Earth Science

The study of Earth Science draws primarily on geology and meteorology with additional attention to the fields of oceanography and life history. The traditional background for Earth Science focuses on mathematics and the quantitative aspects of science. The contemporary study and practice of Earth Science includes the qualitative evaluation and understanding of earth processes.

Both the quantitative and qualitative factors are applied in decision-making processes that range from plans for worldwide concerns, such as global warming, and for natural disasters, such as earthquakes and floods, to evaluation of a building site for a home. Earth Science is also a companion field of study for hydrologists and environmental scientists and for related careers in government, business, and industry.

Programs

- Geography, B.S. (Earth Science Emphasis) *major*
- Science Education, B.S. (Earth and Space Science Specialty (Teacher Licensure)) *major*
- Earth Science *minor*

Career Directions

Federal/State Agent
Industry/Business Consultant
Park Naturalist
Science Curriculum Coordinator
Also: Graduate Study

Preparation

Recommended High School Courses
Algebra
Biology
Chemistry
Physics
Trigonometry

Geography, B.S. *major*
Earth Science Emphasis

A total of 120 semester credits are needed for the **Geography, Earth Science emphasis B.S.** degree and include the following:

- 40 upper division credits (level 3000/4000)
- 48 required major core credits
- Completion of Core Curriculum credits (Minnesota Transfer Curriculum [MnTC] Goal Areas 1-10) - required for all baccalaureate degrees
- Completion of BSU Focus and Nisidotaading Course Requirements

Dual Degrees
Students wishing to complete two degrees concurrently, (example: Bachelor of Science and Bachelor of Arts) must complete a minimum of an additional 30 credits above the required 120 credits.

Multiple Credentials
Any additional major, minor or certificate in a degree must have at least 6 credits of course work not used to meet the requirements of another major, minor or certificate in the degree.

Required Credits: 48
Required GPA: 2.25

I REQUIRED CORE COURSES

Complete the following courses:

- BUAD 2231 Business Statistics I (3 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)
  or STAT 2610 Applied Statistics (4 credits)
- ENGL 2150 Technical Writing (3 credits)
  or ENGL 3150 Writing In The Disciplines (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3410 Geography of North America (3 credits)
  or GEOG 3800 Regional Geography (1-3 credits)
  or GEOG 3810 Geography of Europe (3 credits)
  or GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
  or GEOG 3840 Geography of Africa (3 credits)
  or GEOG 3850 Geography of the Middle East (3 credits)
  or GEOG 3860 Geography of Latin America and the Caribbean (3 credits)

  or GEOG 3870 Planning for Sustainable Cities (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)

II EARTH SCIENCE EMPHASIS

REQUIRED EMPHASIS CORE

Complete the following courses:

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)
- GEOG 4910 Directed Independent Study (3 credits)
  or GEOG 4970 Internship (3 credits)
  or GEOG 4990 Thesis (3 credits)
- GEOL 1110 Physical Geology (4 credits)
- GEOL 2110 Crystals, Minerals and Rocks (4 credits)

EARTH SCIENCE ELECTIVES
Select 3 courses from the following, or related upper division courses as approved in advance by advisor:

- BIOL 3120 Soils (4 credits)
  or GEOL 3120 Soils (4 credits)
- BIOL 3361 Limnology (4 credits)
- BIOL 3730 Plant Diversity (4 credits)
- BIOL 3840 Wetlands Ecology (3 credits)
- BIOL 4623 Forest Ecology (4 credits)
- ENVR 3040 Environmental Economics (3 credits)
- ENVR 3600 Environmental Justice and Sustainability (3 credits)
- GEOG 3125 Weather and Climate (3 credits)
- GEOG 3630 Conservation Biology (3 credits)

or BIOL 3630 Conservation Biology (3 credits)
- GEOL 1120 Intro to Fossils and History of Planet Earth (4 credits)
- GEOL 3211 Environmental Hydrology (3 credits)
- GEOL 3212 Hydrogeology (3 credits)
- GEOL 3400 Glacial and Pleistocene Geology (3 credits)
- GEOL 3500 Topics in Paleontology (3 credits)
- GEOL 3600 Stratigraphy and Sedimentation (3 credits)
- GEOL 3700 Environmental Geophysics (3 credits)
- GEOL 4300 Global Environmental Change (3 credits)

III SPATIAL METHODS ELECTIVES

Select 1 of the following courses:

- GEOG 3226 Cartography (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 4190 Qualitative Methods in Geographic Research (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)
- STAT 3610 Time Series Analysis (3 credits)

Program Learning Outcomes | Geography, B.S.

1. Geographic Understanding: Students will have an understanding of the nature of Geography as an academic discipline, including familiarity with its history and principal sub-fields, concepts are introduced in Geog 1400, and core courses.

2. Thematic Geographic Knowledge: Students will demonstrate understanding of Geography as a spatial science within its various sub-disciplines.

2.1. Competence in the Basic Concepts of Human Geography: Students will show proficiency in this area by meeting specific performance metrics in Geog 2200 and another upper division Human Geography Elective.

2.2. Competence in the Basic Concepts of Physical Geography: Students will show proficiency in this area by meeting performance metrics in Geog 2100 and another upper division Physical Geography Elective.

2.3. Competence in the Basic Concepts of Economic Geography: Students will show proficiency in this area by meeting performance metrics in Geog 2300.

2.4. Competence in the Basic Concepts of Planning: Students will show proficiency in this area by meeting performance metrics in Geog 2400 and another upper division Planning Courses.

3. Understanding the Basic Concepts of Geospatial Analysis: Students will show proficiency in this area by meeting performance metrics all classes requiring both quantitative and qualitative analysis.

3.1. Demonstrate confidence with GIS Software: Demonstrate a competency in selected geographic techniques and/or methods: Relevant Courses: Geog3231, Geog3232, Geog 4275.

3.2. Apply GIS skills in a related Geography Course: Demonstrate the ability to use and integrate GIS into research and project development non-GIS classes.

4. Basic Understanding of Regional Concepts: Students will appreciate how Geography's unique spatial perspective is essential for understanding historical, cultural, and demographic patterns in different world regions. Upper Division Regional courses, Geog3810, 3820, 3830, 3850.

5. Effective Communication: Students will display competency in written expression with respect to clarity, logical expression, and effective argument.

6. General Geographic Research Skills: Students will apply basic research skills, including the ability to {a} critically evaluate the research of others and {b} develop a coherent, thoughtful analysis of these findings. (Typically applies to shorter paper projects, not full term projects for the assessment criteria)

6.1. Competence in Geographic Research: Conceive, develop and produce a term project that involves a précis or abstract, an annotated bibliography and a review of academic literature presented in a coherent, well-developed articulate thesis or independent study project. (Assessments suited to full term projects).

7. Practical Experience - Internship: Students will acquire knowledge and skills sufficient to allow one to pursue advanced study in Geography or find employment in Geography-related fields, including but not limited to those involving urban and regional planning.

Science Education, B.S. *major*
Earth and Space Science Specialty (Teacher Licensure)

A total of 120 semester credits are needed for the **Science Education, Earth and Space Science specialty (Teacher Licensure) B.S.** degree and include the following:

- Completion of a minimum of 40 upper division credits (level 3000/4000)
- Completion of all required major credits
- Completion of Core Curriculum credits (Minnesota Transfer Curriculum [MnTC] Goal Areas 1-10 with a minimum of 40 credits) required for all baccalaureate degrees
- Completion of BSU Focus and Nisidotaading Course Requirements

Dual Degrees
Students wishing to complete two degrees concurrently, (example: Bachelor of Science and Bachelor of Arts) must complete a minimum of an additional 30 credits above the required 120 credits.

Multiple Credentials
Any additional major, minor or certificate in a degree must have at least 6 credits of course work not used to meet the requirements of another major, minor or certificate in the degree.

Required Credits: 86
Required GPA: 2.50

Core Courses for Science Teaching in Grades 5-8

Complete the following courses:

- BIOL 1400 Cellular Principles (4 credits)
  or BIOL 1110 Human Biology (4 credits)
- BIOL 1500 Diversity of Life (4 credits)
  or BIOL 1120 General Biology: Evolution And Ecology (3 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
  or CHEM 1111 General Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
  or CHEM 1112 General Chemistry II (4 credits)
- GEOL 1110 Physical Geology (4 credits)
- SCI 3100 Integrative Science for Teachers (4 credits)
- SCI 3450 Science Methods For Grades 5-8 (4 credits)
  or ED 3410 Secondary Science Methods (4 credits)

REQUIRED PROFESSIONAL EDUCATION COURSES

Complete the following courses with a minimum 2.50 GPA:

- ED 1100 Education & Society (3 credits)
- ED 2110 Educational Psychology and Learning Theories (3 credits)

- ED 3140 Human Diversity and Educational Equity (3 credits)
- ED 3350 Principles and Strategies of Teaching (3 credits)
- ED 3780 Inclusive Teaching and Classrooms (3 credits)
- ED 4737 Content Area Reading (3 credits)
- ED 4778 Teacher Leadership (3 credits)

Complete 12 credits of student teaching:

- ED 4830 Student Teaching - Secondary (1-12 credits)

EARTH AND SPACE SCIENCE SPECIALTY

Complete the following courses:

- ENVR 2000 Introduction to Environmental Science (3 credits)
- GEOL 1120 Intro to Fossils and History of Planet Earth (4 credits)
- GEOL 2110 Crystals, Minerals and Rocks (4 credits)
- GEOL 3500 Topics in Paleontology (3 credits)
- GEOL 3600 Stratigraphy and Sedimentation (3 credits)
- PHYS 2000 Astronomy (3 credits)

Select 1 of the following courses:

- GEOL 3211 Environmental Hydrology (3 credits)
- ENVR 4050 Geochemistry (3 credits)

Select 1 of the following courses:

- GEOL 4970 Internship (3 credits)
- GEOL 4980 Research (3 credits)

Earth Science *minor*

The Earth Science minor is designed to support other fields such as geography, biology, and chemistry. The program will complement and enhance many majors, but does not in and by itself lead to a career choice.

Multiple Credentials
Any additional major, minor or certificate in a degree must have at least 6 credits of course work not used to meet the requirements of another major, minor or certificate in the degree.

Required Credits: 23
Required GPA: 2.00

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 3630 Conservation Biology (3 credits)
- GEOL 1110 Physical Geology (4 credits)
- GEOL 1120 Intro to Fossils and History of Planet Earth (4 credits)
- GEOL 3211 Environmental Hydrology (3 credits)
- SCI 2200 Meteorology (3 credits)

II REQUIRED ELECTIVES

SELECT 2 OF THE FOLLOWING COURSES:

- GEOL 2110 Crystals, Minerals and Rocks (4 credits)
- GEOL 2730 Introduction to Planetary Science (4 credits)
- GEOL 3212 Hydrogeology (3 credits)
- GEOL 3400 Glacial and Pleistocene Geology (3 credits)
- GEOL 3500 Topics in Paleontology (3 credits)
- GEOL 3600 Stratigraphy and Sedimentation (3 credits)
- GEOL 3700 Environmental Geophysics (3 credits)
- GEOL 3120 Soils (4 credits)
  or BIOL 3120 Soils (4 credits)

Courses

All-University Courses

The course numbers listed below, not always included in the semester class schedule, may be registered for by consent of the advisor, instructor, or department chair, or may be assigned by the department when warranted. Individual registration requires previous arrangement by the student and the completion of any required form or planning outline as well as any prerequisites.

1910, 2910, 3910, 4910 DIRECTED INDEPENDENT STUDY
1920, 2920, 3920, 4920 DIRECTED GROUP STUDY
1930, 2930, 3930, 4930 EXPERIMENTAL COURSE
1940, 2940, 3940, 4940 IN-SERVICE COURSE
1950, 2950, 3950, 4950 WORKSHOP, INSTITUTE, TOUR
1960, 2960, 3960, 4960 SPECIAL PURPOSE INSTRUCTION
1970, 2970, 3970, 4970 INTERNSHIP
1980, 2980, 3980, 4980 RESEARCH
1990, 2990, 3990, 4990 THESIS