# Science Education

While the term "science" is applied generally to the study of natural phenomena, in the Science degree program at Bemidji State University it applies to a combined study of the life, earth, and physical sciences in the context of teacher certification for grades 5-8. This "broad science" degree is favored by school districts for their junior high/middle school science positions. Students in the Teacher Licensure Grades 5-12 degree program are also required to select at least one specialty for grades 9-12 from one of the following science areas: Chemistry, Earth and Space Science, Life Science, or Physics.

**Programs**

- Elementary Education, B.S. (Science Endorsement (Teacher Licensure)) *major*
- Science Education, B.S. (Physics Specialty (Teacher Licensure)) *major*
- Science Education, B.S. (Life Science Specialty (Teacher Licensure)) *major*
- Science Education, B.S. (Chemistry Specialty (Teacher Licensure)) *major*
- Science Education, B.S. (Earth and Space Science Specialty (Teacher Licensure)) *major*

**Career Directions**

Middle School Teacher
Junior High School Teacher
High School Science Teacher

**Preparation**

*Recommended High School Courses*

Biology

Chemistry

Physics

Algebra

Trigonometry

## Elementary Education, B.S. *major*
## Science Endorsement (Teacher Licensure)

Required Credits: 101
Required GPA: 2.50

**I ELEMENTARY EDUCATION FOUNDATION COURSES**

Complete the following courses:

- ED 3100 Introduction to the Foundations of Public School Education (3 credits)
- ED 3110 Educational Psychology (3 credits)
- ED 3140 Human Relations In Education (3 credits)
- ED 3350 Pedagogy: Planning for Instruction (3 credits)
- ED 3780 Adaptation and Management: Designing the Learning Environment (3 credits)
- ED 4799 The Professional Teacher (1 credit)
- HLTH 3400 Health and Drugs in Society (2 credits)

Complete the following course, up to 12 credits:

- ED 4820 Student Teaching - Elementary (1-12 credits)

**II ELEMENTARY EDUCATION MAJOR COURSES**

Complete the following courses:

- ED 3201 Language Arts I (3 credits)
- ED 3202 Language Arts II (3 credits)
- ED 3203 Language Arts III (3 credits)
- ED 3221 Elementary Math Methods (3 credits)
- ED 3222 Elementary Science Methods (3 credits)
- ED 3240 Social Studies in the Elementary School (3 credits)
- ED 3301 Creative Expressions (3 credits)
- ED 3302 Creative Process Foundations: Patterns (3 credits)
- HLTH 4100 Teaching Elementary School Health (2 credits)
- PHED 4200 Methods of Teaching Elementary Physical Education to Classroom Teachers (1 credit)

Complete the following course:

- MATH 1011 Mathematics for Elementary School Teachers I (3 credits)

Complete the following course:

- MATH 1013 Mathematics for Elementary School Teachers II (3 credits)

**SCIENCE ENDORSEMENT**

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)

EDUCATION CORE
COMPLETE THE FOLLOWING COURSES:

- ED 3417 Teaching and Learning in the Middle School (3 credits)
- ED 4737 Content Area Reading (3 credits)

COMPLETE THE FOLLOWING COURSE (5 CREDITS):

- ED 4840 Student Teaching - Special Fields (1-12 credits)

## Science Education, B.S. *major*
## Physics Specialty (Teacher Licensure)

Required Credits: 82
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 3100 Introduction to the Foundations of Public School Education (3 credits)
- ED 3110 Educational Psychology (3 credits)
- ED 3140 Human Relations In Education (3 credits)
- ED 3350 Pedagogy: Planning for Instruction (3 credits)
- ED 3780 Adaptation and Management: Designing the Learning Environment (3 credits)
- ED 4737 Content Area Reading (3 credits)
- ED 4799 The Professional Teacher (1 credit)

Complete the following course:

- HLTH 3400 Health and Drugs in Society (2 credits)

Complete 12 credits of student teaching:

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

**PHYSICS SPECIALTY**

Complete the following courses:

MATH 2471 is recommended (required for PHYS 2101)

- PHYS 2101 Physics I (4 credits)
  *or* PHYS 1101 General Physics I (4 credits)
- PHYS 2102 Physics II (4 credits)
  *or* PHYS 1102 General Physics II (4 credits)
- PHYS 3103 Physics III (4 credits)
- PHYS 3300 Thermal and Statistical Physics (3 credits)
  *or* CHEM 4711 Physical Chemistry I (3 credits)
- PHYS 4300 Optics (4 credits)

Complete the following course:

- PHYS 4980 Research (3 credits)

## Science Education, B.S. *major*
## Life Science Specialty (Teacher Licensure)

Required Credits: 83
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 3100 Introduction to the Foundations of Public School Education (3 credits)
- ED 3110 Educational Psychology (3 credits)
- ED 3140 Human Relations In Education (3 credits)
- ED 3350 Pedagogy: Planning for Instruction (3 credits)
- ED 3780 Adaptation and Management: Designing the Learning Environment (3 credits)
- ED 4737 Content Area Reading (3 credits)
- ED 4799 The Professional Teacher (1 credit)

Complete the following course:

- HLTH 3400 Health and Drugs in Society (2 credits)

Complete 12 credits of student teaching:

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

**LIFE SCIENCE SPECIALTY**

A. Required Biology Courses
Complete the following courses:

- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 4620 Evolution (3 credits)
- BIOL 3720 Plant Form and Function (4 credits)
  *or* BIOL 3830 Aquatic Plants and Algae (4 credits)
- BIOL 4894 Advanced Research Project I (2 credits)
  *or* BIOL 4895 Advanced Research Project II (2 credits)

B. Required Biology Elective
Select 1 of the following courses:

- BIOL 3150 Animal Behavior (3 credits)
- BIOL 3310 Entomology (3 credits)
- BIOL 4510 Ornithology (3 credits)

- BIOL 4520 Mammalogy (3 credits)
- BIOL 4534 Ichthyology (4 credits)

**Suggested Semester Schedule | Science Education, B.S. Life Science Specialty (Teacher Licensure)**

The following is a list of required Science (Life Science) Major, B.S. courses arranged by year. This schedule is intended to assist students in planning their courses. There is some flexibility in this schedule, but graduation within four years will require close adherence to the specified sequence of courses. Always consult your Biology academic advisor as to the proper courses and sequence of courses needed for graduation. It is possible, in some circumstances, that courses in a student's Core Curriculum program may be used in his or her academic major.

Freshman

- BIOL 1400 Cellular Principles (4 credits)
- BIOL 1500 Diversity of Life (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- Core Curriculum requirements

Sophomore

- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 4894 Advanced Research Project I (2 credits) or BIOL 4895
- BIOL 3720 Plant Form and Function (4 credits)
- GEOL 1110 Physical Geology (4 credits)
- PHYS 1101 General Physics I (4 credits)
  *or* PHYS 2101 Physics I (4 credits)
- Consider starting Professional Education sequence
- Core Curriculum requirements

Junior

- BIOL 3710 Microbiology (4 credits)
- SCI 3100 Integrative Science for Teachers (4 credits)
- SCI 3450 Science Methods For Grades 5-8 (4 credits)
- Other Professional Education requirements
- Core Curriculum requirements

Senior

- Biology Elective (BIOL 3150, 3310, 3510, 4520, or 4534)
- BIOL 4620 Evolution (3 credits)
- Complete Professional Education requirements, including one semester of student teaching
- Complete Core Curriculum requirements

## Science Education, B.S. *major*
## Chemistry Specialty (Teacher Licensure)

Required Credits: 78
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 3100 Introduction to the Foundations of Public School Education (3 credits)
- ED 3110 Educational Psychology (3 credits)
- ED 3140 Human Relations In Education (3 credits)
- ED 3350 Pedagogy: Planning for Instruction (3 credits)
- ED 3780 Adaptation and Management: Designing the Learning Environment (3 credits)
- ED 4737 Content Area Reading (3 credits)
- ED 4799 The Professional Teacher (1 credit)

Complete the following course:

- HLTH 3400 Health and Drugs in Society (2 credits)

Complete 12 credits of student teaching:

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

**CHEMISTRY SPECIALTY**

COMPLETE THE FOLLOWING COURSES:

- CHEM 3110 Laboratory Management and Safety (2 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- CHEM 3980 Research (1-2 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 4411 Biochemistry I (3 credits)
- CHEM4811

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

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 3100 Introduction to the Foundations of Public School Education (3 credits)
- ED 3110 Educational Psychology (3 credits)
- ED 3140 Human Relations In Education (3 credits)
- ED 3350 Pedagogy: Planning for Instruction (3 credits)
- ED 3780 Adaptation and Management: Designing the Learning Environment (3 credits)
- ED 4737 Content Area Reading (3 credits)
- ED 4799 The Professional Teacher (1 credit)

Complete the following course:

- HLTH 3400 Health and Drugs in Society (2 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 Historical Geology (4 credits)
- GEOL 2110 Mineralogy and Petrology (4 credits)
- GEOL 3500 Topics in Paleontology (3 credits)
- GEOL 3600 Stratigraphy and Sedimentation (3 credits)
- SCI 2100 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)

## Science Courses

**SCI 1110 Physical Science I (4 credits)**
A single-semester survey of Physical Science, with laboratory. Includes selected topics in physics, chemistry, geology, astronomy, and meteorology. Includes laboratory and computer sessions. [**Core Curriculum Goal Area 3 (LC)]

**SCI 1120 Physical Science II (4 credits)**
Science and Technology in Society (STS). An alternative perspective on Physical Science, using selected topics to discuss societal concerns and responsibilities. Includes laboratory and related computer-based small group sessions. [**Core Curriculum Goal Area 3 (LC)]

**SCI 2100 Astronomy (3 credits)**
A one-semester survey course, with emphasis on the history of astronomy, the science of stellar and solar system formation, the evolution of stars and galaxies, and modern cosmology and the fate of the universe. Includes laboratory simulations and field exercises. [**Core Curriculum Goal Area 3]

**SCI 2200 Meteorology (3 credits)**
A one-semester survey course, with emphasis on the science of the atmospheric dynamics of weather and climate, precipitation, storms, and forecasting. Includes laboratory simulations and field exercises. [**Core Curriculum Goal Area 3]

**SCI 2925 People of the Environment: Science Perspective (3 credits)**
The discussions of this section will include the specific relation between air, water, and solid waste pollution and the effect on the environment, including the following: acid rain, smog, global warming, measurement of environmental pollutants, and the role of science in solving pollution problems. [**Core Curriculum Goal Area 10]

**SCI 2951 Study-Travel Natural Science (1-6 credits)**
Study Travel course in Science. **Core Curriculum Goal Area 3.

**SCI 3100 Integrative Science for Teachers (4 credits)**
An interdisciplinary laboratory-based course incorporating the areas of biology, chemistry, earth science, and physics. Focuses on conducting a series of investigations by Science Inquiry and demonstrating the connection between the various disciplines. Prerequisites: 2 courses each in the life sciences and physical sciences.

**SCI 3450 Science Methods For Grades 5-8 (4 credits)**
Strategies for implementation of the Minnesota Graduation Standards in the areas of Science and Inquiry for grades 5-8. Strategies include laboratory activities, discussions, the development of classroom activities, and the adaptation of these strategies for use in the elementary and high school science classroom. Prerequisite: Senior status or consent of instructor.

**SCI 4917 DIS Tchg Assoc | (1-2 credits)**
Directed Independent Study | Teaching Associate

### 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