter and energy between the Earth's surface and the atmosphere and the average weather conditions that result. In addition, topics of global concern, such as greenhouse effect, El Nino, urban heat islands and acid rain, are discussed. Laboratory exercises provide an opportunity to investigate climate variation and climatic change through the use of a variety of computer simulations. Prerequisites: GEOG 1201, GEOG 1216, & GEOG 1264.

GEOG 3620 Applied Climatology (4 Credits)
Climatic impact on environmental systems and human behavior; techniques to investigate climatic characteristics of environmental extremes (floods, blizzards), urban climatology and socioeconomic impacts of climate. Prerequisite: GEOG 1201. Recommended Prerequisite: GEOG 3600 or GEOG 3610.

GEOG 3630 Dendroclimatology (2-4 Credits)
Systematic variations in tree ring width and/or density can be used to reconstruct changes in precipitation or temperature well before humans were around to record the variability. This class utilizes hands on methods to introduce the fundamental principles of dendroclimatology. Through readings and lectures, students will learn how tree ring growth can be correlated to climate change. Students will then undertake several research projects to reconstruct past climate variability in the Denver metro area using tree rings. Prerequisite: permission of instructor.

GEOG 3640 Climate Change and Society (4 Credits)
The science of anthropogenic climate change will be presented with an emphasis on critical evaluation of the evidence of climate change and future scenarios and migration strategies. Students will be introduced to the latest climate change research, including the Intergovernmental Panel on Climate Change report, and the most recent literature from the field. The societal and cultural implications of climate change will also be discussed. Prerequisites: GEOG 1201, GEOG 1216, or GEOG 1264.

GEOG 3701 Topics in Geographic Information Science (1-4 Credits)
Topics vary by instructor.

GEOG 3720 Mountain Environments and Sustainability (4 Credits)
Mountain Environments and Sustainability explores the unique physical and cultural aspects of high relief and/or high altitude environments. Covering one quarter of the Earth's land surface, mountains directly or indirectly impact the lives of millions of people. We examine the significance of mountains to climate, water resources, and human activities, and discuss the sustainability of these environments and communities in light of rapid changes in many mountain regions resulting from anthropogenic factors and global change. GEOG 1201, 1202, and 1203 or instructor approval.

GEOG 3750 Topics in Human-Environment Interactions (1-4 Credits)
This course investigates various aspects of the relationships between human societies and the natural environment.

GEOG 3755 Geography of Health (4 Credits)
The geography of health is a thriving area of study that considers the impact of natural, built, and social environments on human health. This course introduces students to three geographical contributions to health studies. First, it emphasizes the importance of ecological approaches to health, which consider interactions between humans and their environments, including topics such as how climate change might influence disease distributions, and how the built environment can influence patterns of physical activity. A second focus is social theory, exploring how aspects such as race, socioeconomic status, and identity play a critical role in influencing human health. A third section of the course considers how spatial methods (cartography, GIS, and spacial statistics) can help answer health-related questions.

GEOG 3800 Geography of Colorado (4 Credits)
This course focuses on the physical and human geography of Colorado, a state that includes the western Great Plains, the southern Rocky Mountains, and the eastern Colorado Plateau. Colorado's varied natural landscapes provide equally varied settings for human settlement and resource use. Recommended Prerequisites: GEOG 1201, GEOG 1202, and GEOG 1203.

GEOG 3820 Kiwis and Kauris: Sustainability in New Zealand (4 Credits)
With its tourist tagline of “100% Pure New Zealand,” New Zealand prides itself as a world leader in sustainability, with great efforts made towards sustainable use of resources and renewable energy, conservation of indigenous species, and integration of indigenous Maori understandings of the land into sustainability approaches. At the same time, New Zealand faces significant sustainability challenges, particularly related to climate change, invasive species, continued reliance on extractive industries, and histories of oppression/exploitation of native peoples. This class uses a field-based case study approach to unpick some of these complex issues, as we visit local sites and explore topics such as preserving native species, sustainable resource use, ecotourism, and indigeneity.

GEOG 3825 Geographies of International Development in Africa (4 Credits)
What are the historical roots of (under)development in sub-Saharan Africa? How is sub- Saharan Africa typically depicted in the media? How can we explain the fact that the Niger Delta provides the bulk of Nigeria’s revenue, and yet, it remains the poorest part of the country? Is climate change the major cause of persistent food insecurity in the drylands of Ethiopia and Burkina Faso? How can we make sense of the uneven geography of poverty in Ghana? What explains urban food insecurity in Cape Town, or land struggles in rural South Africa? What are the social processes underlying the spatial disparity in health status in Malawi, or gender differences in HIV rates in Nyanza province, Kenya? And why do land users often resist state conservation efforts in Tanzania? These are some of the critical questions explored in this course. The primary aim is to provide a critical introduction to the geography of sub-Saharan Africa. We will begin by exploring how “the Africa story” is told by the media, scholars and policymakers. Attention will then shift to understanding the key historical processes that shape (under)development in the region. We will cover a broad range of topics, including governance, colonial history, debt and structural adjustment, foreign aid, food and agriculture, gender, climate change, land grabbing, health, population growth, migration, remittances, and resource extraction. We cannot possibly cover all these topics in greater detail; indeed, some are too vast and complex. We will however use specific case studies to illustrate and discuss each of the topics.

GEOG 3835 Sustainability in South Florida: The Everglades and Florida Keys (4 Credits)
South Florida represents a unique region in the United States and faces the challenge of trying to balance a tourist economy with protection of natural landscapes and resources. The region’s significant sustainability challenges include: climate change (particularly sea level rise), invasive species, fisheries management, and landscape protection. This class uses a field-based case study approach to unpick some of these complex issues as we visit local sites and explore topics such as protecting native species, sustainable resource use, and ecotourism.

GEOG 3840 Water Resource Analysis (4 Credits)
The focus of this course is on complex policy, economic and local, national and international, and political issues surrounding resource use in the western U.S. Issues include exploitation of nonrenewable and renewable energy and mineral resources; and flexible responses to changing public policy.

GEOG 3870 Water Resources & Sustainability (4 Credits)
In this course, we look at water as both a local and global resource and examine what sustainability means for human and ecological realms. After an overview of the physical processes that drive the hydrologic cycle, surface and groundwater hydrology, we examine how we humans have harnessed water for our use and how we both alter and treat its quality. We examine the legal aspects of water allocation in the U.S. and the groups and agencies that are most involved in managing and overseeing water issues. Finally, we examine the most pressing water "issues" related to wildlife, development, scarcity and conflict. We look forward to imagining the power of both the individual and the collective in meeting our future, global water needs.

GEOG 3890 Ecological Economics (4 Credits)
Ecological Economics is an emerging transdisciplinary endeavor that reintegrates the natural and social sciences toward the goal of developing a united understanding of natural and human-dominated ecosystems and designing a sustainable and desirable future for humans on a materially finite planet. In this course we start with a basic overview and summary of the neo-classical economic perspective with a particular focus on the recognized market failures of public goods, common property, and externalities. We begin with a reconceptualization of economic theory by imposing scientific constraints (e.g. conservation of mass and energy, the laws of thermodynamics, evolutionary theory, etc.). Using the ideas developed in this reconceptualization of economic theory we explore the implications for international trade and myriad public policies associated with the ethical, environmental, and economic aspects of sustainability.

GEOG 3910 Geomorphology (4 Credits)
An advanced course that examines how Earth's landforms are created by a range of physical processes. Most landforms can be viewed as a result of some combination of erosion, transport and deposition of rock, soil and sediment. The most common agents causing these geomorphic processes are water, wind, ice and waves. This course examines the processes responsible for eroding, transporting and depositing earth materials and compares these processes with the resulting landforms. Prerequisites: GEOG 1202 or GEOG 1217 or instructor's permission.

GEOG 3920 Remote Sensing Seminar (4 Credits)
Special topics in advanced remote sensing.

GEOG 3930 Cultural Geography Seminar (4 Credits)
Topics, methods and current research in cultural geography.

GEOG 3940 Urban Geography Seminar (4 Credits)
International comparison of economic and social, positive and negative aspects of urban systems.

GEOG 3950 Physical Geography Seminar (2-4 Credits)

GEOG 3955 Pollen Analysis Seminar (3 Credits)
Pollen grains preserved in sediment provide long-term records of vegetation conditions. Changing proportions of pollen types may reflect climatic fluctuation or human impacts. We review important recent research in pollen analysis (palynology), pollen sampling, laboratory techniques and pollen identification. Students are responsible for counting a number of samples and contributing data for a pollen diagram.

GEOG 3990 Undergraduate Research Seminar (1 Credit)
This course is designed to prepare students who will participate in faculty-supervised summer research projects. Students are introduced to research design, use of the scientific method, research expectations and reporting of results. Preparation of formal research proposal with adviser.

GEOG 3991 Independent Study (1-5 Credits)

GEOG 3995 Independent Research (1-5 Credits)

GEOG 3999 Geographic Internship (0-5 Credits)
Supervised internship in a government office at local, state or federal level or within private sector. Prerequisite: permission of instructor.

Geology (GEOL)

GEOL 2020 Historical Geology (4 Credits)
Historical geology is the study of the evolution of Earth through geologic time. Geologic features such as rock types and fossils are used to interpret and date past events. This course specifically introduces the basic geologic principles underlying historical geology, the geologic evolution of North America, and the evolution of life on Earth.

GEOL 2400 Geology and Ecology of the Southwest (5 Credits)
This field class emphasizes firsthand observations of the interactions among environmental properties (including substrate geology, soils, and climate) and natural vegetation in the Colorado Front Range, Rio Grande Rift, and Chihuahuan desert regions of New Mexico and southeastern Arizona. The course also examines Pliocene and Quaternary volcanism in southern Colorado and New Mexico in addition to Paleozoic and Mesozoic geology along the uplands of the Rio Grande Rift. Prerequisite: permission of instructor.

GEOL 3100 Environmental Geology (4 Credits)
Environmental geology examines geologic hazards, both natural and those attributable to human impacts on the environment from urban and regional development. Specific topics may include disposal of municipal solid waste and radioactive waste; flood, earthquake, volcanic hazards; groundwater pollution and withdrawal; mass-wasting phenomena; and energy-related issues. Prerequisite: GEOL 1010, GEOG 1203 or instructor's permission.

GEOL 3200 Sedimentology/Stratigraphy (4 Credits)
This course reviews the origin, geologic history, and depositional environments of sediments and sedimentary rocks. Course work concentrates on the identification of sedimentary rocks and depositional environments by first-hand observations of rocks in the Denver area. Prerequisite: GEOL 1010, GEOG 1203 or instructor's permission.

GEOL 3540 Hydrology (4 Credits)
This course provides an overview of the hydrologic cycle with emphasis placed on the study of applied hydrology. Discussions include the fundamental characteristics of precipitation, runoff processes, calculation of flood hazards, aquifers (porosity and permeability), the geologic settings of groundwater, the basic physics of groundwater flow, and water supply and use. Prerequisite: GEOL 1010, GEOG 1203 or instructor's permission. Recommended prerequisite: one introductory statistics course.

GEOL 3900 Geomorphology Seminar (1-5 Credits)
Hill slopes comprise the vast majority of the Earth's land surface. It is upon these surfaces that nearly all of the human population must exist and, hopefully, flourish. Hill slopes assume various forms, and their shape influences their utility for various human endeavors. Numerous geomorphic processes operate upon hill slopes to determine their form, and human activities strongly influence the frequency and magnitude of these geomorphic processes. Consequently, hill slopes are an interface between the Earth and the human population. Prerequisite: GEOL 3010 or permission of instructor.

GEOL 3991 Independent Study (1-5 Credits)