BIOLOGICAL SCIENCES

Description
The School of Biological Sciences offers educational opportunities in various areas of biology leading toward either the bachelor of science or the bachelor of arts degree. Our research and teaching cover all levels of biological organization—from molecules to ecosystems—with a focus on integrating across levels. Study in the biological sciences prepares students for a variety of careers, including medicine, allied health, government, industry, education and research.

Program Assessment. To assist the department in evaluating the effectiveness of its program, after significantly completing the course work, all majors will be required in their senior year to register for BIOS 99 Assessment of the Major and complete selected assessment activities. Results of participation in these assessment activities will in no way affect a student’s GPA or graduation.

Cedar Point Biological Station. Biological sciences majors are strongly urged to attend the Cedar Point Biological Station for at least one summer session. Majors are also encouraged to do a research project with a faculty member.

College Requirements

College Admission

College Admission
The entrance requirements for the College of Arts and Sciences are the same as the University of Nebraska–Lincoln General Admission Requirements. Students who are admitted through the Admission by Review process may have certain conditions attached to their enrollment at Nebraska. These conditions are explained under “Removal of Deficiencies.”

In addition to these requirements, the College of Arts and Sciences strongly recommends a third and fourth year of one foreign language. Four years of high school course work in the same language will fulfill the College of Arts and Sciences’ language requirement. It will also allow students to continue language study at a more advanced level at the University of Nebraska–Lincoln, and provide more opportunity to study abroad.

Transfer Students
To be considered for admission as a transfer student, Nebraska resident or nonresident, students must have an accumulated average of C (2.0 on a 4.0 scale) and a minimum C average in the last semester of attendance at another college. Transfer students who graduated from high school January 1997 and after must also meet the University of Nebraska–Lincoln General Admission Requirements. Those transfer students who graduated before January 1997 must have completed in high school, 3 years of English, 2 years of the same foreign language, 2 years of algebra, and 1 year of geometry. Transfer students who have completed less than 12 credit hours of college study must also submit either their ACT or SAT scores.

Ordinarily, hours earned at a similarly accredited college or university are applicable to the University of Nebraska–Lincoln degree. The College, however, will evaluate all hours submitted on an application for transfer, and reserves the right to accept or reject any of them, based upon its exclusion and restriction policies. Sixty (60) is the maximum number of hours the University will accept on transfer from a two-year college or international institution. Transfer credit in the major or minor must be approved by the departmental advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the major or minor. At least half of the hours in the major field must be completed at the University regardless of the number of hours transferred.

The College of Arts and Sciences will accept no more than 15 semester hours of C- and D grades from other schools. The C- and D grades cannot be applied toward requirements for a major or minor. This policy does not apply to the transfer of grades from UNO or UNK to the University of Nebraska–Lincoln. All D grades may be transferred from UNO or UNK, but they are not applicable to a major or minor.

Readmitted Students
University of Nebraska–Lincoln students who choose not to take courses for more than two consecutive terms, must reapply to the University of Nebraska–Lincoln. Students readmitted to the College of Arts and Sciences will follow the requirements stated in the catalog for the academic year of readmission and re-enrollment as a degree-seeking student in Arts and Sciences. In consultation with advisors, a student may choose to follow a catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at Nebraska in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991, the catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Admission Deficiencies/Removal of Deficiencies
Students must remove entrance deficiencies in geometry and foreign language as soon as possible, and before graduating from the College of Arts and Sciences. For questions and more information, students should consult a college advisor in the Academic and Career Advising Center in 107 Oldfather Hall.

Removing Foreign Language Deficiencies
Students must complete the second semester of a first year language sequence to clear the deficiency and the second semester of the second year language sequence to complete the college graduation requirement in language.

Removing Geometry Deficiencies
A deficiency of one year of geometry can be removed by taking high school geometry courses through an approved independent study program, or by completing a geometry course from an accredited community college or a four-year institution. Neither of these options will count for college credit.

College Degree Requirements

College Distribution Requirements

Bachelor of Arts or Bachelor of Science (16 hours + Language)
The College of Arts and Sciences distribution requirements are designed to further the purposes of liberal education by encouraging study in several different areas within the College. All requirements are in addition to University ACE requirements. A student may not use a single course to satisfy more than one of the following five distribution requirements. A student cannot use a single course to satisfy both an ACE outcome and a College distribution requirement. A student cannot use a course from their primary major to satisfy the Breadth Requirement (F), but may apply an ancillary requirement of the primary major or a course from their second major toward this requirement. Independent study or reading courses and internships cannot be used to satisfy distribution
requirements. To see a complete list of excluded courses, run a degree audit through MyRED.

Courses from interdisciplinary programs will count in the same area as courses from the home/cross-listed department(s).

**College Distribution Requirements**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CDR A - Written Communication</strong></td>
<td>3</td>
</tr>
<tr>
<td>Select from courses approved for ACE outcome 1.</td>
<td></td>
</tr>
<tr>
<td><strong>CDR B and BL - Natural, Physical, and Mathematical Sciences with Lab</strong></td>
<td>4</td>
</tr>
<tr>
<td>Select from biochemistry, biological sciences, chemistry, computer science, geology, meteorology, mathematics, physics and statistics. Must include one lab in the natural or physical sciences. Lab courses may be selected from biochemistry, biological sciences, chemistry, geology, meteorology and physics.</td>
<td></td>
</tr>
<tr>
<td>Some courses from geography and anthropology may also be used to satisfy the lab requirement above.</td>
<td></td>
</tr>
<tr>
<td><strong>CDR C - Humanities</strong></td>
<td>3</td>
</tr>
<tr>
<td>Select from classics, English, history, modern languages and literatures, philosophy, and religious studies.</td>
<td>2</td>
</tr>
<tr>
<td><strong>CDR D - Social Science</strong></td>
<td>3</td>
</tr>
<tr>
<td>Select from: anthropology, communication studies, geography, political science, psychology, or sociology.</td>
<td>3</td>
</tr>
<tr>
<td><strong>CDR E - Language</strong></td>
<td>0-16</td>
</tr>
<tr>
<td>Fulfilled by the completion of the 6-credit-hour second-year sequence in a single foreign language in one of the following departments: Classics and religious studies, modern languages and literatures, or anthropology. Instruction is currently available in Arabic, Chinese, Czech, French, German, Greek, Japanese, Latin, Omaha, Russian, and Spanish. A student who has completed the fourth-year level of one foreign language in high school is exempt from the languages requirement.</td>
<td></td>
</tr>
<tr>
<td><strong>CDR F - Additional Breadth</strong></td>
<td>3</td>
</tr>
<tr>
<td>Select from: natural, physical and mathematical sciences (Area B), humanities (Area C), or social sciences (Area D). Cannot be a course from the primary major.</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 16-32

1. See degree audit or a College of Arts and Sciences advisor for approved geography and anthropology courses that apply as natural science.
2. Language courses numbered 210 or below apply only for the foreign language requirement.
3. See degree audit or College of Arts and Sciences advisor for list of natural/physical science courses in anthropology, geography, and psychology that do not apply as social science.

**Scientific Base**

**Bachelor of Science Only (60 hours)**

The bachelor of science degree requires students to complete 60 hours in mathematical, physical and natural sciences. Approved courses for scientific base credit come from the following College of Arts and Sciences disciplines: actuarial science, anthropology (selected courses), astronomy, biochemistry (excluding BIOS 101), biological sciences (excluding BIOS 203), chemistry (excluding CHEM 101), computer science (excluding CSCE 10), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology, physics and statistics.

See your degree audit or a College of Arts and Sciences advisor for a complete list including individual classes that fall outside of the disciplines listed above. Up to 12 hours of scientific and technical courses offered by other colleges may be accepted toward this requirement with approval of a college advisor.

**Foreign Languages/Language Requirement**

**Languages Exemption Policy**

The University of Nebraska–Lincoln and the College of Arts and Sciences will exempt or waive students from the Nebraska entrance requirement of two years of the same foreign language or from the College’s language distribution requirement based on documentation only. The following are the options and procedures for documentation:

**High School Transcripts**

For the University entrance requirement, students must show an official high school transcript with two or more years of the same foreign language.

For the College of Arts and Sciences College Distribution Requirement E-Language, students must show an official high school transcript with four or more years of the same foreign language in high school, or show evidence of graduation from a non-English-speaking foreign high school. Students whose native language is not English must show English as a Second Language study on an official high school transcript. Four years of ESL at the high school level (9th, 10th, 11th and 12th grades) will be the basis for a waiver of the CDR E Language requirement.

**Proficiency Examination at UNL**

For the University entrance requirement, students who do not have transcript documentation can request to take a proficiency exam in the language. (This is not the same test as the Modern Languages Placement Exam.) However, the University will provide testing only in the languages it teaches. Currently, these languages are: Arabic, French, German, Spanish, Russian, Czech, Japanese, Chinese.

For the College of Arts and Sciences College Distribution Requirement E-Language, the Department of Modern Languages will oversee the test at the 202 level. If the student passes the test, the department will sign the College Request for Waiver form and indicate the level of proficiency. The form is then forwarded to the Arts and Sciences Advising Center for approval.

The Department of Modern Languages will oversee the test and provide written documentation to the Arts and Sciences Advising Center the level of proficiency passed.

**Distance Education**

For the University entrance requirement, students without transcript documentation who claim proficiency in a language not taught at the University of Nebraska–Lincoln, have the option of seeking out a distance education program in languages. If the student completes the equivalent of 102 from an approved distance education program, the student will meet the University’s entrance requirement. The student must have the course work approved before he/she takes/completes the course as equivalent to 102 by a College advisor. The student then completes the course and has the distance education program send the transcript to the Admissions Office.

For the College of Arts and Sciences College Distribution Requirement E-Language, the student can seek out a distance education program and complete the equivalent of the 202-level course. The student must submit
the request on the College Request for Substitution form and have the
course work approved by a College advisor. The student then completes
the course and has the distance education program send the transcript to
the Admissions Office.

**Third Language Option**
If a student demonstrates knowledge of two foreign languages at
the 102 level, the College of Arts and Sciences may consider waiving
two semesters of the four semester College Distribution Requirement
E-Languages requirement. If this waiver were granted, the student
would then be required to complete 101 and 102 in another, 3rd foreign
language at Nebraska.

**Minimum Hours Required for Graduation**
A minimum of 120 semester hours of credit is required for graduation
from the College of Arts and Sciences. A total grade point average of at
least 2.0 is required.

**Grade Rules**

**Restrictions on C- and D Grades**
The College will accept no more than 15 semester hours of C- and D
grades from other schools except for UNO and UNK. No transfer C- and
D grades can be applied toward requirements in a major or a minor. No
University of Nebraska–Lincoln C- and D grades can be applied toward
requirements in a major or a minor.

**Pass/No Pass Privilege**

**University regulations for the Pass/No Pass (P/N) privilege state:**

- The Pass/No Pass option is designed for your use by seeking to
  expand your intellectual horizons by taking courses in areas where
  you may have had minimal preparation.
- Neither the P nor the N grade contribute to your GPA.
- P is interpreted to mean C or above.
- A change to or from a Pass/No Pass may be made until mid-term (see
  academic calendar for specific dates per term).
- The Pass/No Pass or grade registration cannot conflict with the
  policy of the professor, department, college, or University governing
  the grading option.
- Changing to or from Pass/No Pass requires using the MyRED system
to change the grading option or filing a Drop/Add form with the Office
of the University Registrar, 107 Canfield Administration Building. After
mid-term of the course, a student registered for Pass/No Pass cannot
change to a grade registration unless the Pass/No Pass registration
is in conflict with the policy of the professor, department, college, or
University governing Pass/No Pass.
- The Pass/No Pass grading option cannot be used for the removal of
  C- or D or F grades.

**Pass/No Pass privileges in the College of Arts and Sciences are extended to
students according to the following additional regulations:**

- Departments may specify that certain courses of theirs can be taken
  only on a P/N basis.
- The college will permit no more than a total of 24 semester hours
  of P/N grades to be applied toward degree requirements. This
total includes all Pass grades earned at the University and other
U.S. schools. **NOTE:** This 24-hour limit is more restrictive than the
University regulation.

**Grading Appeals**
A student who feels that he/she has been unfairly graded must ordinarily
take the following sequential steps in a timely manner, usually by
initiating the appeal in the semester following the awarding of the grade:

1. Talk with the instructor concerned. Most problems are resolved at
   this point.
2. Talk to the instructor’s department chairperson.
3. Take the case to the Grading Appeal Committee of the department
   concerned. The Committee should be contacted through the
   department chairperson.
4. Take the case to the College Grading Appeals Committee by
   contacting the Dean’s Office, 1223 Oldfather Hall.

**Course Level Requirements**

**Courses Numbered above 299**
Thirty of the 120 semester hours of credit must be in courses numbered
above 299. Of the 30 hours above 299, 15 hours (1/2) must be completed
in residence at UNL.

**Graduate Courses**
Seniors in the University who have obtained in advance the approval
of the dean for Graduate Studies may receive up to 12 hours credit for
graduate courses taken in addition to the courses necessary to complete
their undergraduate work, provided that such credits are earned within
the calendar year prior to receipt of the baccalaureate. For procedures,
inquire at the Office of Graduate Studies.

Course work taken prior to receipt of the baccalaureate may not always
be accepted for transfer to other institutions as graduate work.

**Residency**

**Residency Requirement and Open Enrollment and Summer**
**Independent Study Courses**
Students must complete at least 30 of the 120 total hours for their
degree at the University of Nebraska–Lincoln. Students must complete
at least 1/2 of their major course work including 6 hours above 299 in
their major, and 15 of the 30 hours required above 299 in residence.
Credit earned during education abroad may be used toward the residency
requirement if students register through the University and participate in
prior-approved education abroad programs. The University of Nebraska–
Lincoln open enrollment and summer independent study courses count
toward residence.

**ACE Requirements**
Consistent with the mission and values of the University, ACE is based
on a shared set of four institutional objectives and ten student learning
outcomes. The ACE program was approved by faculty in all eight
undergraduate colleges and endorsed by the Faculty Senate, the student
government, and the Academic Planning Committee in January 2008
for implementation in the fall 2009. ACE aligns with current national
initiatives in general education.
Key characteristics of ACE demonstrate the benefits of the program to students:

- Students receive a broad education with exposure to multiple disciplines, critical life skills and important reasoning, inquiry, and civic capacities.
- ACE is simple and transparent for students, faculty and advisors. Students complete the equivalent of 3 credit hours for each of the ten student learning outcomes.
- Students connect and integrate their ACE experiences with their selected major.
- Students can transfer all ACE certified courses across colleges within the institution to meet the ACE requirement and any course from outside the institution that is directly equivalent to a University of Nebraska–Lincoln ACE-certified course. Courses from outside institutions without direct equivalents may be considered with appropriate documentation for ACE credit (see academic advisor).

ACE allows faculty to assess and improve their effectiveness and facilitate students’ learning.

ACE Institutional Objectives and Student Learning Outcomes

To meet the ACE Program requirement, a student will complete a minimum of 3 credit hours for each of the ten ACE Student Learning Outcomes (a total of 30 ACE credit hours). See the ACE website at: http://ace.unl.edu for the most current information and the most recently certified courses.

Catalog Rule

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to and enrolled as a degree-seeking student at the University of Nebraska–Lincoln. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at Nebraska in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991 the catalog which a student follows may not be more than 10 years old at the time of graduation.

Learning Outcomes

Majors in biological sciences will be able to:

1. Demonstrate mastery of the concepts, principles and knowledge for following subdisciplines: cell biology, organismal biology, genetics, ecology and evolution.
2. Use scientific methods and knowledge of the natural and physical world to address biological problems through inquiry, experimentation, interpretation, analysis, and the making of inferences from data, to determine whether conclusions or solutions are reasonable.
3. Acquire a more in depth knowledge of in a subdiscipline area by generating a scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation, presentation, and reflection, and is representative of a typical scholarly product for the subdiscipline.

### Major Requirements

#### Core Requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE 120</td>
<td>Fundamentals of Biology I</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 120L</td>
<td>and Fundamentals of Biology I laboratory</td>
<td></td>
</tr>
<tr>
<td>LIFE 121</td>
<td>Fundamentals of Biology II</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 121L</td>
<td>and Fundamentals of Biology II Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOS 205</td>
<td>Genetics, Molecular and Cellular Biology</td>
<td>2</td>
</tr>
<tr>
<td>BIOS 205</td>
<td>Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOS 206</td>
<td>General Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 207</td>
<td>Ecology and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 99</td>
<td>Assessment of the Major</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Specific Major Requirements

Select eighteen (18) hours of BIOS courses, including at least 10 hours at the 300 level or above and at least two courses at the 400 level.

| Credit Hours Subtotal: | 18 |

#### Ancillary Requirements

##### Mathematics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 106</td>
<td>Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 107</td>
<td>Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 155T</td>
<td>Computer Science I: Informatics Focus</td>
<td>4</td>
</tr>
<tr>
<td>STAT 218</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>EDPS 459</td>
<td>Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 350</td>
<td>Research Methods and Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ECON 215</td>
<td>Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 380</td>
<td>Statistics and Applications</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Additional Biological Sciences Courses

Select eighteen (18) hours of BIOS courses, including at least 10 hours at the 300 level or above and at least two courses at the 400 level.

| Credit Hours Subtotal: | 18 |

1. No more than 8 hours may be from courses for which the home department is other than biological sciences.
2. The following courses will NOT count toward the biological sciences major: BIOS 101, BIOS 101L, BIOS 110, BIOS 110L, BIOS 117, BIOS 203, BIOS 395.

##### Chemistry

Select one sequence from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 110</td>
<td>and General Chemistry II</td>
<td></td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Fundamental Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 114</td>
<td>and Fundamental Chemistry II</td>
<td></td>
</tr>
</tbody>
</table>

Select one sequence from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 251</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 253</td>
<td>and Organic Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 255</td>
<td>Biological Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 257</td>
<td>and Biological Organic Chemistry Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

| Credit Hours Subtotal: | 11-13 |
Biological Sciences

Biochemistry
Select one course from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 321</td>
<td>Elements of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 431 / CHEM 431</td>
<td>Structure and Metabolism</td>
<td>3</td>
</tr>
</tbody>
</table>

**Credit Hours Subtotal:** 3

Physics
Select one sequence from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 141 &amp; PHYS 142</td>
<td>Elementary General Physics I and Elementary General Physics II</td>
<td>8-10</td>
</tr>
<tr>
<td>PHYS 211 &amp; PHYS 212</td>
<td>General Physics I and General Physics II</td>
<td>8-10</td>
</tr>
</tbody>
</table>

**Credit Hours Subtotal:** 8-10

**Total Credit Hours:** 30-35

Additional Major Requirements

**Grade Rules**

**C- and D Grades**
A grade of C or above is required for all courses in the 36 hours for the major.

**Pass/No Pass**
Except for BIOS 310, no course taken Pass/No Pass can be counted toward the 36 hours for the major.

Requirements for Minor Offered by Department

Eighteen (18) hours, comprised of the five-course core:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE 120 &amp; LIFE 120L</td>
<td>Fundamentals of Biology I and Fundamentals of Biology I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 121 &amp; LIFE 121L</td>
<td>Fundamentals of Biology II and Fundamentals of Biology II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 205</td>
<td>Genetics, Molecular and Cellular Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOS 206</td>
<td>General Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 207</td>
<td>Ecology and Evolution</td>
<td>4</td>
</tr>
</tbody>
</table>

**Total Credit Hours:** 18

Grade Rules

**C- and D Grades**
A grade of C or above is required for all courses in the minor.

**Pass/No Pass**
No course taken Pass/No Pass can be counted toward the minor.

BIOS 100 Pathways to Success in the Biological Sciences Major

**Prerequisites:** Biological Science Major

**Description:** An orientation to the Biological Sciences Major. Introduction to advising and university services, study skills, professionalism, community building, and career development.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Format:** LEC

**Offered:** FALL/SPR

BIOS 101 General Biology

**Prerequisites:** Parallel registration in BIOS 101L.

**Notes:** Credit toward the degree cannot be earned in both BIOS 101 and BIOS 110. BIOS 101 does not count in the Biological Sciences major. High school chemistry strongly recommended. Not intended for most Life Sciences majors; such students should take LIFE 120-LIFE 120L and LIFE 121-LIFE 121L instead.

**Description:** Analysis of the structure, functions, and interactions of organisms from the molecular to the ecosystem levels.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Prerequisite for:** AGRO 216, HORT 216; AGRO 278, HORT 278; ASCI 240; BIOC 321; BIOS 111; BIOS 203; BIOS 213; BIOS 213L; BSEN 317; ENTO 308; GEOG 308, GEOL 308, NRES 308; NRES 220; NRES 302, HORT 302; PSYC 370

**ACE:** ACE 4 Science

BIOS 101L General Biology Laboratory

**Prerequisites:** Parallel registration in BIOS 101.

**Notes:** Credit toward the degree cannot be earned in both BIOS 101L and BIOS 110L. BIOS 101L does not count in the Biological Sciences major.

**Description:** Laboratory exercises and experiments that complement material covered in BIOS 101.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Format:** LAB

**Prerequisite for:** AGRO 216, HORT 216; AGRO 278, HORT 278; ASCI 240; BIOC 321; BIOS 111; BIOS 203; BIOS 213; BIOS 213L; ENTO 308; GEOG 308, GEOL 308, NRES 308; NRES 220, NRES 302, HORT 302; PSYC 370

**ACE:** ACE 4 Science

BIOS 110 Human Biology

**Prerequisites:** Parallel registration in BIOS 110L.

**Notes:** High school chemistry or equivalent strongly recommended. Not intended for most Life Sciences majors; such students should take LIFE 120-LIFE 120L and LIFE 121-LIFE 121L instead. Credit toward the degree cannot be earned in both BIOS 101 and BIOS 110. BIOS 110 does not count in the Biological Sciences major.

**Description:** Introduction to biology with a focus on organization of molecules and cells to the level of human body systems; basic structure (anatomy) and function (physiology) of human tissues, organs and organ systems; reproduction, genetics; DNA technology and genetic engineering.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Offered:** FALL/SPR

**Prerequisite for:** BIOS 111; BIOS 213; BIOS 213L

**ACE:** ACE 4 Science
BIOS 110L Human Biology Laboratory
**Prerequisites:** Parallel registration in BIOS 110.
**Notes:** Credit toward the degree cannot be earned in both BIOS 101L and BIOS 110L. BIOS 110L does not count in the Biological Sciences major.
**Description:** Hands-on lab exercises to understand biological concepts of human organization from molecules to cells to the body systems, basic structure and function of human tissues, organs, organ systems, reproduction, genetics, as well as DNA technology and genetic engineering.
**Credit Hours:** 1
**Max credits per semester:** 1
**Max credits per degree:** 1
**Format:** LAB
**Offered:** FALL/SPR
**Prerequisite for:** BIOS 111; BIOS 213; BIOS 213L

BIOS 111 The Biology of Microorganisms
**Prerequisites:** BIOS 101 and BIOS 101L or BIOS 110 and BIOS 110L
**Description:** Comparative study of microorganisms, principles and applications.
**Credit Hours:** 4
**Max credits per semester:** 4
**Max credits per degree:** 4
**Format:** LEC
**Prerequisite for:** ENTO 200; ENTO 400

BIOS 115 Insect Biology
**Crosslisted with:** ENTO 115
**Description:** Fundamental insect biology (anatomy, development, physiology, behavior, ecology and diversity). Economic and medical importance of insects and principles of insect pest management.
**Credit Hours:** 3
**Max credits per semester:** 3
**Max credits per degree:** 3
**Format:** LEC
**Prerequisite for:** ENTO 200; ENTO 400

ACE: ACE 4 Science

BIOS 116 Insect Identification
**Crosslisted with:** ENTO 116
**Description:** Identification of representative orders and families of insects by their anatomy, metamorphosis, habits and habitats. Sight recognition emphasized but dichotomous keys also used. Interrelation of insect and habitats stressed.
**Credit Hours:** 1
**Max credits per semester:** 1
**Max credits per degree:** 1
**Format:** LAB

BIOS 117 Life in the Universe
**Crosslisted with:** ASTR 117, GEOL 117
**Description:** Survey of what modern science tells us about the possibilities of life elsewhere in the universe. Topics include how the Earth formed and became suitable for life, how life arose on the Earth, the conditions under which life can thrive, places in the solar system that might support life, the existence of other solar systems that might provide suitable habitats, and attempts to find evidence of life on other planets.
**Credit Hours:** 3
**Max credits per semester:** 3
**Max credits per degree:** 3
**Format:** LEC

ACE: ACE 4 Science

BIOS 136 Discovery Research: Virus Hunting
**Prerequisites:** By permission
**Description:** Perform original research by using the scientific method to isolate a virus that infects a harmless bacterium (bacteriophage) from local soil samples. Lab skills acquired include pipetting, aseptic technique, and serial dilutions; use basic DNA and electron microscopy analyses to characterize the phage.
**Credit Hours:** 2
**Max credits per semester:** 2
**Max credits per degree:** 2
**Format:** LAB
**Offered:** FALL
**Prerequisite for:** BIOS 137

BIOS 137 Discovery Research: Virus Genome Analyses
**Prerequisites:** BIOS 136 and by permission.
**Description:** Build on an original project involving isolation of a virus that infects a harmless bacterium (bacteriophage) using bioinformatic tools to analyze and annotate the sequenced bacteriophage genome.
**Credit Hours:** 2
**Max credits per semester:** 2
**Max credits per degree:** 2
**Format:** LAB
**Offered:** SPRING

BIOS 189H University Honors Seminar
**Prerequisites:** Good standing in the University Honors Program.
**Notes:** University Honors Seminar 189H is required of all students in the University Honors Program.
**Description:** Topic varies.
**Credit Hours:** 3
**Max credits per semester:** 3
**Max credits per degree:** 3
**Format:** LEC

ACE: ACE 4 Science

BIOS 191 Biological Sciences Learning Community Freshman Seminar
**Prerequisites:** Permission
**Notes:** Open to Biological Sciences Learning Community students only
**Description:** An exploration of biological science for undergraduates in the Biological Sciences Learning Community. Topics vary.
**Credit Hours:** 1
**Max credits per semester:** 1
**Max credits per degree:** 1
**Format:** LEC

BIOS 203 Bioethics
**Prerequisites:** Sophomore standing; BIOS 101 and 101L
**Description:** Relevance of biological science to society and its environment examined through readings, guest lecturers, and discussion.
**Credit Hours:** 3
**Max credits per semester:** 3
**Max credits per degree:** 3
**Format:** LEC
BIOS 205 Genetics, Molecular and Cellular Biology Laboratory  
**Prerequisites:** BIOS 206 or parallel  
**Description:** Series of lab exercises to introduce principles of genetic, molecular and cellular biology. Experiments done using model systems to identify, map and clone genes; analyze gene products and expression; and fractionate cell components.  
**Credit Hours:** 2  
Max credits per semester: 2  
Max credits per degree: 2  
Format: LEC  
**Prerequisite for:** FORS 401

BIOS 206 General Genetics  
**Prerequisites:** LIFE 120 & LIFE 120L and LIFE 121 & LIFE 121L  
**Description:** Inheritance and regulation of genes in organisms and populations. Fundamentals of genomics and bioinformatics.  
**Credit Hours:** 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC  
**Prerequisite for:** ASCI 330; ASCI 486; BIOS 99; BIOS 205; BIOS 302; BIOS 303; BIOS 326; BIOS 420; BIOS 820, VBMS 820, MBIO 420; BIOS 421, BIOS 821, MBIO 421; BIOS 443, BIOS 843, VBMS 843, MBIO 443; BIOS 802, BIOS 402; FORS 401

BIOS 207 Ecology and Evolution  
**Prerequisites:** LIFE 120 & LIFE 120L and LIFE 121 & LIFE 121L  
**Description:** Introduction to the principles and processes of ecology and evolution. Structure and dynamics of populations and communities; biotic and abiotic interactions; mechanisms of evolutionary change; natural selection; adaptation; and speciation.  
**Credit Hours:** 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC  
**Prerequisite for:** BIOS 99; BIOS 472; NRES 311

BIOS 213 Human Physiology  
**Prerequisites:** BIOS 101 and 101L or BIOS 110 and 110L or LIFE 120 and 120L; Parallel registration in BIOS 213L.  
**Description:** Elementary survey of the basic functional systems of the human body: the muscular, nervous, receptor, circulatory, respiratory, digestive, excretory, endocrine, and reproductive systems.  
**Credit Hours:** 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
**Prerequisite for:** ASCI 341; NUTR 355; NUTR 450; NUTR 455; VBMS 303; VBMS 403; VBMS 410

BIOS 213L Human Physiology Laboratory  
**Prerequisites:** BIOS 101 and 101L or BIOS 110 and 110L or LIFE 120 and 120L; Parallel registration in BIOS 213.  
**Description:** Laboratory exercises and experiments that complement material covered in BIOS 213.  
**Credit Hours:** 1  
Max credits per semester: 1  
Max credits per degree: 1  
Format: LAB  
**Prerequisite for:** VBMS 303; VBMS 403

BIOS 214 Human Anatomy  
**Prerequisites:** Sophomore standing.  
**Notes:** Cadaver dissections are studied in the lab. Letter Grade Only.  
**Description:** Introduction to the major organ systems of the human body including skeletal, major muscle, nervous, digestive, circulatory, excretory, and reproductive systems. Anatomical structures as they pertain to clinical anatomy.  
**Credit Hours:** 5  
Max credits per semester: 5  
Max credits per degree: 5  
Format: LEC

BIOS 232 Ecological Issues in the Great Plains  
**Prerequisite for:** NUTR 384

BIOS 233 Topics in Biology  
**Prerequisites:** Permission.  
**Description:** Topic varies.  
**Credit Hours:** 1-3  
Max credits per semester: 1  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
**ACE:** ACE 8 Civic/Ethics/Stewardship

BIOS 295 Topics in Biology  
**Prerequisites:** Permission.  
**Description:** Topic varies.  
**Credit Hours:** 1-3  
Max credits per semester: 1  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

BIOS 296 Independent Study in Biology  
**Prerequisites:** Permission  
**Notes:** A maximum of 3 credit hours may be counted toward the major in BIOS. Before registering, arrangements must be made with a faculty member in BIOS to reach an agreement on the scope and determine the amount of credit for the project.  
**Description:** Opportunity to participate in work in a research laboratory in order to gain some insight into the philosophy and methods of original research.  
**Credit Hours:** 1-3  
Min credits per semester: 1  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LAB

BIOS 300 Toxins in the Environment  
**Crosslisted with:** ENTO 300, NRES 300  
**Prerequisites:** One semester BIOS and one semester CHEM  
**Description:** Introduction to the principles of toxicology as they apply to environmental contaminants, agri-chemicals, and industrial and naturally occurring chemicals.  
**Credit Hours:** 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC
BIOS 302 Cell Biology
Prerequisites: BIOS 206; CHEM 251 or CHEM 255 or CHEM 261.
Notes: BIOS 205 and CHEM 252 recommended.
Description: The design, execution, and evaluation of scientific experiments that advance the knowledge of cell and molecular biology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 303 Molecular Biology
Prerequisites: BIOS 206
Description: Molecular biology of prokaryotes and eukaryotes. Review of the experimental basis for the principles of the discipline.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 310 School of Biological Sciences Seminar
Prerequisites: LIFE 120 and LIFE 121
Notes: Pass/No Pass only.
Description: Reviews of current literature of general interest; reports of research activities by staff and guest speakers.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 3
Format: LEC

BIOS 312 Microbiology
Prerequisites: LIFE 121; LIFE 121L; CHEM 251 or CHEM 255 or CHEM 261.
Notes: BIOS 206 recommended. Parallel registration in BIOS 313 or 314 recommended.
Description: Microbial cell structure, genetics, metabolic and biosynthetic activity, diversity, ecology and evolution including host-microbe interactions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: BIOS 421, BIOS 421, Mbio 421; BIOS 440, BIOS 840, VBMS 840, Mbio 440

BIOS 313 Molecular Microbiology Laboratory
Prerequisites: LIFE 121; LIFE 121L; CHEM 251 or CHEM 255 or CHEM 261.
Notes: Credit towards the degree may not be earned in both BIOS 313 and 314. BIOS 206 and parallel registration in BIOS 312 recommended.
Description: Traditional microbiology techniques without recombinant DNA methods.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB
Prerequisite for: BIOS 440, BIOS 840, VBMS 840, Mbio 440

BIOS 314 Microbiology Laboratory
Prerequisites: LIFE 121; LIFE 121L; CHEM 251 or CHEM 255 or CHEM 261.
Notes: Credit towards the degree may not be earned in both BIOS 313 and 314. BIOS 206 and parallel registration in BIOS 312 recommended.
Description: Traditional microbiology techniques without recombinant DNA methods.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB
Prerequisite for: BIOS 440, BIOS 840, VBMS 840, Mbio 440

BIOS 316 Case Studies in Theoretical Ecology
Crosslisted with: MATH 316, NRES 316
Prerequisites: MATH 106 or higher OR LIFE 121. Parallel registration in BIOS 316L.
Notes: Case studies are structured around preparation for subsequent independent research (BIOS 498 or MATH 496).
Description: Introduction to biological literature, applied mathematics, computer programming, and/or statistical techniques relevant to field questions in ecology, evolution, and behavior. Typical mathematical topics include discrete dynamics, systems of differential equations, matrix algebra, or statistical inference and probability.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SUMMER
ACE: ACE 4 Science
Groups: Advanced Mathematics Courses

BIOS 316L Case Studies in Theoretical Ecology Lab
Prerequisites: MATH 106 or higher OR LIFE 121. Parallel registration in BIOS 316.
Description: Introduction to biological literature, applied mathematics, computer programming, and/or statistical techniques relevant to field questions in ecology, evolution, and behavior. Typical mathematical topics include discrete dynamics, systems of differential equations, matrix algebra, or statistical inference and probability.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB
Offered: SUMMER

BIOS 317 The Biology of Plants
Prerequisites: LIFE 120 and LIFE 121
Notes: Field trips are required and may occur outside of scheduled class time.
Description: Introduction to the basic principles and concepts of the biology of plants. Adaptive variation and biodiversity of plants considering the relationships of plant structure to function integrating across succeeding levels of organization: molecule, cell, tissue, organism, organism, population, community, and ecosystem.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
BIOS 326 Biology of Viruses
Prerequisites: BIOS 206; CHEM 251 or CHEM 255 or CHEM 261.
Description: Fundamental concepts in virology including basic features of structure, evolution, diseases, replication cycles and virus-host interactions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 337 Applications of Bioinformatics
Prerequisites: LIFE 120; LIFE 120L
Description: Provides a broad overview of bioinformatics. Shows how bioinformatics can help solving problems in biological research. Covered topics: biological databases, molecular biology tools, sequence comparison methods, phylogenetic inference, and molecular graphics.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Offered: FALL

BIOS 368 Plants in Human Medicine: Biological, Social, and Ethical Dimensions
Prerequisites: LIFE 121
Description: Introduction to the use of plants in traditional and alternative medicine, nutrition, and wellness. Examination of the biological, historical, and cultural origins of plant medicinal compounds used to enhance wellness or treat human diseases, such as cancer and heart disease. Consideration of the social and ethical consequences of the development of plant-derived drugs, use of herbal remedies in wellness and nutrition and of other emerging issues associated with plants in human medicine.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL

BIOS 369 Introductory Plant Pathology
Crosslisted with: PLPT 369
Prerequisites: AGRO 131/HORT 131, or LIFE 120 and 120L, or BIOS 109.
Description: Relation of plant disease to crop production, the environment, and society. Organisms that cause disease and their interactions with plants. Strategies for plant disease management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 381 Invertebrate Zoology
Prerequisites: LIFE 121 & LIFE 121L
Description: Comparative study of the morphology and natural history of invertebrate animals; emphasis on phylogenetic relationships.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

BIOS 385 Parasitology
Prerequisites: LIFE 121 & LIFE 121L
Description: Emphasis on parasitic diseases of humans. Impact of parasitism on societies considered in addition to the clinical consequences for infected individuals. Means of transmission, diagnosis, and treatment considered in respect to recent technological advances in production of monoclonal antibodies and genetic engineering. Nature and biological significance of parasitism are viewed in terms of prospects for control.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

BIOS 386 Vertebrate Zoology
Crosslisted with: NRES 386
Prerequisites: LIFE 121 & LIFE 121L
Description: Evolutionary origin and relationships, natural history, and ecological adaptations of vertebrates. Comparative form and function, particularly of bone and muscle systems among and the diversity within vertebrate groups.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

BIOS 389 Anatomy and/or Physiology Internship
Prerequisites: Permission
Notes: Open only to students who expect to become teaching assistants in anatomy or physiology
Description: A combination of academic work and instruction in the anatomy or physiology laboratories in biological sciences: cadaver dissection or work with physiological equipment; assist in the instruction of anatomical and physiological concepts.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

BIOS 394 Seminar in Behavioral Biology
Crosslisted with: PSYC 394
Prerequisites: PSYC 273 or PSYC 373/BIOS 373
Description: Critical reading and discussion of literature on topics dealing with the biological bases of behavior.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

BIOS 395 Internship
Prerequisites: Permission
Notes: Pass/No Pass only. Will not count toward a major in BIOS.
Description: Combination of work outside the University and academic work in biological sciences arranged through the Career Services Office.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Format: IND
BIOS 398H Honors Seminar
Prerequisites: Good standing in the University Honors Program.
Description: Special topics in biology.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

BIOS 399H Honors Research
Prerequisites: Good standing in the University Honors program.
Description: Independent research leading to an honors thesis and exam in accordance with the College's degrees with distinction procedure.
Credit Hours: 1-4
Min credits per semester: 1
Max credits per semester: 4
Max credits per degree: 4
Format: IND

BIOS 402 Cancer Biology
Crosslisted with: BIOS 802
Prerequisites: BIOS 206 and Senior standing
Description: Principles of cancer genetics, cancer prevention, and new methods for diagnosis and therapy. Fundamentals of the cell and molecular events that lead to human cancer.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 406 Insect Ecology
Crosslisted with: BIOS 806, ENTO 406, ENTO 806
Prerequisites: BIOS/NRES 220 and 222.
Description: Biotic and abiotic factors as they influence insect development, behavior, distribution, and abundance.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 407 Biology of Cells and Organelles
Crosslisted with: BIOS 807
Prerequisites: BIOS 206
Description: Regulation and timing of macromolecular synthesis during the cell cycle; the genetic autonomy of mitochondria and chloroplasts.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 408 Functional Histology
Crosslisted with: BIOS 808, VBMS 408, VBMS 808
Prerequisites: BIOS 101 and 101L or LIFE 120 and 120L or BIOS 112; BIOS 213 or ASCI 240 or ASCI 340.
Description: Microscopic anatomy of the tissues and organs of major vertebrate species, including humans. Normal cellular arrangements of tissues and organs as related to their macroscopic anatomy and function, with reference to sub-cellular characteristics and biochemical processes. Functional relationships among cells, tissues, organs and organ systems, contributory to organismal well being. General introduction to pathological processes and principles underlying some diseases.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

BIOS 412 Human Genetics
Crosslisted with: BIOS 812
Prerequisites: BIOS 206 and Senior standing
Description: Genetic basis of human variation, with emphasis on methods of applying genetic principles to humankind. Genetic ratios in pooled data; population and quantitative genetics; consanguinity; polygenic inheritance; blood types; sex linkage; linkage and crossing over; sex determination; visible chromosome variation; mutation; heredity and environment; eugenics; anthropological genetics; molecular genetics and molecular basis of disease; human genome project.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 415 Developmental Biology
Crosslisted with: BIOS 815
Prerequisites: BIOS 206
Description: Survey of topics in developmental biology, both animal and plant development.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 416 Biodiversity Conservation
Crosslisted with: BIOS 816
Prerequisites: BIOS 207 or NRES 220
Description: Basic conservation science theory and conservation decision making tools which are essential for making effective decisions for biodiversity conservation. Topics include systematic conservation planning, population viability analysis, risk assessment, and applying those tools to real conservation problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
BIOS 418 Advanced Genetics
Crosslisted with: BIOS 818
Prerequisites: BIOS 206 and Senior standing
Description: In-depth study of the principles and methodology of genetics, with emphasis on Drosophila: multiple alleles and complex loci, linkage and recombination, chromosome rearrangements, fine structure analysis, sex determination, recombinant DNA, and gene function in development.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

ACE: ACE 10 Integrated Product

BIOS 420 Molecular Genetics
Crosslisted with: BIOS 820, VBMS 820, MBIO 420
Prerequisites: BIOS 206 and Senior standing
Description: Molecular basis of genetics. Gene structure and regulation, transposable elements, chromosome structure, DNA replication, and repair mechanisms and recombination.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: BIOS 945; BIOS 964, VBMS 964; FDST 908B
ACE: ACE 10 Integrated Product

BIOS 421 Microbial Diversity
Crosslisted with: BIOS 821, MBIO 421
Prerequisites: BIOS 206 and BIOS 312 and Senior Standing.
Description: Diversity of microbial cell composition, structure, and function enabling movement, metabolism, symbiosis, and adaptation using bacterial, fungal, algal, and viral examples. A physiological, biochemical and molecular approach used throughout.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 422 Comparative Physiology
Crosslisted with: BIOS 822
Prerequisites: BIOS 213
Description: Comprehensive survey of comparative physiology with emphasis on the diversity of adaptations in basic physiological systems and the effects of environmental parameters upon such systems. Comparative physiology of osmoregulation, temperature regulation, metabolism, muscle, central nervous function, and sensory function.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 422L Comparative Physiology Laboratory
Prerequisites: Parallel registration in BIOS 422/822
Notes: Letter grade only.
Description: Physiological adaptations in ecological and evolutionary context.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB

BIOS 423 Quaternary Paleoclimatology and Paleoecology
Crosslisted with: BIOS 823, GEOL 423, GEOL 823
Prerequisites: 12 hrs GEOL or BIOS.
Description: Analysis and interpretation of the Quaternary period's paleoclimatological data. Patterns of long-term climate variation. Distribution patterns and responses of organisms and ecosystems to Quaternary environmental change.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 424 Biogeochemical Cycles
Crosslisted with: BIOS 824, GEOL 424, GEOL 824
Prerequisites: CHEM 109 or 113; 12 hrs GEOL or BIOS.
Description: Chemical cycling at or near the earth's surface, emphasizing interactions among the atmosphere, biosphere, geosphere and hydrosphere. Modern processes, the geological record, and human impacts on elemental cycles.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 425 Plant Biotechnology
Crosslisted with: BIOS 825
Prerequisites: BIOS 206
Description: Introduction to the use of plants for basic and applied purposes by deliberate manipulation of their genomes; techniques in plant genetic engineering; manipulations of plant development and metabolism; engineering pest, disease, and stress resistance; plants as bioreactors; and environmental and social impacts of plant biotechnology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 426 Systems Biology
Crosslisted with: BIOS 826
Prerequisites: LIFE 120 and LIFE 121 or BIOS 101; STAT 218 or STAT 380 or EDPS 459 or PSYC 350 or ECON 215.
Notes: BIOS 206 and CSCE 155T are recommended, but not required.
Description: Fundamentals of the analysis of high throughput experiments to understand complex biological systems. Principles and methods such as next generation sequencing, protein-protein interaction networks, regulatory networks, and biological data mining and integration. Emerging research in new biotechnology and data analysis in biomedical and life sciences.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 428 Advanced Genetics
Crosslisted with: BIOS 818
Prerequisites: BIOS 206 and Senior standing
Description: In-depth study of the principles and methodology of genetics, with emphasis on Drosophila: multiple alleles and complex loci, linkage and recombination, chromosome rearrangements, fine structure analysis, sex determination, recombinant DNA, and gene function in development.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

ACE: ACE 10 Integrated Product
BIOS 427 Practical Bioinformatics Laboratory
Crosslisted with: BIOS 827
Prerequisites: BIOS 206
Notes: No computer programming skill is required.
Description: Basic knowledge and skills needed for general bioinformatics, genomics and proteomics analyses. Various computational analyses including database search, sequence alignment, phylogenetic reconstruction, gene prediction/mining, microarray data analyses and protein structure analyses.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 428 Perl Programming for Biological Applications
Crosslisted with: BIOS 828
Prerequisites: LIFE 120 and LIFE 121
Description: Computer programming, using Perl, as applied to biological sciences, bioinformatics, computational biology, and genomics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 429 Phylogenetic Biology
Crosslisted with: BIOS 829
Prerequisites: BIOS 207 and Senior standing
Description: Principles of phylogenetic inference and emphasis on the application of phylogenetic hypotheses in biology and the biomedical sciences. How inferences derived from phylogenetic trees can be applied in different areas of biological investigation including systematics, biogeography, conservation biology, molecular evolution, genome structure, epidemiology, population biology, ecology, character evolution, behavior, and macroevolution.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 430 Communicating Science through Outreach
Crosslisted with: BIOS 830
Prerequisites: BIOS 207
Notes: Students must have at least one afternoon available for running a middle school science club (typically between 3-5pm). Background checks required.
Description: Introduction to science communication, formal versus informal science education, and best practices in informal science education. Review of state and national science standards and how students learn. Introduction to informal science practitioners and facilities in Nebraska. Role playing and development and implementation of hands on, inquiry-based science activities. Training in evaluation and assessment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR

BIOS 431 Structure and Metabolism
Crosslisted with: BIOS 431, BIOS 831, BIOS 831, CHEM 431, CHEM 831
Prerequisites: LIFE 120 with a grade of C or better; CHEM 252 or CHEM 262 with a grade of C or better.
Notes: BIOS 206 or AGRO 215 is recommended. First course of a two-semester, comprehensive biochemistry course sequence.
Description: Structure and function of proteins, nucleic acids, carbohydrates and lipids; nature of enzymes; major metabolic pathways of catabolism; and biochemical energy production.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR
Prerequisite for: BIOS 432, BIOS 832, CHEM 432, CHEM 832, BIOS 832
Crosslisted with: BIOS 431/831 or parallel; or CHEM 435/835.
Prerequisite for: ASCI 949, BIOC 431, BIOS 949, BIOS 949, BIOG 435/835.
Prerequisite for: AGRO 434, BIOC 434, CHEM 434, AGRO 834, BIOS 834, CHEM 834; AGRO 810, BIOS 810, HORT 810; ASCI 820; ASCI 917; ASCI 925, NUTR 925; ASCI 926, NUTR 926; ASCI 927, NUTR 927; BIOS 305, BIOS 432, BIOS 832, BIOS 432, BIOS 832, CHEM 832, BIOS 832, BIOS 833, BIOS 833, CHEM 833, CHEM 879; BIOS 950, VBMS 950; BSEN 416, BSEN 816; FDST 470; FDST 870; NUTR 450; NUTR 455; NUTR 820; NUTR 821; VBMS 410; VBMS 805

BIOS 432 Metabolism and Biological Information
Crosslisted with: BIOS 432, BIOS 832, CHEM 432, CHEM 832, BIOS 832
Prerequisites: BIOS 431/831 with a grade of C or better; BIOS 206 or AGRO 215 with a grade of C or better.
Notes: Continuation of BIOS 431/831.
Description: Major metabolic pathways of anabolism, structural and biochemical aspects of biological information flow and use in biotechnology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGRO 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOS 834, CHEM 834, AGRO 810, BIOS 810, HORT 810; ASCI 820; ASCI 917; ASCI 925, NUTR 925; ASCI 926, NUTR 926; ASCI 927, NUTR 927; BIOS 305, BIOS 432, BIOS 832, BIOS 432, CHEM 432, CHEM 832, BIOS 832, BIOS 833, BIOS 833, CHEM 833, CHEM 879; BIOS 950, VBMS 950; BSEN 416, BSEN 816; FDST 470; FDST 870; NUTR 450; NUTR 455; NUTR 820; NUTR 821; VBMS 410; VBMS 805

BIOS 433 Biochemistry Laboratory
Crosslisted with: BIOS 433, BIOS 833, BIOS 833, CHEM 433, CHEM 833
Prerequisites: BIOS 431/831 or parallel; or CHEM 435/835.
Description: Introduction to techniques used in biochemical and biotechnology research, including measurement of pH, spectroscopy, analysis of enzymes, chromatography, fractionation of macromolecules, electrophoresis, and centrifugation.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC
Offered: FALL/SPR
Prerequisite for: BIOS 437, BIOS 837, BIOS 437, BIOS 837; BIOS 898; CHEM 498
BIOS 434 Plant Biochemistry
Crosslisted with: AGRO 434, BIOC 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834
Prerequisites: BIOC/BIOS/CHM 431/831.
Description: Biochemical metabolism unique to plants. Relationships of topics previously acquired in general biochemistry to biochemical processes unique to plants. Biochemical mechanisms behind physiological processes discussed in plant or crop physiology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 435 Evolutionary Medicine
Crosslisted with: BIOC 835
Prerequisites: BIOS 207
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 437 Research Techniques in Biochemistry
Crosslisted with: BIOC 437, BIOC 837, BIOS 837
Prerequisites: BIOC/BIOS/CHM 433/833.
Description: Methods approach to systems biology analysis. Molecular identification and quantification employing techniques such as mass spectrometry, chromatography, electrophoretic fractionation, transcriptomics, proteomics and metabolomics. Data and pathway analysis with computational methods.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: VBMS 919

BIOS 439 Dynamics of Biochemical and Biological Networks
Crosslisted with: BIOC 439, BIOC 839, BIOS 839
Prerequisites: BIOS 206 or AGRO 215; BIOC 321 or BIOC 431
Description: To introduce and integrate, students in biochemistry and other life sciences, to the field of computational modeling of biochemical and biological network systems into a seamless curriculum.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING
Prerequisite for: ASCI 494, BIOC 494, BIOC 949, NUTR 949; BIOC 932, BIOS 932, CHEM 932; BIOC 933, BIOS 933, CHEM 933; BIOC 992K, CHEM 992K; BIOC 998

BIOS 440 Microbial Physiology
Crosslisted with: BIOS 840, VBMS 840, Mbio 440
Prerequisites: BIOS 312; BIOS 313 or BIOS 314.
Description: Molecular approaches to the study of prokaryotic cell structure and physiology, including growth, cell division, metabolism, and alternative microbial life styles.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 441 Pathogenic Microbiology
Crosslisted with: BIOS 841, VBMS 441, VBMS 841H, VBMS 841
Prerequisites: BIOS 312
Description: Fundamental principles involved in host-microorganism interrelationships. Identification of pathogens, isolation, propagation, mode of transmission, pathogenicity, symptoms, treatment, prevention of disease, epidemiology, and methods of control.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: VBMS 805; VBMS 949

BIOS 442 Endocrinology
Crosslisted with: ASCI 442, ASCI 842, BIOS 842, VBMS 842
Prerequisites: A course in vertebrate physiology and/or biochemistry.
Description: Mammalian endocrine glands from the standpoint of their structure, their physiological function in relation to the organism, the chemical nature and mechanisms of action of their secretory products, and the nature of anomalies manifested with their dysfunction.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 443 Immunology
Crosslisted with: BIOS 843, VBMS 843, Mbio 443
Prerequisites: BIOS 206; CHEM 251 or CHEM 255 or CHEM 261.
Description: Fundamental consideration of cellular and humoral mechanisms of immunity, the structure and function of immunoglobulins, antigen-antibody interactions; hypersensitivity; transplantation and tumor immunity; immune and autoimmune disorders.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: BIOS 966, VBMS 966; VBMS 852; VBMS 908; VBMS 910; VBMS 948; VBMS 949

BIOS 444 Geomicrobiology
Crosslisted with: BIOS 844, GEOL 444, GEOL 844
Prerequisites: 3 hours of BIOS or 3 hours of LIFE; 3 hours of CHEM
Description: Lectures and discussions of primary literature regarding microorganisms and their role transforming Earth through geologic time.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
BIOS 445 Food Microbiology
Crosslisted with: BIOS 845, FDST 405, FDST 805
Prerequisites: BIOS 312; CHEM 251; BIOC 321.
Description: Nature, physiology, and interactions of microorganisms in foods. Introduction to food-borne diseases, the effect of food processing systems on the microflora of foods, principles of food preservation, food spoilage, and foods produced by microorganisms. Food plant sanitation and criteria for establishing microbial standards for food products.
Credit Hours: 4
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: BIOS 446, BIOS 846, FDST 406, FDST 806; FDST 415, FDST 815; FDST 425, FDST 825; FDST 455, FDST 855; FDST 455L, FDST 855L; FDST 460, FDST 860; FDST 875; FDST 877; FDST 908B

BIOS 446 Food Microbiology Laboratory
Crosslisted with: BIOS 846, FDST 406, FDST 806
Prerequisites: Parallel in FDST 405/805/BIOS 446/846.
Description: The microorganisms in foods and the methods used to study them.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LAB
Prerequisite for: FDST 415, FDST 815

BIOS 448 Human Growth and Development
Crosslisted with: ANTH 448, ANTH 848, BIOS 848
Prerequisites: ANTH 242 and 242L, or BIOS 101 and 101L.
Description: The history of the study of human physical growth and biological principles of growth. Genetic, epigenetic and hormonal effects on human and other mammal growth patterns, and environmental factors that influence growth. Effects of nutrition, disease, socio-economic status, pollution, etc. Unique features of human growth in its various stages. How anthropologists interpret variation in growth patterns among human populations and the possible adaptive significance of this variation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Biological Anthropology

BIOS 450 Biology of Wildlife Populations
Crosslisted with: BIOS 850, NRES 450, NRES 850
Prerequisites: NRES 311; MATH 104 or above; STAT 218 or equivalent
Description: Principles of population dynamics. Management strategies (for consumptive and nonconsumptive fish and wildlife species) presented utilizing principles developed.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Offered: SPRING

BIOS 452 Field Epidemiology
Crosslisted with: BIOS 852
Prerequisites: LIFE 121; LIFE 121L; three hours of BIOS
Notes: Offered summers only at Cedar Point Biological Station.
Description: Principles of epidemiology and the role in modern medicine. Combination of theory and practice with living populations.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: VBMS 949
ACE: ACE 10 Integrated Product

BIOS 453 Predator Ecology
Crosslisted with: BIOS 853
Prerequisites: BIOS 207 or NRES 220
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 454 Ecological Interactions
Crosslisted with: BIOS 854, NRES 454, NRES 854
Prerequisites: LIFE 121; LIFE 121L; BIOS 207 or NRES 220; Senior Standing
Description: Nature and characteristics of populations and communities. Interactions within and between populations in community structure and dynamics. Direct and indirect interactions and ecological processes, competition, predation, parasitism, herbivory, and pollination. Structure, functioning and persistence of natural communities, foodweb dynamics, succession, and biodiversity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 456 Mathematical Models in Biology
Crosslisted with: BIOS 856, NRES 456, NRES 856
Prerequisites: LIFE 120; LIFE 120L; LIFE 121; LIFE 121L; MATH 107
Description: Biological systems, from molecules to ecosystems, are analyzed using mathematical techniques. Strengths and weaknesses of mathematical approaches to biological questions. Brief review of college level math; introduction to modeling; oscillating systems in biology; randomness in biology; review of historically important and currently popular models in biology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
BIOS 457 Ecosystem Ecology
Crosslisted with: BIOS 857, GEOl 457, GEOl 857
Prerequisites: BIOS 207 and CHEM 110 and Senior standing
Description: Processes controlling the cycling of energy and elements in ecosystems and how both plant and animal species influence them. Human-influenced global and local changes that alter these cycles and ecosystem functioning.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: BSEN 954, NRES 954
ACE: ACE 10 Integrated Product

BIOS 488 Field Animal Behavior
Crosslisted with: BIOS 868
Prerequisites: BIOS 207 or BIOS 220 recommended. Offered summers only at Cedar Point Biological Station.
Description: Behavior of animals. Stresses methods for testing evolutionary hypotheses under field conditions with emphasis on foraging behavior, animal communication, and animal social systems.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 462 Animal Behavior
Crosslisted with: BIOS 862
Prerequisites: BIOS 206, 207 and Senior Standing
Description: Introduction to animal behavior stressing the ethological approach. Anatomical and physiological bases of behavior, ontogenetic and phylogenetic observations, and the relations of animal behavior studies to genetics, ecology, taxonomy, and evolution.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 458 Wetlands
Crosslisted with: NRES 468, NRES 868, WATS 468, BSEN 468, BSEN 868
Prerequisites: 12 hrs biological sciences; BIOS 220; CHEM 109 and 110.
Notes: Offered even-numbered calendar years.
Description: Physical, chemical and biological processes that occur in wetlands; the hydrology and soils of wetland systems; organisms occurring in wetlands and their ecology wetland creation, delineation, management and ecotoxicology.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

BIOS 459 Limnology
Crosslisted with: BIOS 859, NRES 459, NRES 859, WATS 459
Prerequisites: 12 hrs BIOS, including BIOS/NRES 220/BIOS220x; two semesters CHEM.
Description: Physical, chemical, and biological processes that occur in fresh water. Organisms occurring in fresh water and their ecology; biological productivity of water and its causative factors; eutrophication and its effects.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: BIOS 866, NRES 866
ACE: ACE 10 Integrated Product

BIOS 464 Fisheries Biology
Crosslisted with: BIOS 864, NRES 464, NRES 864
Prerequisites: BIOS/NRES 489/889 or equivalent.
Description: Biology of fishes. Factors that affect fishes in the natural environment. Techniques used in the analysis and management of fish populations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 465 Behavioral Neuroscience
Crosslisted with: BIOS 865, PSYC 465, PSYC 865
Prerequisites: PSYC 273 or PSYC 373 or BIOS 373.
Description: Relationship of physiological variables to behavior, an introduction to laboratory techniques in neuropsychology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 468 Field Animal Behavior
Crosslisted with: BIOS 868
Prerequisites: LIFE 120 and LIFE 121
Notes: BIOS 207 or BIOS 220 recommended. Offered summers only at Cedar Point Biological Station.
Description: Behavior of animals. Stresses methods for testing evolutionary hypotheses under field conditions with emphasis on foraging behavior, animal communication, and animal social systems.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
ACE: ACE 10 Integrated Product

BIOS 470 Prairie Ecology
Crosslisted with: BIOS 870
Prerequisites: BIOS 207 or NRES 220
Notes: Extensive field work is required.
Description: Structure, function, and distribution of communities. Interaction of different species with their biotic and abiotic environments.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

BIOS 460 Soil Microbiology
Crosslisted with: AGRO 460, NRES 460, SOIL 460, AGRO 860, BIOS 860, NRES 860
Prerequisites: One semester microbiology; one semester biochemistry or organic chemistry.
Description: Soil from a microbe's perspective-growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S, and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil microorganisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

BIOS 462 Animal Behavior
Crosslisted with: BIOS 862
Prerequisites: BIOS 206, 207 and Senior Standing
Description: Introduction to animal behavior stressing the ethological approach. Anatomical and physiological bases of behavior, ontogenetic and phylogenetic observations, and the relations of animal behavior studies to genetics, ecology, taxonomy, and evolution.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product
BIOS 471 Plant Systematics  
Crosslisted with: BIOS 871  
Prerequisites: LIFE 121 and LIFE 121L  
Description: Overview of the diversity of plants and algae, with emphasis on phylogenetic relationships, the evolution of important physical and genomic characteristics, principles of plant classification and identification, and modern methods of plant molecular systematics. Lab work on taxonomic analysis and plant identification.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC

BIOS 472 Evolution  
Prerequisites: BIOS 207 and Senior standing  
Description: The principles and processes of micro- and macroevolution. Mechanisms behind evolutionary change and examples of these processes in a wide variety of organisms.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

ACE: ACE 10 Integrated Product

BIOS 474 Herpetology  
Crosslisted with: BIOS 874, NRES 474, NRES 874  
Prerequisites: BIOS/NRES 386 and permission.  
Notes: BIOS 388 recommended.  
Description: Fossil and living amphibians and reptiles. Anatomy, classification, ecology and evolution.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC

BIOS 475 Avian Biology  
Crosslisted with: BIOS 875  
Prerequisites: LIFE 121 & LIFE 121L  
Notes: May also be offered at Cedar Point Biological Station.  
Description: Biology of birds emphasizing the behavior and ecology of this group. Topics include avian diversity, systematics & evolutionary history, flight, foraging, migration, communication, reproductive biology, population ecology and conservation biology.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

BIOS 475L Avian Biology Laboratory  
Crosslisted with: BIOS 875L  
Prerequisites: Parallel registration in BIOS 475/875  
Description: Avian field identification in diverse prairie, riparian, and montane habitats. Individual studies of foraging behavior, territoriality, anti-predator behavior, mating systems, or nesting ecology.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Format: LAB

BIOS 476 Mammalogy  
Crosslisted with: BIOS 876, NRES 476, NRES 876  
Prerequisites: 8 hrs BIOS; BIOS/NRES 386 or NRES 311.  
Notes: May also be offered at Cedar Point Biological Station. Field trips are required and may occur outside of scheduled class time. Lab and field time emphasize diversity of mammalian families and species identification of Nebraska mammals.  
Description: Evolution, natural history, ecology, and functional morphology of planetary mammals and mammals of the Northern Great Plains.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC

BIOS 477 Bioinformatics and Molecular Evolution  
Crosslisted with: BIOS 877  
Prerequisites: BIOS 206 or parallel; CHEM 251 or CHEM 255 or CHEM 261.  
Notes: Statistics course recommended.  
Description: Pairwise and multiple alignments, sequence similarity and domain search, distance estimation, phylogenetic methods, gene mining, protein classification and structure. Algorithms used in bioinformatics as well as fundamental concepts of molecular evolution that underlie various bioinformatics methods.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

BIOS 478 Plant Anatomy  
Crosslisted with: BIOS 878, AGRO 478, AGRO 878, HORT 478, HORT 878  
Prerequisites: 8 hrs biological sciences  
Notes: BIOS 109 recommended.  
Description: Development, structure, and function of tissues and organs of the higher plants. Relationships of structure to physiology and ecology of plants.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC  
Prerequisite for: BIOS 879

BIOS 480 Ecology and Evolution of Arachnids  
Crosslisted with: BIOS 880  
Prerequisites: BIOS 207 or NRES 220  
Description: Ecology and evolutionary biology of living arachnids.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC
BIOS 481 Stream and River Ecology  
**Crosslisted with:** WATS 481, WATS 881, NRES 481  
**Prerequisites:** NRES 222 or equivalent  
**Description:** Fundamental physical drivers operating in stream and river ecosystems and how those vary in space and time. Major classes of organisms associated with stream ecosystems and their functional roles. Fundamental controls on biotic diversity in stream and river ecosystems and its variance. Major aspects of stream ecosystem function including energy flow and nutrient cycling. Ecosystem services provided by stream and river ecosystems and causes and consequences of human impacts on streams and rivers. Underlying principles of bioassessment and current methods of stream restoration.  
**Credit Hours:** 4  
**Max credits per semester:** 4  
**Max credits per degree:** 4  
**Format:** LEC  

BIOS 482 Field Entomology  
**Crosslisted with:** BIOS 882, ENTO 482, ENTO 882  
**Prerequisites:** 12 hrs biological sciences.  
**Notes:** Offered only at Cedar Point Biological Station.  
**Description:** Field course in insect taxonomy and biology emphasizing field collection, specimen preparation, classification, and insect natural history.  
**Credit Hours:** 4  
**Max credits per semester:** 4  
**Max credits per degree:** 4  
**Format:** LEC  
**Offered:** SUMMER  

BIOS 485 Aquatic Insects  
**Crosslisted with:** BIOS 885, ENTO 402, ENTO 802, NRES 402, NRES 802  
**Prerequisites:** 12 hrs biological sciences.  
**Description:** Biology and ecology of aquatic insects.  
**Credit Hours:** 2  
**Max credits per semester:** 2  
**Max credits per degree:** 2  
**Format:** LEC  
**Prerequisite for:** BIOS 485L, BIOS 885L, ENTO 402L, ENTO 802L, NRES 402L, NRES 802L  

BIOS 485L Identification of Aquatic Insects  
**Crosslisted with:** BIOS 885L, ENTO 402L, ENTO 802L, NRES 402L, NRES 802L  
**Prerequisites:** Parallel ENTO 802, NRES 402/802, BIOS 485/885.  
**Description:** Identification of aquatic insects to the family level.  
**Credit Hours:** 1  
**Max credits per semester:** 1  
**Max credits per degree:** 1  
**Format:** LAB  

BIOS 486 Advanced Topics in Biophysical Chemistry  
**Crosslisted with:** BIOC 486, BIOC 886, BIOS 886, CHEM 486, CHEM 886  
**Prerequisites:** CHEM 471/871 or CHEM 481/881.  
**Description:** Applications of thermodynamics to biochemical phenomena, optical properties of proteins and polynucleotides, and kinetics of rapid reactions.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC  

BIOS 487 Field Parasitology  
**Crosslisted with:** BIOS 887  
**Prerequisites:** LIFE 120; LIFE 120L; LIFE 121; LIFE 121L  
**Notes:** BIOS 207 or NRES 220 recommended. Offered summers only at Cedar Point Biological Station.  
**Description:** Animal host-parasite relationships, epizootiology, ecology, host distribution, classification, and life cycle stages of animal parasites.  
**Credit Hours:** 4  
**Max credits per semester:** 4  
**Max credits per degree:** 4  
**Format:** LEC  
**ACE:** ACE 10 Integrated Product  

BIOS 489 Ichthyology  
**Crosslisted with:** BIOS 889, NRES 489, NRES 889  
**Prerequisites:** LIFE 120 and LIFE 121  
**Notes:** May also be offered at Cedar Point Biological Station.  
**Description:** Fishes, their taxonomy, physiology, behavior, and ecology. Dynamics of fish stocks and factors regulating their production.  
**Credit Hours:** 4  
**Max credits per semester:** 4  
**Max credits per degree:** 4  
**Format:** LEC  
**Prerequisite for:** BIOS 464, BIOS 864, NRES 464, NRES 864, NRES 871; NRES 965  

BIOS 497 Special Topics in Biological Sciences  
**Crosslisted with:** BIOS 897  
**Prerequisites:** BIOS 206 or BIOS 207  
**Description:** Topics vary by term.  
**Credit Hours:** 1-4  
**Min credits per semester:** 1  
**Max credits per semester:** 4  
**Max credits per degree:** 24  
**Format:** LEC  

BIOS 498 Independent Research in Biological Sciences  
**Crosslisted with:** BIOS 898  
**Prerequisites:** Permission  
**Notes:** Four credit hours may be counted toward the undergraduate BIOS major. Before registering, arrangements must be made with a School of Biological Sciences faculty member to reach an agreement on the scope and to determine the amount of credit for the project.  
**Description:** Independent study and laboratory or field investigation of a specific problem.  
**Credit Hours:** 1-8  
**Min credits per semester:** 1  
**Max credits per semester:** 8  
**Max credits per degree:** 8  
**Format:** IND  

**PLEASE NOTE**  
This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.

**Biological Sciences (B.S.)**
Career Information

The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.

Transferable Skills

• Communicate results of scientific experiments to scientific and non-scientific audiences
• Read, understand, and critically review scientific information
• Design and implement research experiments
• Define problems and identifying causes
• Understand and use proper laboratory and technical skills and instruments
• Apply mathematical and scientific skills to solve real-world problems
• Collaborate with a team to develop solutions
• Confidently navigate complex, ambiguous projects and environments
• Document and replicate processes and procedures
• Examine problems from multiple perspectives
• Implement appropriate technological interventions to help solve problems
• Interpret, compare, and contrast ideas
• Conduct and present research to large and small groups
• Simplify complex information and present it to others
• Understand and operate within ethical framework for professional work in the field

Jobs of Recent Graduates

• Clinical Assistant, Bryan Health - Lincoln NE
• Mental Health Technician, TouchStone - Lincoln NE
• Physical Therapy Technician, Lincoln Physical Therapy Associates - Lincoln NE
• DNA Lab Tech, GeneSeek - Lincoln NE
• Veterinary Assistant, Animal Care Clinic - Lincoln NE
• Zookeeper, Omaha Henry Doorly Zoo - Omaha NE
• Forestry Aid, United States Forest Service - Ogden UT
• Hospital Generalist, Pathology Medical Services - Lincoln NE
• Hematology Technician I, Streck - La Vista NE
• Clinical Data Quality Specialist, Celerion Inc. - Lincoln NE
• Pharmacy Technician, Kroger Pharmacy - Dayton OH
• Contract Coordinator, QuarterLine Consulting Services - Herndon VA
• School Technology Support Specialist I, Educational Service Unit 6 - Milford NE
• Executive Team Leader, Target Corporation - Lincoln NE
• Aquatics Coordinator, YMCA - Lincoln NE

Internships

• Beckman Research Scholar, College of Arts & Sciences - Lincoln NE
• Sales/Marketing Intern, Li-Cor Biosciences - Lincoln NE
• Anatomy Intern, School of Biological Sciences - Lincoln NE
• Dental Intern, University of Nebraska Medical Center Dental College - Lincoln NE
• Intern, Southwestern - Nationwide
• Intern, NE Dept of Health & Human Services - Lincoln NE
• Intern, Pregnancy Center - Lincoln NE
• Advisor, Vector Marketing - Denver CO

• Campaign Intern, Clark for Legislature - Lincoln NE
• Biological Intern, University of Nebraska-Lincoln Biology Department - Lincoln NE
• Parasitology Intern, University of Nebraska State Museum - Lincoln NE

Graduate & Professional Schools

• Medical Doctor, University of Nebraska Medical Center - Omaha NE
• Doctor of Veterinary Medicine, Iowa State University - Ames IA
• Doctor of Pharmacy, University of Nebraska Medical Center - Omaha NE
• Doctor of Physical Therapy, Briar Cliff University - Iowa NE
• Master’s Degree, Clinical Laboratory Science, St. Luke’s - Kansas City MO
• Master’s Degree, Public Health, University of Nebraska Medical Center - Omaha NE
• Doctor of Optometry, Southern College of Optometry - Memphis TN
• Master’s Degree, Food Science, University of Nebraska-Lincoln - Lincoln NE
• Master’s Degree, Business Administration, Bellevue University - Bellevue NE
• Master’s Degree, Physician Assistant, University of Nebraska Medical Center - Omaha NE
• Master’s Degree, Environmental Sciences, Florida Atlantic University - Boca Raton FL
• Master’s Degree, Entomology, University of Nebraska-Lincoln - Lincoln NE