Twin Cities Campus

Geography B.S.

Geography, Environment, Society

College of Liberal Arts

- Program Type: Baccalaureate
- Requirements for this program are current for Fall 2019
- Required credits to graduate with this degree: 120
- Required credits within the major: 44 to 59
- Degree: Bachelor of Science

Geography focuses on the integrated study of our increasingly connected world, shaped by the interactions between cultural and biophysical forces. The major synthesizes approaches widely used in the humanities, social, biophysical, and digital information sciences. Geography is uniquely poised to investigate combinations of social, political, economic, and ecological processes - especially the role of space, place, and geographic networks in shaping these processes and interactions. Geography attempts to interpret not just these phenomena, but also, how they are perceived and what meanings they hold. Such an integrative perspective on global, regional, and local change provides students with a singular understanding of today's complex world.

Depending on their specific interests, geographers employ one or more research techniques, including field observation, legal and archival analysis, interviewing, textual analysis, ethnography, mapping, spatial statistics, and computer and econometric modeling. Many geographers are interested in the intersections of science, technology, and information, such as the application and evaluation of geographic information science on decision-making. All geography undergraduates are trained to be interdisciplinary to be better prepared to address some of the worlds most pressing problems including climate change, inequity, population growth, natural resource use and perception, and economic challenges.

Students earning a degree in geography are well-prepared to pursue a wide range of career opportunities due to a strong foundation of interdisciplinary education and training. Students in geography engage in course work in the three primary subfields of the discipline: cultural patterns, environmental processes and global change, and geographic information and mapping sciences. Students pursuing the BS degree may also pursue the Geographic Information Sciences track emphasizing spatial and quantitative analysis skills.

Geographers have a broad range of career opportunities. Federal, regional, and local governmental agencies seek geographers for city and regional planning, natural resource management, law enforcement, and transportation positions. Private industry consulting, environmental and marketing firms, the non-profit sector, and local, national, and transnational non-governmental organizations seek geographic skills including geographic information sciences and spatial analytical techniques. Many Geography undergraduate majors obtain careers in education and many go on to graduate school.

The BS degree offers a challenging and solid foundation in the theory and practice of geography, with the flexibility needed to specialize in particular areas of student interest. Geography undergraduates are encouraged to tailor their individual programs to meet their needs and goals.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

For information about University of Minnesota admission requirements, visit the Office of Admissions website.

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the liberal education requirements.Required courses for the major or minor in which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

Some GEOG 5xxx-level courses are graduate-level courses and will require departmental consent.

A given course may only count towards one major requirement.

See major advisor for final approval of individual program.

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At least 14 upper-division credits in the major must be taken at the University of Minnesota - Twin Cities campus.

Students may earn up to one undergraduate degree in the geography program: a BA, a BS, or a minor. Students in the Geography BS may also seek a major or minor in urban studies, or the minor in public health. Students who declare the Geographic Information Science sub-plan in the BS may not minor in Geographic Information Science.

All incoming CLA freshmen must complete the First-Year Experience course sequence.

Ways of Knowing

The Ways of Knowing requirement provides a theory-intensive overview of the discipline. Students are encouraged to take 3-5 of their breadth courses and electives before taking their Ways of Knowing course.

Take exactly 1 course(s) totaling 3 - 4 credit(s) from the following:

- GEOG 4001 - Modes of Geographic Inquiry (3.0 cr)
- GEOG 4002W - Environmental Thought and Practice [WI] (3.0 cr)

Capstone

The Capstone is a process that may include data collection, reading, reflection, collaboration, and interpretation, and ends with writing a document. As the culmination of undergraduate training, each project develops from an interest or specialization deriving from previous courses. Students who double major and choose to complete the capstone requirement in their other major may waive the geography BS capstone, and they do not need to replace the 2 credits.

Take exactly 1 course(s) totaling 2 - 4 credit(s) from the following:

Option 1: Seminar

Note: this option is not available every semester.

- GEOG 3985W *{Inactive}*[WI] (4.0 cr)

or GEOG 3985V *{Inactive}*[WI] (4.0 cr)

- **Option 2: Directed Research**

Note: this option requires instructor consent prior to the first day of classes.

- GEOG 3996 *{Inactive}*(3.0 - 4.0 cr)

or GEOG 3996H *{Inactive}*(3.0 - 4.0 cr)

- **Option 3: Supplemental Project**

Note: this option requires instructor consent prior to the first day of classes and concurrent registration in a breadth or elective course.

- GEOG 3997 *{Inactive}*(2.0 cr)

or GEOG 3997H *{Inactive}*(2.0 cr)

Upper Division Writing Intensive within the major

Students are required to take one upper division writing intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.

Take 0 - 1 course(s) from the following:

- GEOG 3371W - Cities, Citizens, and Communities [DSJ, WI] (3.0 cr)
- GEOG 3411W - Geography of Health and Health Care [WI] (3.0 cr)
- GEOG 4002W - Environmental Thought and Practice [WI] (3.0 cr)
- URBS 3955W - Senior Paper Seminar [WI] (2.0 cr)
- URBS 3301W *{Inactive}*[WI] (3.0 cr)
- GEOG 3361W *{Inactive}*[WI] (3.0 cr)

or BSE 3361W *{Inactive}*[WI] (3.0 cr)

- GEOG 3374W - The City in Film [AH, WI] (4.0 cr)

or GEOG 3374V *{Inactive}*[AH, WI] (4.0 cr)

- GEOG 3381W - Population in an Interacting World [SOCS, GP, WI] (3.0 cr)

or GLOS 3701W *{Inactive}*[SOCS, GP, WI] (3.0 cr)

- GEOG 3985W *{Inactive}*[WI] (4.0 cr)

or GEOG 3985V *{Inactive}*[WI] (4.0 cr)

Program Sub-plans

Students are required to complete one of the following sub-plans.

Environmental Geography

Breadth Requirement

Breadth courses expose students to geography sub-fields. Students may count ONLY one 1xxx course toward the breadth requirement.

Human Geography

Take exactly 1 course(s) totaling 3 or more credit(s) from the following:

- GEOG 1301W - Our Globalizing World [SOCS, GP, WI] (3.0 cr)
- GEOG 3101 *{Inactive}*[SOCS, TS] (4.0 cr)

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•GEOG 3371W - Cities, Citizens, and Communities [DSJ, WI] (3.0 cr)
•GEOG 3373 - Changing Form of the City [HIS, GP] (3.0 cr)
•GEOG 3331 - Geography of the World Economy [SOCS, GP] (3.0 cr)
or GLOS 3231 - Geography of the World Economy [SOCS, GP] (3.0 cr)
•GEOG 3361W *{Inactive}*[WI] (3.0 cr)
or BSE 3361W *{Inactive}*[WI] (3.0 cr)
•GEOG 3379 - Environment and Development in the Third World [SOCS, ENV] (3.0 cr)
or GLOS 3303 *{Inactive}*[SOCS, ENV] (3.0 cr)
•**Geography of the Twin Cities**
•GEOG 1973 - Geography of the Twin Cities [SOCS] (3.0 cr)
or GEOG 3973 - Geography of the Twin Cities [SOCS] (3.0 cr)
•GEOG 3381W - Population in an Interacting World [SOCS, GP, WI] (3.0 cr)
or GLOS 3701W *{Inactive}*[SOCS, GP, WI] (3.0 cr)

Environmental Geography

Take exactly 1 course(s) totaling 3 or more credit(s) from the following:
•GEOG 3401W - Geography of Environmental Systems and Global Change [ENV, WI] (3.0 cr)
•GEOG 3423 - Urban Climatology (3.0 cr)
•GEOG 3431 - Plant and Animal Geography (3.0 cr)
•GEOG 3839 - Introduction to Dendrochronology (4.0 cr)
•GEOG 1403 - Biogeography of the Global Garden [BIOL, ENV] (4.0 cr)
or GEOG 1403H - Honors: Biogeography of the Global Garden [BIOL, ENV] (4.0 cr)
•GEOG 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
or ESPM 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)

Geographic Information Science

Take exactly 2 course(s) totaling 6 or more credit(s) from the following:
•GEOG 1502 - Mapping Our World [TS, SOCS] (3.0 cr)
•GEOG 3511 - Principles of Cartography (4.0 cr)
•GEOG 3521 *{Inactive}*[TS] (3.0 cr)
•GEOG 3523 *{Inactive}*(3.0 cr)
•GEOG 3541 - Principles of Geocomputing (3.0 cr)
•GEOG 5563 - Advanced Geographic Information Science (3.0 cr)
•GEOG 5564 - Urban Geographic Information Science and Analysis (3.0 cr)
•GEOG 3531 - Numerical Spatial Analysis (4.0 cr)
or GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
•GEOG 3561 - Principles of Geographic Information Science (4.0 cr)
or GEOG 5561 - Principles of Geographic Information Science (4.0 cr)

Supporting Courses

Note: Some courses require prerequisites. For more information consult the university catalog, or contact the department offering the course directly.
Take exactly 4 course(s) totaling 12 or more credit(s) from the following:

Mathematics

Take 0 - 3 course(s) from the following:
•MATH 1151 - Precalculus II [MATH] (3.0 cr)
or MATH 1155 *{Inactive}*[MATH] (5.0 cr)
•MATH 1142 - Short Calculus [MATH] (4.0 cr)
or MATH 1271 - Calculus I [MATH] (4.0 cr)
or MATH 1371 - CSE Calculus I [MATH] (4.0 cr)
or MATH 1571H - Honors Calculus I [MATH] (4.0 cr)
•MATH 1272 - Calculus II (4.0 cr)
or MATH 1372 - CSE Calculus II (4.0 cr)
or MATH 1572H - Honors Calculus II (4.0 cr)
•MATH 2243 - Linear Algebra and Differential Equations (4.0 cr)
or MATH 2373 - CSE Linear Algebra and Differential Equations (4.0 cr)
or MATH 2574H - Honors Calculus IV (4.0 cr)
•**Basic Statistics**
Take 0 - 1 course(s) from the following:
•BIOL 3272 - Applied Biostatistics (4.0 cr)
•EPSY 3264 - Basic and Applied Statistics [MATH] (3.0 cr)
•EPSY 5261 - Introductory Statistical Methods (3.0 cr)
•SOC 3811 - Social Statistics [MATH] (4.0 cr)
•STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
•STAT 3021 - Introduction to Probability and Statistics (3.0 cr)
•GEOG 3531 - Numerical Spatial Analysis (4.0 cr)
or GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
•**Intermediate & Advanced Statistics**
Take 0 - 2 course(s) from the following:

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•ESPM 3012 - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)
•STAT 3022 - Data Analysis (4.0 cr)
•STAT 4101 - Theory of Statistics I (4.0 cr)
•STAT 4102 - Theory of Statistics II (4.0 cr)
•STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
•STAT 5302 - Applied Regression Analysis (4.0 cr)
•STAT 5421 - Analysis of Categorical Data (3.0 cr)

•Programming & Logic

Take 0 - 3 course(s) from the following:
•PHIL 1001 - Introduction to Logic [MATH] (4.0 cr)
•PHIL 5201 - Symbolic Logic I (4.0 cr)
•PHIL 5202 - Symbolic Logic II (4.0 cr)
•PHIL 1005 - Scientific Reasoning (4.0 cr)
or PHIL 1005H *{Inactive}*(4.0 cr)
•CSCI 1103 - Introduction to Computer Programming in Java (4.0 cr)
or CSCI 1113 - Introduction to C/C++ Programming for Scientists and Engineers (4.0 cr)
or CSCI 1133 - Introduction to Computing and Programming Concepts (4.0 cr)
•CSCI 1913 - Introduction to Algorithms, Data Structures, and Program Development (4.0 cr)
or CSCI 1933 - Introduction to Algorithms and Data Structures (4.0 cr)

•Physical Sciences

Take 0 - 3 course(s) from the following:
•BIOC 3021 - Biochemistry (3.0 cr)
•CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
•CHEM 1071H - Honors Chemistry I [PHYS] (3.0 cr)
CHEM 1075H - Honors Chemistry I Laboratory [PHYS] (1.0 cr)
•CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
•CHEM 1072H - Honors Chemistry II [PHYS] (3.0 cr)
CHEM 1076H - Honors Chemistry II Laboratory [PHYS] (1.0 cr)
•CHEM 2301 - Organic Chemistry I (3.0 cr)
or CHEM 2331H - Honors Elementary Organic Chemistry I (3.0 cr)
•CHEM 2302 - Organic Chemistry II (3.0 cr)
or CHEM 2332H - Honors Elementary Organic Chemistry II (3.0 cr)
•CHEM 2311 - Organic Lab (4.0 cr)
or CHEM 2312H - Honors Organic Lab (5.0 cr)
•PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
or PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1301W - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
or PHYS 1401V - Honors Physics I [PHYS, WI] (4.0 cr)
•PHYS 1202W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1302W - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)
or PHYS 1402V - Honors Physics II [PHYS, WI] (4.0 cr)

•Earth Sciences

Take 0 - 3 course(s) from the following:
•ESCI 2201 - Solid Earth Dynamics (4.0 cr)
•ESCI 2202 - Earth History (4.0 cr)
•ESCI 2203 - Earth Surface Dynamics (4.0 cr)
•ESCI 2301 - Mineralogy (3.0 cr)
•ESCI 3002 - Climate Change and Human History [ENV] (3.0 cr)
•ESCI 3402 - Science and Politics of Global Warming [ENV] (3.0 cr)
•SOIL 2125 - Basic Soil Science [PHYS, ENV] (4.0 cr)
•ESCI 1001 - Earth and Its Environments [PHYS, ENV] (4.0 cr)
or ESCI 1101 - Introduction to Geology (lecture only) [ENV] (3.0 cr)
•ESCI 1006 - Oceanography [PHYS, ENV] (4.0 cr)
or ESCI 1106 - Oceanography [ENV] (3.0 cr)
•GEOG 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
or ESPM 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)

•Biological & Environmental Sciences

Take 0 - 3 course(s) from the following:
•ANTH 1001 - Human Evolution [BIOL] (4.0 cr)
•EEB 4068 - Plant Physiological Ecology (3.0 cr)
•EEB 4611 - Biogeochemical Processes (3.0 cr)
•GCD 3033 - Principles of Cell Biology (3.0 cr)
•BIOL 1001 - Introductory Biology: Evolutionary and Ecological Perspectives [BIOL] (4.0 cr)
or BIOL 1001H - Introductory Biology I: Evolutionary and Ecological Perspectives [BIOL] (4.0 cr)

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•BIOL 1009 - General Biology [BIOL] (4.0 cr)
or BIOL 1009H - Honors: General Biology [BIOL] (4.0 cr)
•ANTH 3002 - Sex, Evolution, and Behavior: Examining Human Evolutionary Biology (4.0 cr)
or EEB 3002 - Sex, Evolution, and Behavior: Examining Human Evolutionary Biology (4.0 cr)
•BIOL 4003 - Genetics (3.0 cr)
or GCD 3022 - Genetics (3.0 cr)
•ANTH 4329 - Primate Ecology and Social Behavior (3.0 cr)
or EEB 4329 - Primate Ecology and Social Behavior (3.0 cr)
•EEB 3407 - Ecology (3.0 cr)
or EEB 3807 - Ecology (4.0 cr)
•EEB 3411 - Introduction to Animal Behavior (3.0 cr)
or EEB 3811W - Animal Behavior in the Field [WI] (4.0 cr)

Electives

Students should work with the departmental advisor to develop a coherent set of electives that meet specific educational goals. Courses counting toward the electives requirements must be worth three or four credits each. In some circumstances, students may substitute 2 two-credit courses for one of the electives. At least 9 of the 15 elective credits must be from the list of Environmental Geography & Geographic Information Sciences Electives

Take exactly 5 course(s) totaling 15 or more credit(s) from the following:

Environmental Geography & Geographic Information Sciences Electives

Students may petition to take additional courses under the GIS designator for major credit when prerequisites have been met.

Take 3 - 5 course(s) totaling 9 or more credit(s) from the following:

Environmental Geography Electives

Take 0 - 5 course(s) from the following:

•GEOG 3401W - Geography of Environmental Systems and Global Change [ENV, WI] (3.0 cr)
•GEOG 3423 - Urban Climatology (3.0 cr)
•GEOG 3431 - Plant and Animal Geography (3.0 cr)
•GEOG 3839 - Introduction to Dendrochronology (4.0 cr)
•GEOG 5426 - Climatic Variations (3.0 cr)
•URBS 3751 - Understanding the Urban Environment [ENV] (3.0 cr)

•Geographic Information Sciences Electives

Take 0 - 5 course(s) from the following:

•GEOG 3511 - Principles of Cartography (4.0 cr)
•GEOG 5563 - Advanced Geographic Information Science (3.0 cr)
•GEOG 5564 - Urban Geographic Information Science and Analysis (3.0 cr)
•GIS 5555 - Basic Spatial Analysis (3.0 cr)
•GIS 5571 - ArcGIS I (3.0 cr)
•GIS 5578 - GIS Programming (3.0 cr)
•GEOG 3531 - Numerical Spatial Analysis (4.0 cr)
or GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
•GEOG 3541 - Principles of Geocomputing (3.0 cr)
or GEOG 5541 - Principles of Geocomputing (3.0 cr)
•GEOG 3561 - Principles of Geographic Information Science (4.0 cr)
or GEOG 5561 - Principles of Geographic Information Science (4.0 cr)

•Additional Geography Electives

Take 0 - 2 course(s) totaling at most 8 credit(s) from the following:

•GEOG 3101 *{Inactive}*[SOCS, TS] (4.0 cr)
•GEOG 3111 - Geography of Minnesota (3.0 cr)
•GEOG 3211 *{Inactive}*(3.0 cr)
•GEOG 3371W - Cities, Citizens, and Communities [DSJ, WI] (3.0 cr)
•GEOG 3373 - Changing Form of the City [HIS, GP] (3.0 cr)
•GEOG 3376 - Political Ecology [ENV] (3.0 cr)
•GEOG 3377 - Music in the City [DSJ, AH] (3.0 cr)
•GEOG 3388 - Going Places: Geographies of Travel and Tourism [CIV] (3.0 cr)
•GEOG 3411W - Geography of Health and Health Care [WI] (3.0 cr)
•GEOG 3521 *{Inactive}*[TS] (3.0 cr)
•GEOG 3523 *{Inactive}*(3.0 cr)
•GEOG 3900 - Topics in Geography (3.0 cr)
•GEOG 3973 - Geography of the Twin Cities [SOCS] (3.0 cr)
•GEOG 4001 - Modes of Geographic Inquiry (3.0 cr)
•GEOG 4002W - Environmental Thought and Practice [WI] (3.0 cr)
•GEOG 3362 *{Inactive}*(3.0 cr)
•GEOG 5393 *{Inactive}*(4.0 cr)
•URBS 3301W *{Inactive}*[WI] (3.0 cr)
•URBS 3771 - Fundamentals of Transit (3.0 cr)
•URBS 3861 - Financing Cities (3.0 cr)
•URBS 3871 - A Suburban World (3.0 cr)

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- GEOG 3145 - The Islamic World [SOCS, GP] (3.0 cr)
  or GLOS 3645 *{Inactive}*[SOCS, GP] (3.0 cr)
  or RELS 3711 - The Islamic World [SOCS, GP] (3.0 cr)
- GEOG 3161 - Europe: A Geographic Perspective [GP] (3.0 cr)
  or GLOS 3921 *{Inactive}*[GP] (3.0 cr)
- GEOG 3331 - Geography of the World Economy [SOCS, GP] (3.0 cr)
  or GLOS 3231 - Geography of the World Economy [SOCS, GP] (3.0 cr)
- GEOG 3361W *{Inactive}*[WI] (3.0 cr)
  or BSE 3361W *{Inactive}*[WI] (3.0 cr)
- GEOG 3374W - The City in Film [AH, WI] (4.0 cr)
  or GEOG 3374V *{Inactive}*[AH, WI] (4.0 cr)
  or GEOG 5374 *{Inactive}*(4.0 cr)
- GEOG 3379 - Environment and Development in the Third World [SOCS, ENV] (3.0 cr)
  or GLOS 3303 *{Inactive}*[SOCS, ENV] (3.0 cr)
- GEOG 3381W - Population in an Interacting World [SOCS, GP, WI] (3.0 cr)
  or GLOS 3701W *{Inactive}*[SOCS, GP, WI] (3.0 cr)

Geographic Information Science

This sub-plan meets federal STEM program requirements.

Where does geographic information come from? How can science and society make use of such information? How can geographic information science contribute to urban development and environmental studies? This sub-plan exposes students to a range of applications, including land use and land cover change, environmental justice, mobility studies, transportation improvements, urban, regional and environmental planning, resource conservation, society-technology relations, cyberGIS, and big data analytics.

Breadth Requirement

Breadth courses expose students to geography sub-fields. Students may count ONLY one 1xxx course toward the breadth requirement.

Human Geography

Take exactly 1 course(s) totaling 3 or more credit(s) from the following:

- GEOG 1301W - Our Globalizing World [SOCS, GP, WI] (3.0 cr)
- GEOG 3101 *{Inactive}*[SOCS, TS] (4.0 cr)
- GEOG 3371W - Cities, Citizens, and Communities [DSJ, WI] (3.0 cr)
- GEOG 3373 - Changing Form of the City [HIS, GP] (3.0 cr)
- GEOG 3331 - Geography of the World Economy [SOCS, GP] (3.0 cr)
  or GLOS 3231 - Geography of the World Economy [SOCS, GP] (3.0 cr)
- GEOG 3361W *{Inactive}*[WI] (3.0 cr)
  or BSE 3361W *{Inactive}*[WI] (3.0 cr)
- GEOG 3379 - Environment and Development in the Third World [SOCS, ENV] (3.0 cr)
  or GLOS 3303 *{Inactive}*[SOCS, ENV] (3.0 cr)
- **Geography of the Twin Cities**
  - GEOG 1973 - Geography of the Twin Cities [SOCS] (3.0 cr)
    or GEOG 3973 - Geography of the Twin Cities [SOCS] (3.0 cr)
  - GEOG 3381W - Population in an Interacting World [SOCS, GP, WI] (3.0 cr)
    or GLOS 3701W *{Inactive}*[SOCS, GP, WI] (3.0 cr)

Environmental Geography

Take exactly 1 course(s) totaling 3 or more credit(s) from the following:

- GEOG 3401W - Geography of Environmental Systems and Global Change [ENV, WI] (3.0 cr)
- GEOG 3423 - Urban Climatology (3.0 cr)
- GEOG 3431 - Plant and Animal Geography (3.0 cr)
- GEOG 3839 - Introduction to Dendrochronology (4.0 cr)
- GEOG 1403 - Biogeography of the Global Garden [BIOL, ENV] (4.0 cr)
  or GEOG 1403H - Honors: Biogeography of the Global Garden [BIOL, ENV] (4.0 cr)
- GEOG 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
  or ESPM 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)

Geographic Information Science

Take exactly 2 course(s) totaling exactly 8 credit(s) from the following:

- GEOG 3511 - Principles of Cartography (4.0 cr)
- GEOG 3531 - Numerical Spatial Analysis (4.0 cr)
  or GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
- GEOG 3541 - Principles of Geocomputing (3.0 cr)
- GEOG 3561 - Principles of Geographic Information Science (4.0 cr)
  or GEOG 5561 - Principles of Geographic Information Science (4.0 cr)

Supporting Courses

Note: Some courses require prerequisites. For more information consult the university catalog, or contact the department offering the course directly. Take 3 of the 4 required Supporting Courses from the following course groups: Mathematics, Basic Statistics,

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Intermediate & Advanced Statistics, and Programming and Logic.
Take exactly 4 course(s) totaling 12 or more credit(s) from the following:

Mathematics

Take 0 - 3 course(s) from the following:

- MATH 1151 - Precalculus II [MATH] (3.0 cr)
  or MATH 1155 *{Inactive}*[MATH] (5.0 cr)
- MATH 1142 - Short Calculus [MATH] (4.0 cr)
  or MATH 1271 - Calculus I [MATH] (4.0 cr)
  or MATH 1371 - CSE Calculus I [MATH] (4.0 cr)
  or MATH 1571H - Honors Calculus I [MATH] (4.0 cr)
- MATH 1272 - Calculus II (4.0 cr)
  or MATH 1372 - CSE Calculus II (4.0 cr)
  or MATH 1572H - Honors Calculus II (4.0 cr)
- MATH 2243 - Linear Algebra and Differential Equations (4.0 cr)
  or MATH 2373 - CSE Linear Algebra and Differential Equations (4.0 cr)
  or MATH 2574H - Honors Calculus IV (4.0 cr)

•Basic Statistics

Take 0 - 1 course(s) from the following:

- BIOL 3272 - Applied Biostatistics (4.0 cr)
- EPSY 3264 - Basic and Applied Statistics [MATH] (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- SOC 3811 - Social Statistics [MATH] (4.0 cr)
- STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
- STAT 3021 - Introduction to Probability and Statistics (3.0 cr)
- GEOG 3531 - Numerical Spatial Analysis (4.0 cr)
  or GEOG 5531 - Numerical Spatial Analysis (4.0 cr)

•Intermediate & Advanced Statistics

Take 0 - 2 course(s) from the following:

- ESPM 3012 - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)
- STAT 3022 - Data Analysis (4.0 cr)
- STAT 4101 - Theory of Statistics I (4.0 cr)
- STAT 4102 - Theory of Statistics II (4.0 cr)
- STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5421 - Analysis of Categorical Data (3.0 cr)

•Programming & Logic

Take 0 - 3 course(s) from the following:

- PHIL 1001 - Introduction to Logic [MATH] (4.0 cr)
- PHIL 5201 - Symbolic Logic I (4.0 cr)
- PHIL 5202 - Symbolic Logic II (4.0 cr)
- PHIL 1005 - Scientific Reasoning (4.0 cr)
  or PHIL 1005H *{Inactive}*(4.0 cr)
- CSCI 1103 - Introduction to Computer Programming in Java (4.0 cr)
  or CSCI 1113 - Introduction to C/C++ Programming for Scientists and Engineers (4.0 cr)
  or CSCI 1133 - Introduction to Computing and Programming Concepts (4.0 cr)
- CSCI 1913 - Introduction to Algorithms, Data Structures, and Program Development (4.0 cr)
  or CSCI 1933 - Introduction to Algorithms and Data Structures (4.0 cr)

•Physical Sciences

Take 0 - 1 course(s) from the following:

- BIOC 3021 - Biochemistry (3.0 cr)
- CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
  CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
- CHEM 1071H - Honors Chemistry I [PHYS] (3.0 cr)
  CHEM 1075H - Honors Chemistry I Laboratory [PHYS] (1.0 cr)
- CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
  CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
- CHEM 1072H - Honors Chemistry II [PHYS] (3.0 cr)
  CHEM 1076H - Honors Chemistry II Laboratory [PHYS] (1.0 cr)
- CHEM 2301 - Organic Chemistry I (3.0 cr)
  or CHEM 2331H - Honors Elementary Organic Chemistry I (3.0 cr)
- CHEM 2302 - Organic Chemistry II (3.0 cr)
  or CHEM 2332H - Honors Elementary Organic Chemistry II (3.0 cr)
- CHEM 2311 - Organic Lab (4.0 cr)
  or CHEM 2312H - Honors Organic Lab (5.0 cr)
- PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
  or PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 cr)

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or PHYS 1301W - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
or PHYS 1401V - Honors Physics I [PHYS, WI] (4.0 cr)
•PHYS 1202W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1302W - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)
or PHYS 1402V - Honors Physics II [PHYS, WI] (4.0 cr)

•Earth Sciences

Take 0 - 1 course(s) from the following:
•ESCI 2201 - Solid Earth Dynamics (4.0 cr)
•ESCI 2202 - Earth History (4.0 cr)
•ESCI 2203 - Earth Surface Dynamics (4.0 cr)
•ESCI 2301 - Mineralogy (3.0 cr)
•ESCI 3002 - Climate Change and Human History [ENV] (3.0 cr)
•ESCI 3402 - Science and Politics of Global Warming [ENV] (3.0 cr)
•SOIL 2125 - Basic Soil Science [PHYS, ENV] (4.0 cr)
•ESCI 1001 - Earth and Its Environments [PHYS, ENV] (4.0 cr)
or ESCI 1101 - Introduction to Geology (lecture only) [ENV] (3.0 cr)
•ESCI 1006 - Oceanography [PHYS, ENV] (4.0 cr)
or ESCI 1106 - Oceanography [ENV] (3.0 cr)
•GEOG 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
or ESPM 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)

•Biological & Environmental Sciences

Take 0 - 1 course(s) from the following:
•ANTH 1001 - Human Evolution [BIOL] (4.0 cr)
•EEB 4068 - Plant Physiological Ecology (3.0 cr)
•EEB 4611 - Biogeochemical Processes (3.0 cr)
•GCD 3033 - Principles of Cell Biology (3.0 cr)
•BIOL 1001 - Introductory Biology: Evolutionary and Ecological Perspectives [BIOL] (4.0 cr)
or BIOL 1001H - Introductory Biology I: Evolutionary and Ecological Perspectives [BIOL] (4.0 cr)
•BIOL 1009 - General Biology [BIOL] (4.0 cr)
or BIOL 1009H - Honors: General Biology [BIOL] (4.0 cr)
•ANTH 3002 - Sex, Evolution, and Behavior: Examining Human Evolutionary Biology (4.0 cr)
or EEB 3002 - Sex, Evolution, and Behavior: Examining Human Evolutionary Biology (4.0 cr)
•BIOL 4003 - Genetics (3.0 cr)
or GCD 3022 - Genetics (3.0 cr)
•ANTH 4329 - Primate Ecology and Social Behavior (3.0 cr)
or EEB 4329 - Primate Ecology and Social Behavior (3.0 cr)
•EEB 3407 - Ecology (3.0 cr)
or EEB 3807 - Ecology (4.0 cr)
•EEB 3411 - Introduction to Animal Behavior (3.0 cr)
or EEB 3811W - Animal Behavior in the Field [WI] (4.0 cr)

Electives

Students should work with the departmental advisor to develop a coherent set of electives that meet specific educational goals. Courses counting toward the electives requirements must be worth three or four credits each. In some circumstances, students may substitute 2 two-credit courses for one of the electives. At least 9 of the 15 elective credits must be Geographic Information Sciences Electives. One of the Geographic Information Sciences Electives must be taken at the 5xxx level.

Take exactly 5 course(s) totaling 15 or more credit(s) from the following:

Geographic Information Sciences Electives

Students may petition to take additional courses under the GIS designator for major credit when prerequisites have been met.

Take 9 or more credit(s) from the following:
•GEOG 3511 - Principles of Cartography (4.0 cr)
•GEOG 3531 - Numerical Spatial Analysis (4.0 cr)
•GEOG 3561 - Principles of Geographic Information Science (4.0 cr)
•GEOG 3541 - Principles of Geocomputing (3.0 cr)

•Advanced Geographic Information Sciences Electives

Take 1 - 5 course(s) totaling 3 or more credit(s) from the following:
•GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
•GEOG 5541 - Principles of Geocomputing (3.0 cr)
•GEOG 5561 - Principles of Geographic Information Science (4.0 cr)
•GEOG 5563 - Advanced Geographic Information Science (3.0 cr)
•GEOG 5564 - Urban Geographic Information Science and Analysis (3.0 cr)
•GIS 5555 - Basic Spatial Analysis (3.0 cr)
•GIS 5571 - ArcGIS I (3.0 cr)
•GIS 5578 - GIS Programming (3.0 cr)

•Environmental Geography Electives

Take 0 - 2 course(s) totaling at most 8 credit(s) from the following:
•GEOG 3401W - Geography of Environmental Systems and Global Change [ENV, WI] (3.0 cr)

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- GEOG 3423 - Urban Climatology (3.0 cr)
- GEOG 3431 - Plant and Animal Geography (3.0 cr)
- GEOG 3839 - Introduction to Dendrochronology (4.0 cr)
- GEOG 5426 - Climatic Variations (3.0 cr)
- URBS 3751 - Understanding the Urban Environment [ENV] (3.0 cr)

•Additional Geography Electives

Take 0 - 2 course(s) totaling at most 8 credit(s) from the following:

- GEOG 3101 *{Inactive}*[SOCS, TS] (4.0 cr)
- GEOG 3111 - Geography of Minnesota (3.0 cr)
- GEOG 3211 *{Inactive}*(3.0 cr)
- GEOG 3371W - Cities, Citizens, and Communities [DSJ, WI] (3.0 cr)
- GEOG 3373 - Changing Form of the City [HIS, GP] (3.0 cr)
- GEOG 3376 - Political Ecology [ENV] (3.0 cr)
- GEOG 3377 - Music in the City [DSJ, AH] (3.0 cr)
- GEOG 3388 - Going Places: Geographies of Travel and Tourism [CIV] (3.0 cr)
- GEOG 3411W - Geography of Health and Health Care [WI] (3.0 cr)
- GEOG 3521 *{Inactive}*[TS] (3.0 cr)
- GEOG 3523 *{Inactive}*(3.0 cr)
- GEOG 3900 - Topics in Geography (3.0 cr)
- GEOG 3973 - Geography of the Twin Cities [SOCS] (3.0 cr)
- GEOG 4001 - Modes of Geographic Inquiry (3.0 cr)
- GEOG 4002W - Environmental Thought and Practice [WI] (3.0 cr)
- GEOG 3362 *{Inactive}*(3.0 cr)
- GEOG 5393 *{Inactive}*(4.0 cr)
- URBS 3301W *{Inactive}*[WI] (3.0 cr)
- URBS 3771 - Fundamentals of Transit (3.0 cr)
- URBS 3861 - Financing Cities (3.0 cr)
- URBS 3871 - A Suburban World (3.0 cr)
- GEOG 3145 - The Islamic World [SOCS, GP] (3.0 cr)
  or GLOS 3645 *{Inactive}*[SOCS, GP] (3.0 cr)
  or RELS 3711 - The Islamic World [SOCS, GP] (3.0 cr)
- GEOG 3161 - Europe: A Geographic Perspective [GP] (3.0 cr)
  or GLOS 3921 *{Inactive}*[GP] (3.0 cr)
- GEOG 3331 - Geography of the World Economy [SOCS, GP] (3.0 cr)
  or GLOS 3231 - Geography of the World Economy [SOCS, GP] (3.0 cr)
- GEOG 3361W *{Inactive}*[WI] (3.0 cr)
  or BSE 3361W *{Inactive}*[WI] (3.0 cr)
- GEOG 3374W - The City in Film [AH, WI] (4.0 cr)
  or GEOG 3374V *{Inactive}*[AH, WI] (4.0 cr)
  or GEOG 5374 *{Inactive}*(4.0 cr)
- GEOG 3379 - Environment and Development in the Third World [SOCS, ENV] (3.0 cr)
  or GLOS 3303 *{Inactive}*[SOCS, ENV] (3.0 cr)
- GEOG 3381W - Population in an Interacting World [SOCS, GP, WI] (3.0 cr)
  or GLOS 3701W *{Inactive}*[SOCS, GP, WI] (3.0 cr)

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