Biology

The Biology program grants several majors, including Biology, B.S.; Biology, B.A.; Aquatic Biology, B.S.; Life Science Specialty, Science Education, B.S.; and Clinical Laboratory Science, B.S. In addition, students may choose from several emphases within the Biology major, including Wildlife Management, Medical Sciences, and Cellular and Molecular Biology. From field to laboratory studies, the Biology program offers diverse opportunities for personal and professional study and growth.

Programs

- Aquatic Biology, B.S. (Aquatic Systems Emphasis) *major*
- Aquatic Biology, B.S. (Fisheries Biology Emphasis) *major*
- Aquatic Biology, B.S. (Wetlands Ecology Emphasis) *major*
- Biology, B.A. *major*
- Biology, B.S. (Medical Sciences Field Of Emphasis) *major*
- Biology, B.S. (Wildlife Management Emphasis (Optional)) *major*
- Biology, B.S. (Cellular and Molecular Emphasis (Optional)) *major*
- Biology, B.S. *major*
- Clinical Laboratory Science, B.S. ((4 + 1 Option)) *major*
- Clinical Laboratory Science, B.S. ((3 + 1 Option)) *major*
- Science Education, B.S. (Life Science Specialty (Teacher Licensure)) *major*
- Biology *minor*
- Wetlands Ecology *minor*

Career Directions

Agricultural Sales
Allied Health Professions
Aquatic Biology
Biotechnology
Clinical Laboratory Sciences
Consultant
Education
Field Biology
Fisheries Biology
Food Sciences
Government Service
Industry
Invertebrate Zoology
Laboratory Biology
Medical Professions
Microbiology
Natural History
Pharmaceutical and Biomedical Products Sales
Research
Science and Technical Writing
Wetlands Science
Wildlife Sciences
Also: Graduate Study

Preparation

Recommended High School Courses

Algebra

Biology

Chemistry

Physics

Precalculus

Trigonometry

Aquatic Biology, B.S. *major*
Aquatic Systems Emphasis

Required Credits: 77
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)

II REQUIRED AQUATIC BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 4200 Freshwater Invertebrates (4 credits)
- BIOL 3361 Limnology I (4 credits)
- BIOL 3362 Limnology II (4 credits)
- BIOL 3554 Readings in Aquatic Biology (1 credit)
- BIOL 3830 Aquatic Plants (4 credits)

III CAPSTONE EXPERIENCE

Complete option A, B or C.

A. COMPLETE THE FOLLOWING COURSES:

- BIOL 4894 Advanced Laboratory Projects in Biology I (2 credits)
- BIOL 4895 Advanced Laboratory Projects in Biology II (2 credits)

B. COMPLETE THE FOLLOWING COURSES

- BIOL 4896 Advanced Field Projects in Biology I (2 credits)
- BIOL 4897 Advanced Field Projects in Biology II (2 credits)

C. COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED BY
YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

AQUATIC SYSTEMS EMPHASIS

REQUIRED CORE COURSES
COMPLETE THE FOLLOWING COURSE:

- BIOL 4534 Ichthyology (4 credits)

ELECTIVE CORE COURSES
SELECT A MINIMUM OF 12 CREDITS FROM THE FOLLOWING:

- BIOL 3310 Entomology (4 credits)
- BIOL 3630 Conservation Biology (3 credits)
  or GEOG 3630 Conservation Biology (3 credits)
- BIOL 3723 Ecosystem Ecology (3 credits)
- BIOL 3850 Marine Biology (3 credits)
- BIOL 4620 Organic Evolution (3 credits)
- CHEM 3150 Standard Methods of Water Analysis (3 credits)
- GEOG3231
- GEOL2430

ADDITIONAL ELECTIVES
SELECT AN ADDITIONAL 3-4 CREDITS OF BIOLOGY ELECTIVES AT THE 3000 LEVEL OR ABOVE.

V REQUIRED COURSES IN RELATED FIELDS

COMPLETE THE FOLLOWING COURSES:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- PHYS 1101 General Physics I (4 credits)
- PHYS 2101 Physics I (5 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- PHYS 1102 General Physics II (4 credits)
- PHYS 2102 Physics II (5 credits)

SUGGESTED SEMESTER SCHEDULE FOR AQUATIC BIOLOGY MAJOR, B.S.
The following is a list of required Aquatic Biology 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 academic advisor in Aquatic Biology as to the proper courses and sequence of courses needed for graduation.
Note: With proper student planning and in consultation with the Aquatic Biology academic advisor a student may complete his or her academic degree in 120 semester credits. It is possible, in some circumstances, that courses in a student's Liberal Education program may be used in his or her academic major.
Freshman
- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- Liberal Education requirements

Sophomore
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)
- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)
- *STAT 2610 Applied Statistics (4 credits)
- or PSY 3401 Basic Statistics for Research (4 credits)
- Liberal Education requirements

Junior
- BIOL 3361 Limnology I (4 credits)
- BIOL 3362 Limnology II (4 credits)
- BIOL 3554 Readings in Aquatic Biology (1 credit)
- BIOL 3830 Aquatic Plants (4 credits)
- BIOL 4200 Freshwater Invertebrates (4 credits)
- Complete Liberal Education requirements
- Writing course
- Elective courses in field of emphasis

Senior
- Capstone Experience: Option A, B, or C
- Elective courses in field of emphasis

Aquatic Biology, B.S. *major*
Fisheries Biology Emphasis

Required Credits: 77
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)

II REQUIRED AQUATIC BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 4200 Freshwater Invertebrates (4 credits)
- BIOL 3361 Limnology I (4 credits)
- BIOL 3362 Limnology II (4 credits)
- BIOL 3554 Readings in Aquatic Biology (1 credit)
- BIOL 3830 Aquatic Plants (4 credits)

III CAPSTONE EXPERIENCE

Complete option A, B or C.

A. COMPLETE THE FOLLOWING COURSES:

- BIOL 4894 Advanced Laboratory Projects in Biology I (2 credits)
- BIOL 4895 Advanced Laboratory Projects in Biology II (2 credits)

B. COMPLETE THE FOLLOWING COURSES

- BIOL 4896 Advanced Field Projects in Biology I (2 credits)
- BIOL 4897 Advanced Field Projects in Biology II (2 credits)

C. COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED

BY
YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

FISHERIES BIOLOGY EMPHASIS

REQUIRED CORE COURSES
COMPLETE THE FOLLOWING COURSES:

- BIOL 4534 Ichthyology (4 credits)
- BIOL 4545 Fisheries Management (4 credits)

ELECTIVE CORE COURSES
SELECT A MINIMUM OF 6 CREDITS FROM THE FOLLOWING:

- BIOL 3150 Animal Behavior (3 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4620 Organic Evolution (3 credits)
- CHEM 3150 Standard Methods of Water Analysis (3 credits)
- ENVR 3040 Environmental Economics (3 credits)
  or ECON 3040 Environmental Economics (3 credits)
- ENVR 4210 Environmental Law and Policy (3 credits)
- GEOG3231

ADDITIONAL ELECTIVES
SELECT AN ADDITIONAL 5-6 CREDITS OF BIOLOGY ELECTIVES AT THE 3000 LEVEL OR ABOVE.

V REQUIRED COURSES IN RELATED FIELDS

COMPLETE THE FOLLOWING COURSES:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- PHYS 1101 General Physics I (4 credits)
- PHYS 2101 Physics I (5 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- PHYS 1102 General Physics II (4 credits)
- PHYS 2102 Physics II (5 credits)

SUGGESTED SEMESTER SCHEDULE FOR AQUATIC BIOLOGY MAJOR, B.S.
The following is a list of required Aquatic Biology 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 academic advisor in Aquatic Biology as to the proper courses and sequence of courses needed for graduation.
Note: With proper student planning and in consultation with the Aquatic Biology academic advisor a student may complete his or her academic degree in 120 semester credits. It is possible, in some circumstances, that courses in a student's Liberal Education program may be used in his or her academic major.
Freshman
- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- Liberal Education requirements

Sophomore
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)
- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)
- *STAT 2610 Applied Statistics (4 credits)
- or PSY 3401 Basic Statistics for Research (4 credits)
- Liberal Education requirements

Junior
- BIOL 3361 Limnology I (4 credits)
- BIOL 3362 Limnology II (4 credits)
- BIOL 3554 Readings in Aquatic Biology (1 credit)
- BIOL 3830 Aquatic Plants (4 credits)
- BIOL 4200 Freshwater Invertebrates (4 credits)
- Complete Liberal Education requirements
- Writing course
- Elective courses in field of emphasis

Senior
- Capstone Experience: Option A, B, or C
- Elective courses in field of emphasis

Aquatic Biology, B.S. *major*
Wetlands Ecology Emphasis

Required Credits: 77
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)

II REQUIRED AQUATIC BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 4200 Freshwater Invertebrates (4 credits)
- BIOL 3361 Limnology I (4 credits)
- BIOL 3362 Limnology II (4 credits)
- BIOL 3554 Readings in Aquatic Biology (1 credit)
- BIOL 3830 Aquatic Plants (4 credits)

III CAPSTONE EXPERIENCE

Complete option A, B or C.

A. COMPLETE THE FOLLOWING COURSES:

- BIOL 4894 Advanced Laboratory Projects in Biology I (2 credits)
- BIOL 4895 Advanced Laboratory Projects in Biology II (2 credits)

B. COMPLETE THE FOLLOWING COURSES

- BIOL 4896 Advanced Field Projects in Biology I (2 credits)
- BIOL 4897 Advanced Field Projects in Biology II (2 credits)

C. COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED BY

YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

WETLANDS ECOLOGY EMPHASIS

REQUIRED CORE COURSES:
COMPLETE THE FOLLOWING COURSES:

- BIOL 3840 Wetlands Ecology (3 credits)
  or ENVR 3840 Wetlands Ecology (3 credits)
- BIOL 3844 Wetlands Ecology Lab (1 credit)
- BIOL 4030 Wetland Delineation and Classification (3 credits)

ELECTIVE CORE COURSES
SELECT A MINIMUM OF 8 CREDITS FROM THE FOLLOWING:

- BIOL 3630 Conservation Biology (3 credits)
  or GEOG 3630 Conservation Biology (3 credits)
- BIOL 3723 Ecosystem Ecology (3 credits)
- CHEM 3150 Standard Methods of Water Analysis (3 credits)
- ENVR 4210 Environmental Law and Policy (3 credits)
- GEOG 2231 Geographic Information Systems (3 credits)
- GEOG 2232 Techniques In Geographic Information Systems (3 credits)
- GEOL 3211 Environmental Hydrology (3 credits)
- BIOL 3120 Soils (4 credits)
  or GEOL 3120 Soils (4 credits)
- BIOL 4031 Advanced Wetland Delineation (2 credits)

ADDITIONAL ELECTIVES
SELECT AN ADDITIONAL 4-5 CREDITS OF BIOLOGY ELECTIVES AT THE 3000 LEVEL OR ABOVE.

V REQUIRED COURSES IN RELATED FIELDS

COMPLETE THE FOLLOWING COURSES:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- PHYS 1101 General Physics I (4 credits)
- PHYS 2101 Physics I (5 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- PHYS 1102 General Physics II (4 credits)
- PHYS 2102 Physics II (5 credits)

SUGGESTED SEMESTER SCHEDULE FOR AQUATIC BIOLOGY MAJOR, B.S.
The following is a list of required Aquatic Biology 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 academic advisor in Aquatic Biology as to the proper courses and sequence of courses needed for graduation.
Note: With proper student planning and in consultation with the Aquatic Biology academic advisor a student may complete his or her academic degree in 120 semester credits. It is possible, in some circumstances, that courses in a student's Liberal Education program may be used in his or her academic major.
Freshman
- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- Liberal Education requirements

Sophomore
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)
- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)
- *STAT 2610 Applied Statistics (4 credits)
- or PSY 3401 Basic Statistics for Research (4 credits)
- Liberal Education requirements

Junior
- BIOL 3361 Limnology I (4 credits)
- BIOL 3362 Limnology II (4 credits)
- BIOL 3554 Readings in Aquatic Biology (1 credit)
- BIOL 3830 Aquatic Plants (4 credits)
- BIOL 4200 Freshwater Invertebrates (4 credits)
- Complete Liberal Education requirements
- Writing course
- Elective courses in field of emphasis

Senior
- Capstone Experience: Option A, B, or C
- Elective courses in field of emphasis

Biology, B.A. *major*

Required Credits: 40
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED BIOLOGY ELECTIVES

SUBORGANISMAL
SELECT 1 OF THE FOLLOWING COURSES:

- BIOL 3260 Medical Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 3590 Cell Biology (4 credits)
- BIOL 3720 Plant Form and Function (4 credits)
- BIOL 3755 Medical Microbiology (3 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (4 credits)

ORGANISMAL
SELECT 1 OF THE FOLLOWING COURSES:

- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 3250 Comparative Vertebrate Anatomy (4 credits)
- BIOL 3310 Entomology (4 credits)
- BIOL 3510 Ornithology (4 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 3730 Plant Diversity (4 credits)
- BIOL 3830 Aquatic Plants (4 credits)
- BIOL 4210 Parasitology (4 credits)

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

III REQUIRED BIOLOGY ELECTIVES

SELECT 15-18 SEMESTER CREDIT ELECTIVES FROM BIOLOGY COURSES (EXCEPT 1000-LEVEL BIOL CLASSES AND BIOL 2925) TO ACHIEVE A MINIMUM OF 40 SEMESTER CREDITS IN BIOL COURSES. THESE ELECTIVES CAN ALSO INCLUDE ONE ONE OF THE FOLLOWING OPTIONS FROM OTHER DEPARTMENTS:
a. CHEM 4411 Biochemistry I (3 credits)
b. CHEM 4411 Biochemistry I (3 credits) and CHEM 4471 Biochemistry Laboratory I (1 credit)
c. ENVR 4400 Environmental Microbiology (3 credits)
d. ENVR 4500 Environmental Toxicology (4 credits)

SUGGESTED SEMESTER SCHEDULE FOR BIOLOGY MAJOR, B.A.

The following is a list of required Biology Major, B.A. 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.

Freshman

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- Liberal Education requirements
- Consult with your Biology academic advisor

Sophomore

- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- Writing course
- Biology degree requirements
- Liberal Education requirements
- Consult with your Biology academic advisor

Junior

- Biology degree requirements
- Liberal Education requirements
- Consult with your Biology academic advisor

Senior

- Complete Biology degree requirements
- Complete Liberal Education requirements
- Consult with your Biology academic advisor

Biology, B.S. *major*
Medical Sciences Field Of Emphasis

Required Credits: 76
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED MEDICAL SCIENCES CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 3250 Comparative Vertebrate Anatomy (4 credits)
- BIOL 3260 Medical Physiology (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 3710 Microbiology (4 credits)

III CAPSTONE EXPERIENCE

This requirement may be completed in one of the following ways: A OR B

A.
COMPLETE A TWO-SEMESTER, 4 CREDIT RESEARCH COURSE (2 CREDITS PER SEMESTER)--ADVANCED LABORATORY PROJECTS IN
BIOLOGY (BIOL 4894 AND BIOL 4895) OR ADVANCED FIELD PROJECTS IN BIOLOGY (BIOL 4896 AND BIOL 4897)

B.
COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED BY
YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

IV REQUIRED MEDICAL SCIENCES ELECTIVES

SELECT 12 CREDITS OF ELECTIVES FROM THE FOLLOWING:

- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3590 Cell Biology (4 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (4 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

V REQUIRED COURSES IN RELATED FIELDS

A. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

GROUP 2:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)

B. SELECT 1 OF THE FOLLOWING COURSES:

- STAT 2610 Applied Statistics (4 credits)
- PSY 3401 Basic Statistics for Research (4 credits)

C. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)

GROUP 2:

- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)

D. COMPLETE THE FOLLOWING 4 COURSES:

- 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)

Biology, B.S. *major*
Wildlife Management Emphasis (Optional)

This emphasis applies only to the Biology Major, B.S. It does not apply to the Biology Major, B.A. and Science (Life Science) Major, B.S. (Teacher Licensure).

The suggested courses are designed to focus the student's Biology Major with an emphasis in Wildlife Management. This emphasis guides the educational development of students preparing for graduate training and careers in the field of wildlife management.

Students complete this emphasis with careful selection of courses while fulfilling the requirement for the Biology Major, B.S. degree. This emphasis is neither a major nor a minor. It is a series of selected courses providing some level of specialization in wildlife management.

Required Credits: 73
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED EMPHASIS COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 3510 Ornithology (4 credits)
- BIOL 3610 Principles of Wildlife Management (3 credits)
- BIOL 3730 Plant Diversity (4 credits)
  or BIOL 3830 Aquatic Plants (4 credits)
- BIOL 3880 Wildlife Management Techniques (4 credits)
- BIOL 4520 Mammalogy (4 credits)
- GEOG3231
- GEOG3232
- ENVR 4210 Environmental Law and Policy (3 credits)
- BIOL 3310 Entomology (4 credits)
  or BIOL 4534 Ichthyology (4 credits)
  or BIOL 3150 Animal Behavior (3 credits)
  or BIOL 4210 Parasitology (4 credits)
- BIOL 3623 Forest Ecology (4 credits)
  or BIOL 3720 Plant Form and Function (4 credits)
- BIOL 3630 Conservation Biology (3 credits)
  or GEOG 3630 Conservation Biology (3 credits)
  or BIOL 4330 Upland Wildlife Management (3 credits)

III CAPSTONE EXPERIENCE

This requirement may be completed in one of the following ways: A OR B

A.
COMPLETE A TWO-SEMESTER, 4 CREDIT RESEARCH COURSE (2 CREDITS PER SEMESTER)--ADVANCED LABORATORY PROJECTS IN
BIOLOGY (BIOL 4894 AND BIOL 4895) OR ADVANCED FIELD PROJECTS IN BIOLOGY (BIOL 4896 AND BIOL 4897)

B.
COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED BY
YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

IV REQUIRED COURSES IN RELATED FIELDS

COMPLETE THE FOLLOWING COURSES:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)
- PHYS 1101 General Physics I (4 credits)
  or PHYS 2101 Physics I (5 credits)
  or BIOL 3120 Soils (4 credits)

Biology, B.S. *major*
Cellular and Molecular Emphasis (Optional)

Required Credits: 72
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

III CAPSTONE EXPERIENCE

This requirement may be completed in one of the following ways: A OR B

A.
COMPLETE A TWO-SEMESTER, 4 CREDIT RESEARCH COURSE (2 CREDITS PER SEMESTER)--ADVANCED LABORATORY PROJECTS IN
BIOLOGY (BIOL 4894 AND BIOL 4895) OR ADVANCED FIELD PROJECTS IN BIOLOGY (BIOL 4896 AND BIOL 4897)

B.
COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED BY
YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

V REQUIRED COURSES IN RELATED FIELDS

A. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

GROUP 2:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)

B. SELECT 1 OF THE FOLLOWING COURSES:

- STAT 2610 Applied Statistics (4 credits)
- PSY 3401 Basic Statistics for Research (4 credits)

C. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)

GROUP 2:

- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)

D. COMPLETE THE FOLLOWING 4 COURSES:

- 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)

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CELLULAR AND MOLECULAR BIOLOGY FIELD OF EMPHASIS REQUIREMENTS

I. REQUIRED EMPHASIS CORE COURSES
COMPLETE THE FOLLOWING COURSES:

- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 3590 Cell Biology (4 credits)
- BIOL 3710 Microbiology (4 credits)

II. REQUIRED EMPHASIS ELECTIVES
SELECT 8 SEMESTER CREDITS FROM THE FOLLOWING COURSES:

- BIOL 3260 Medical Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3755 Medical Microbiology (3 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (4 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

Biology, B.S. *major*

Required Credits: 68
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED BIOLOGY ELECTIVES

SUBORGANISMAL
SELECT 1 OF THE FOLLOWING COURSES:

- BIOL 3260 Medical Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 3590 Cell Biology (4 credits)
- BIOL 3720 Plant Form and Function (4 credits)
- BIOL 3755 Medical Microbiology (3 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (4 credits)

ORGANISMAL
SELECT 1 OF THE FOLLOWING COURSES:

- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 3250 Comparative Vertebrate Anatomy (4 credits)
- BIOL 3310 Entomology (4 credits)
- BIOL 3510 Ornithology (4 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 3730 Plant Diversity (4 credits)
- BIOL 3830 Aquatic Plants (4 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4520 Mammalogy (4 credits)
- BIOL 4534 Ichthyology (4 credits)

III CAPSTONE EXPERIENCE

This requirement may be completed in one of the following ways: A OR B

A.
COMPLETE A TWO-SEMESTER, 4 CREDIT RESEARCH COURSE (2 CREDITS PER SEMESTER)--ADVANCED LABORATORY PROJECTS IN
BIOLOGY (BIOL 4894 AND BIOL 4895) OR ADVANCED FIELD PROJECTS IN BIOLOGY (BIOL 4896 AND BIOL 4897)

B.
COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED BY
YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

IV REQUIRED GENERAL BIOLOGY ELECTIVES

REQUIRED GENERAL BIOLOGY ELECTIVES
SELECT ELECTIVES FROM BIOLOGY COURSES (EXCEPT 1000-LEVEL BIOL CLASSES AND BIOL 2925) TO ACHIEVE A MINIMUM OF 40 SEMESTER CREDITS IN BIOL COURSES. THESE ELECTIVES CAN ALSO INCLUDE ONE OF THE FOLLOWING OPTIONS
FROM OTHER DEPARTMENTS(these courses have prerequisites not included in this major or require consent of the instructor).
a. CHEM 4411 Biochemistry I (3 credits)
b. CHEM 4411 Biochemistry I (3 credits) and CHEM 4471 Biochemistry Laboratory I (1 credit)
c. ENVR 4400 Environmental Microbiology (3 credits)
d. ENVR 4500 Environmental Toxicology (4 credits)

V REQUIRED COURSES IN RELATED FIELDS

A. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

GROUP 2:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)

B. SELECT 1 OF THE FOLLOWING COURSES:

- STAT 2610 Applied Statistics (4 credits)
- PSY 3401 Basic Statistics for Research (4 credits)

C. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)

GROUP 2:

- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)

D. COMPLETE THE FOLLOWING 4 COURSES:

- 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)

SUGGESTED SEMESTER SCHEDULE FOR BIOLOGY MAJOR, B.S.

The following is a list of required Biology Major, B.S. courses arranged by year. This schedule is intended to assist students in planning their courses in an orderly fashion. 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.

Note: Consult with your Biology academic advisor regarding asterisked(*) courses.

Freshman

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- CHEM 1111 General Chemistry I (4 credits)
- or *CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)
- or *CHEM 2212 Principles of Chemistry II (4 credits)
- Liberal Education requirements
- Consult with your Biology academic advisor

Sophomore

- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 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)
- *PHYS 1101 General Physics I (4 credits)
- or PHYS 2101 Physics I (5 credits)
- *PHYS 1102 General Physics II (4 credits)
- or PHYS 2102 Physics II (5 credits)
- Biology degree requirements
- Writing course
- Liberal Education requirements
- Consult with your Biology academic advisor

Junior

- Biology degree requirements
- Liberal Education requirements
- Consult with your Biology academic advisor

Senior

- Complete Biology degree requirements
- Complete Liberal Education requirements
- Consult with your Biology academic advisor

Clinical Laboratory Science, B.S. *major* (4 + 1 Option)

Note: After completing the clinical year courses, students will receive a double major: Biology, B.S., and Clinical Laboratory Science, B.S.

In this option, the student completes a Biology, B.S., major at Bemidji State University, and then applies for admission to the clinical year program through the University of North Dakota or other affiliated institution (a 2.80 GPA overall and in science courses is one requirement for entrance into the clinical year program).

This option may be of interest to students considering a pre-professional program such as pre-medicine, pre-veterinary medicine, or other pre-professional area. Students who fail to gain admission to the professional school of their choice will have the option of pursuing a health-related career in Clinical Laboratory Science.

Required Credits: 108
Required GPA: 2.25

REQUIRED CLINICAL STUDIES 4 + 1 OPTION

(a 2.80 GPA overall and in science courses is one requirement for entrance into

the clinical year program). This option may be of interest to students considering a pre-professional program such as pre-medicine, pre-veterinary medicine, or other pre-professional area. Students who fail to gain admission to the professional school of their choice will have the option of pursuing a health-related career in Clinical Laboratory Science. NOTE: After completing the clinical year courses, students will receive a double major: Biology, B.S. and Clinical Laboratory Science, B.S. In this option, the student completes a Biology, B.S., major at Bemidji State University, and then applies for admission to the clinical year program through the University of North Dakota or other affiliated institution

I REQUIRED BIOLOGY COURSES

I. REQUIRED BIOLOGY COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 4210 Parasitology (4 credits)

II CAPSTONE EXPERIENCE

This requirement may be completed in one of the following ways: A OR B

A.
COMPLETE A TWO-SEMESTER, 4 CREDIT RESEARCH COURSE (2 CREDITS PER SEMESTER)--ADVANCED LABORATORY PROJECTS IN
BIOLOGY (BIOL 4894 AND BIOL 4895) OR ADVANCED FIELD PROJECTS IN BIOLOGY (BIOL 4896 AND BIOL 4897)

B.
COMPLETE SOME OTHER CAPSTONE EXPERIENCE APPROVED BY
YOUR BIOLOGY ACADEMIC ADVISOR AND THE DEPARTMENT

III REQUIRED COURSES IN RELATED FIELDS

COMPLETE THE FOLLOWING COURSES:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 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 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

- PHYS 1101 General Physics I (4 credits)
  or PHYS 2101 Physics I (5 credits)
- PHYS 1102 General Physics II (4 credits)
  or PHYS 2102 Physics II (5 credits)

- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)

IV REQUIRED CLINICAL STUDIES

Clinical year courses, taken after the senior year beginning with summer term, are taken through entrance into the clinical year program at the University of North Dakota or at affiliated hospitals. NOTE: A clinical year position is not guaranteed. Students must apply for a clinical year position in October of the junior year. Please see advisor regarding the clinical year of study.

Clinical Laboratory Science, B.S. *major* (3 + 1 Option)

The Clinical Laboratory Science student must consult with the Clinical Laboratory Science advisor at the start of the academic program and regularly throughout the course of study. The student must complete the Bemidji State University Liberal Education requirements before the year of clinical study.

To prepare the student for the clinical year of training, two options are available: 1) a 3+1 option, where a student earns a Clinical Laboratory Science, B.S., degree, with the fourth year spent at an affiliated clinical program, and 2) a 4+1 option, where a student earns a Biology, B.S., degree, including specific courses in biology and chemistry, and completes the fifth year at an affiliated clinical program. Both options are described below.

Required Credits: 84
Required GPA: 2.25

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 4210 Parasitology (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

SELECT 1 OF THE FOLLOWING COURSES:

- MATH 1170 College Algebra (4 credits)
- MATH 1470 Precalculus (5 credits)

II REQUIRED CLINICAL STUDIES

Clinical year courses, taken during the senior year beginning with summer term, are taken through entrance into the clinical year program at the University of North Dakota or at affiliated hospitals.

SUGGESTED SEMESTER SCHEDULE FOR CLINICAL LABORATORY SCIENCE MAJOR, B.S.

The following is a list of Clinical Laboratory Science courses arranged by year.

This suggested schedule is intended to help students plan their courses without course conflicts. Courses that are asterisked(*) are recommended but not required. Courses that are double asterisked(**) are required but offered only in alternate years.

Note: With proper student planning and in consultation with the Clinical Laboratory Science coordinator, a student may complete his or her academic degree in 128 semester credits. It is possible, in some circumstances, that courses in a student's Liberal Education program may be used in his or her academic major. In addition, Clinical Laboratory Science students should register for ECON 2000 Markets and Resource Allocation in Liberal Education Goal Area 5.

Freshman

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2110 Human Anatomy and Physiology (5 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- ENGL 1151 Composition (3 credits)
- ENGL 2152 Argument and Exposition (3 credits)
- MATH 1170 College Algebra (4 credits)
- or MATH 1470 Precalculus (5 credits)

Sophomore

- *BIOL 2360 Genetics (4 credits)
- **BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 3755 Medical Microbiology (3 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)

Junior

- **BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 4210 Parasitology (4 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- STAT 2610 Applied Statistics (4 credits)
- or PSY 3401 Basic Statistics for Research (4 credits)

Senior

- Clinical year courses

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

Required Credits: 88
Required GPA: 2.50

Core Courses for Science Teaching in Grades 5-8

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- SCI 3100 Integrative Science for Teachers (4 credits)
- SCI 3450 Science Methods For Grades 5-8 (4 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- GEOL 1110 Physical Geology (4 credits)
- GEOL 1120 Historical Geology (4 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- PHYS 1101 General Physics I (4 credits)
- PHYS 2101 Physics I (5 credits)

REQUIRED PROFESSIONAL EDUCATION 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 4737 Content Area Reading (3 credits)
- ED 4799 The Professional Teacher (1 credit)
- 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 2620 Field and Laboratory Projects in Ecological Research (2 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 4620 Organic Evolution (3 credits)
- BIOL 3720 Plant Form and Function (4 credits)
  or BIOL 3830 Aquatic Plants (4 credits)

B. REQUIRED BIOLOGY ELECTIVE
SELECT 1 OF THE FOLLOWING COURSES:

- BIOL 3150 Animal Behavior (3 credits)
- BIOL 3310 Entomology (4 credits)
- BIOL 3510 Ornithology (4 credits)
- BIOL 4520 Mammalogy (4 credits)
- BIOL 4534 Ichthyology (4 credits)

SUGGESTED SEMESTER SCHEDULE FOR LIFE SCIENCE SPECIALTY, SCIENCE EDUCATION MAJOR, B.S. (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 Liberal Education program may be used in his or her academic major.

Freshman

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- Liberal Education requirements

Sophomore

- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)
- BIOL 3720 Plant Form and Function (4 credits)
- GEOL 1110 Physical Geology (4 credits)
- or GEOL 1120 Historical Geology (4 credits)
- PHYS 1101 General Physics I (4 credits)
- or PHYS 2101 Physics I (5 credits)
- Consider starting Professional Education sequence
- Liberal Education 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
- Liberal Education requirements

Senior

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

Biology *minor*

Required Credits: 24
Required GPA: 2.00

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED BIOLOGY ELECTIVES

Select 9 credits from the following areas with at least 1 course in each area.

SUBORGANISMAL
SELECT 1 OF THE FOLLOWING COURSES:

- BIOL 3260 Medical Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 credits)
- BIOL 3590 Cell Biology (4 credits)
- BIOL 3720 Plant Form and Function (4 credits)
- BIOL 3755 Medical Microbiology (3 credits)
- BIOL 4270 Histology (4 credits)

ORGANISMAL
SELECT 1 OF THE FOLLOWING COURSES:

- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 3250 Comparative Vertebrate Anatomy (4 credits)
- BIOL 3310 Entomology (4 credits)
- BIOL 3510 Ornithology (4 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 3730 Plant Diversity (4 credits)
- BIOL 3830 Aquatic Plants (4 credits)
- BIOL 4200 Freshwater Invertebrates (4 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4520 Mammalogy (4 credits)
- BIOL 4534 Ichthyology (4 credits)

Wetlands Ecology *minor*

Required Credits: 29
Required GPA: 2.00

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)

II REQUIRED ENVIRONMENTAL STUDIES CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- ENVR 2000 Introduction to Environmental Science (3 credits)
- ENVR 4210 Environmental Law and Policy (3 credits)

COMPLETE THE FOLLOWING COURSE:

- ENVR 3920 DGS: Seminar in Environmental Controversies (2 credits)

III REQUIRED BIOLOGY ADVANCED COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 2610 General Ecology (3 credits)
- BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)
- BIOL 3830 Aquatic Plants (4 credits)
- BIOL 3840 Wetlands Ecology (3 credits)
  or ENVR 3840 Wetlands Ecology (3 credits)
- BIOL 3844 Wetlands Ecology Lab (1 credit)

Biology Courses

BIOL 1110 Human Biology (4 credits)
General introduction to biology, focusing on humans, including topics on cell biology, genetics, molecular biology, form and function of organ systems, and the interaction between humans and their environment. Intended for nonbiology majors. Lecture and laboratory. Liberal Education Goal Area 3 (LC).

BIOL 1120 General Biology: Evolution And Ecology (3 credits)
A general introduction to biology with an emphasis on evolution, ecology, and the diversity of life. Intended for nonbiology majors. Includes laboratory simulations and field exercises. Liberal Education Goal Area 3 and 10.

BIOL 1150 Aquatic Systems (3 credits)
An introduction to the physical characteristics, chemistry, and biology of lakes, streams, and rivers. Includes information on human impacts and alteration of these natural systems. Includes laboratory simulations and field exercises. Liberal Education Goal Area 3.

BIOL 1211 Introductory Biology I (4 credits)
An introduction to the structure and function of living systems, with an emphasis on basic mechanisms and concepts in biochemistry and in cellular and molecular biology. Intended for biology majors and minors, preprofessional students, and open to any student wishing to fulfill their Liberal Education requirement. Lecture and laboratory. BIOL 1211 and BIOL 1212 must be taken in sequence. Liberal Education Goal Area 3 (LC).

BIOL 1212 Introductory Biology II (4 credits)
An introduction to living organisms, with an emphasis on the basic mechanisms and concepts in organismal biology, ecology, and evolutionary biology. Topics include taxonomy and classification of the major groups of plants and animals, structure and function, development, and behavior. Intended for biology majors and minors, preprofessional students, and open to any student wishing to fulfill their Liberal Education requirement. Lecture and laboratory. Prerequisite: BIOL 1211 or consent of instructor. Liberal Education Goal Area 3 (LC).

BIOL 1300 Medical Terminology (2 credits)
A study of anatomical and medical terminology by examining word roots, prefixes, and suffixes. Designed to assist pre-professional and allied health students who desire to increase their usage and understanding of medical terminology. This course does not satisfy any Biology major or minor degree requirements.

BIOL 2110 Human Anatomy and Physiology (5 credits)
The structure, function, and development of the human body. Lecture and laboratory. Prerequisite: BIOL 1110 or BIOL 1211.

BIOL 2360 Genetics (4 credits)
Fundamental principles of heredity in plants, animals, and microorganisms. Includes both classical and molecular genetic approaches to studying organisms. Prerequisites: BIOL 1211 and BIOL 1212.

BIOL 2610 General Ecology (3 credits)
Introduction to the interrelationships of organisms and their environments, emphasizing the historic development of fundamental principles at the levels of individual, population, community, and ecosystem through examination of theoretical and empirical findings. Prerequisites: BIOL 1110, 1120 or BIOL 1211, 1212 or consent of instructor.

BIOL 2620 Field and Laboratory Projects in Ecological Research (2 credits)
Introduction to the process of research in ecological science. The first part of the class consists of activities and lectures pertaining to basic issues of study design and execution. For the remainder of the class, students will design, carry out, and report on their own ecological study. Prerequisite or Corequisite BIOL 2610.

BIOL 2925 People & The Environment: Biological Perspectives on the Environment (3 credits)
Discussion and evaluation of current environmental biology topics, including biodiversity, ecosystems, biological resources, and human impact on the environment. This course fulfills Liberal Education requirements only and does not satisfy and Biology major or minor degree requirements. Liberal Education Goal Area 10.

BIOL 3120 Soils (4 credits)
Introduction to principles of soil genesis, classification, physical and chemical properties, and biological significance. Lecture and laboratory. Prerequisites: BIOL 1211 and BIOL 1212 or consent of instructor.

BIOL 3150 Animal Behavior (3 credits)
Introduction to the study of the diversity, physiology, ecological context, and evolutionary development of behavior of invertebrate and vertebrate animals. Prerequisite: BIOL 1211 and BIOL 1212, or PSY 1100.

BIOL 3250 Comparative Vertebrate Anatomy (4 credits)
Classification, adaptation, and evolutionary history of vertebrates; anatomy and functional morphology of vertebrates, including humans. Lecture and Laboratory. Prerequisites: BIOL 1211 and BIOL 1212.

BIOL 3260 Medical Physiology (4 credits)
Physiological and pathophysiological principles and control mechanisms of organ systems within humans. Lecture and laboratory. Prerequisites: BIOL 1211, BIOL 1212, BIOL 3250, and CHEM 3312.

BIOL 3300 Introduction to Hematology (4 credits)
Introduction to the principles of blood cell formation, function, and associated disorders. Lecture and Laboratory. Prerequisites: BIOL 1211, CHEM 2211, and CHEM 2212. BIOL 2360 or BIOL 3380 is recommended.

BIOL 3310 Entomology (4 credits)
The biology of insects, their natural history, morphology, classification, and economic importance. Lecture, laboratory, and field study. Prerequisites: BIOL 1211 and BIOL 1212, or consent of instructor.

BIOL 3361 Limnology I (4 credits)
Introduction to the biology, chemistry, geology, and physics of lakes and streams. Lecture, field, and laboratory work. Prerequisites: BIOL 1211, BIOL 1212, BIOL 2610, CHEM 2211, CHEM 2212, and PHYS 1101 (concurrent enrollment possible), or consent of instructor.

BIOL 3362 Limnology II (4 credits)
The second course of the Limnology sequence concentrating on the organisms commonly found in aquatic systems. Topics include physical, chemical, and biotic constraints of aquatic biota with an emphasis on ecological relationships within and between groups. Lecture and laboratory. Prerequisite: BIOL 3361.

BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
Study of the structure, replication, repair, expression, regulation, and change of genetic material. Introduction to theory and procedures by which recombinant DNA molecules are formed, cloned, and expressed. Lecture and laboratory. Prerequisites: BIOL 1211 and BIOL 1212. Might not be offered every year.

BIOL 3510 Ornithology (4 credits)
Morphology, ecology, behavior, classification, distribution, and evolution of birds. Lecture, laboratory, and field study (early morning field trips and one or two all-day field trips). Prerequisites: BIOL 1211 and BIOL 1212.

BIOL 3554 Readings in Aquatic Biology (1 credit)
In-depth review and focused group discussion of a selected topic or topics. Emphasis is on learning to access and synthesize relevant literature. Active participation in discussions and working groups is required. Prerequisite: Junior status in Aquatic Biology.

BIOL 3580 Immunology (4 credits)
The study of disease fighting mechanisms of the body. Lecture and laboratory. Prerequisites: BIOL 2360 or BIOL 3380, and one year of chemistry.

BIOL 3590 Cell Biology (4 credits)
Microscopic anatomy and physiological mechanisms of plant and animal cells. Gene control of cellular metabolism, mechanism of energy utilization in cells and pathways of synthesis of molecules. Lecture and laboratory. Prerequisites: BIOL 2360 or BIOL 3380; and CHEM 2211, CHEM 2212.

BIOL 3610 Principles of Wildlife Management (3 credits)
Introduction to the field of wildlife management, including the biological principles important to the understanding of wildlife populations and the management strategies implemented by natural resource managers. Prerequisites: BIOL 1211, BIOL 1212, and BIOL 2610. Might not be offered every year.

BIOL 3623 Forest Ecology (4 credits)
Fundamentals of forest ecology, including study of tree growth, tree demography, forest community dynamics, and ecosystem processes. Students also learn to identify forest trees native to the region and basic techniques of forest stand description. Prerequisite: BIOL 2610. (Might not be offered every year)

BIOL 3630 Conservation Biology (3 credits)
Methods and theory of conservation biology; species diversity, extinction rates, management of endangered species, and the economics of conservation strategies. Also GEOG 3630.

BIOL 3710 Microbiology (4 credits)
Structure, classification, and physiology of bacteria and related microorganisms. Lecture and laboratory. Prerequisites or Corequisites: One year introductory biology and one year introductory chemistry or consent of instructor.

BIOL 3720 Plant Form and Function (4 credits)
Structure, function, and development of vascular plants. Interrelationships between anatomical structures and physiological processes and how plants cope with environmental challenges. Lecture and laboratory. Prerequisites: BIOL 1211, 1212 and one year of college chemistry or consent of instructor.

BIOL 3723 Ecosystem Ecology (3 credits)
Fundamentals of the study of ecosystems, with emphasis on the integration of abiotic and biotic components in the development of ecosystem processes. Comparisons and interactions between terrestrial, wetland, aquatic, and atmospheric systems across the major biomes. Prerequisite: BIOL 2610.

BIOL 3730 Plant Diversity (4 credits)
Classification, phylogeny, collection, field identification, and uses of wild plants. Lecture and laboratory. Prerequisites: BIOL 1211 and BIOL 1212 or consent of instructor.

BIOL 3755 Medical Microbiology (3 credits)
Introduction to pathogenic microorganisms, the interaction of pathogens and the immune system, transmission of infections, and methods of controlling infections. The laboratory portion of the class covers aseptic technique, pure culture techniques, microscopy, and diagnostic microbiology. This course is intended primarily for Nursing and Clinical Laboratory Science majors. Prerequisites: (BIOL 1211 or BIOL 1110) and (CHEM 1110 or CHEM 1111 or CHEM 2211).

BIOL 3830 Aquatic Plants (4 credits)
Survey of the morphology, physiology, taxonomy, systematics, and ecology of algae and aquatic vascular plants. Lecture, laboratory, and field study. Prerequisites: BIOL 1211 and BIOL 1212.

BIOL 3840 Wetlands Ecology (3 credits)
Survey course develops a basic understanding of the terminology, classification, ecology, values, and conservation of wetlands. Covers wetland systems from around the world, with emphasis on wetlands in North America. Prerequisites: BIOL 1211 and 1212.

BIOL 3844 Wetlands Ecology Lab (1 credit)
Laboratory course to supplement BIOL/ENVR 3840 Wetlands Ecology. Intended to strengthen a basic understanding of the terminology, classification, ecology, values, and conservation of wetlands. Prerequisite or Corequisite: BIOL/ENVR 3840 or consent of instructor.

BIOL 3850 Marine Biology (3 credits)
Lecture course introducing major concepts and theories. Includes physical and chemical components of the oceans, with special interest paid to the major groups of organisms living in marine systems. Emphasis on the different types of marine systems (coral reefs, mangroves, open water, etc.). Prerequisites: BIOL 1211 and 1212. Might not be offered every year.

BIOL 3880 Wildlife Management Techniques (4 credits)
This course emphasizes application of ecological principles, knowledge, and practical field skills to data collection used in the management of wildlife resources and their habitats. Use of literature, development of basic field and laboratory skills, and application of management and research principles are integral. Designed for upper level students who have met prerequisites, and graduate students, who are preparing for professional careers in wildlife conservation, natural sciences, and related areas of natural resources management. The course helps fulfill The Wildlife Society professional certification requirements. Prerequisite: BIOL 3610.

BIOL 4030 Wetland Delineation and Classification (3 credits)
This training course for the identification, delineation, and classification of wetlands covers the major types of wetlands and their general delineation procedures. Hydrological, soil, and vegetation characteristics will be used to identify and map wetland boundaries. Focuses on current regulations as established by the US Army Corps of Engineers' 1987 Wetland Delineation Manual with additional regulations specific for the state of Minnesota. Satisfies the requirements for basic delineation training as specified by the Corps of Engineers and certification programs in many states. Prerequisites: BIOL 1211, 1212, or consent of instructor.

BIOL 4031 Advanced Wetland Delineation (2 credits)
Training course intended to develop an advanced understanding of wetland delineation and regulation. Includes review of hydrological, physiochemical, and vegetation characteristics used to identify wetland boundaries, as well as specifics of wetland regulation, comprehensive wetland delineations, and post-field reporting. Covers procedures and regulations used by federal and state agencies, with an emphasis on those in Minnesota. Prerequisite: BIOL 4030 or consent of instructor.

BIOL 4200 Freshwater Invertebrates (4 credits)
Morphology and functional roles of representative freshwater invertebrates and their ecological interrelationships. Lecture and laboratory. Prerequisite: BIOL 1211, BIOL 1212, BIOL 3361, BIOL 3362, and junior status, or consent of instructor.

BIOL 4210 Parasitology (4 credits)
The biology of animal parasites, their identification, biochemistry, immunology, and epidemiology. Lecture and laboratory. Prerequisites: BIOL 1211, 1212, or consent of instructor.

BIOL 4270 Histology (4 credits)
Microscopic anatomy of vertebrate tissues and organs with functional correlations. Lecture and laboratory. Prerequisites: BIOL 1211 and BIOL 1212, BIOL 3250, and BIOL 3260. Might not be offered every year.

BIOL 4330 Upland Wildlife Management (3 credits)
An advanced pre-professional course for majors in natural resources, biology, and related fields. Lectures cover the history, philosophy, evolution, and application of wildlife management with a focus on upland wildlife as a renewable, sustainable natural resource. The course fulfills some professional certification requirements of The Wildlife Society and is recommended for students planning graduate study or employment in natural resources management. Prerequisite: BIOL 3610.

BIOL 4360 Developmental and Tumor Biology (4 credits)
Investigation of the mechanisms leading to the development of multicellular animal organisms from a fertilized egg. In contrast, the course also investigates how cells within a multicellular organism can become misregulated, leading to cancer. Lecture and lab. Prerequisites: BIOL 1211 and BIOL 1212. BIOL 2360 or BIOL 3380 is highly recommended. Might not be offered every year.

BIOL 4520 Mammalogy (4 credits)
Morphology, ecology, behavior, classification, distribution, and evolution of mammals. Lecture and laboratory. Collection or paper by each student. Prerequisites: BIOL 1211 and BIOL 1212.

BIOL 4534 Ichthyology (4 credits)
An overview of morphology, physiology, behavior, taxonomy, systematics, and ecology of fishes. This course emphasizes the evolution of ecological adaptations and the origin and conservation of biodiversity. Lecture, laboratory, and field work. Prerequisites: BIOL 1211 and BIOL 1212.

BIOL 4545 Fisheries Management (4 credits)
Theory and methods of fisheries management with an emphasis on quantitative methods and ecosystem management. Lecture and extensive field and laboratory work. Prerequisites: BIOL 1211, BIOL 1212, BIOL 3362, and STAT 2610. BIOL 4534 strongly recommended.

BIOL 4620 Organic Evolution (3 credits)
Mechanisms and results of organic evolution. Lectures and discussion. Prerequisite: BIOL 2360 and junior status or consent of instructor.

BIOL 4894 Advanced Laboratory Projects in Biology I (2 credits)
Independent laboratory project work based on the background and interests of the students and the instructor. Students are normally expected to register for both semesters of the advanced laboratory projects (4894 and 4895). Prerequisites: Completion of the Area II required writing course for the B.S. or B.A. Biology major, junior status and consent of instructor.

BIOL 4895 Advanced Laboratory Projects in Biology II (2 credits)
Independent laboratory project work based on the background and interests of the students and the instructor. Students are normally expected to register for both semesters of the advanced laboratory projects (4894 and 4895). Prerequisites: Completion of the Area II required writing course for the B.S. or B.A. Biology major, junior status and consent of instructor.

BIOL 4896 Advanced Field Projects in Biology I (2 credits)
Independent field projects based on the background and interests of the students and the instructor. Students are normally expected to register for both semesters of the advanced field projects (4896 and 4897). Prerequisites: Completion of the Area II required writing course for the B.S. or B.A. Biology major, junior status and consent of instructor.

BIOL 4897 Advanced Field Projects in Biology II (2 credits)
Independent field projects based on the background and interests of the students and the instructor. Students are normally expected to register for both semesters of the advanced field projects (4896 and 4897). Prerequisites: Completion of the Area II required writing course for the B.S. or B.A. Biology major, junior status and consent of instructor.

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