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.

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.

Options in the Major
Students may choose to focus their advanced coursework in ways that meet their specific interests and career goals. All students complete a core set of requirements and can determine, in consultation with faculty and their academic advisor, which specific option to follow. The option will be documented on the final transcript.

Standard Option
Allows students to choose their own combination of advanced courses from subareas of cell biology, organismal biology, genetics, ecology, and evolution.

Human Health and Disease Option
Provides students the opportunity to combine a strong biological sciences education with a focus on the health and disease of humans.

Learning Outcomes
Graduates with a major in biological sciences will be able to:

1. Demonstrate mastery of the concepts, principles, and knowledge for the following sub-disciplines: cell biology, molecular biology, organismal biology, genetics, ecology, and evolution.
2. Interpret and analyze data to make inferences, interpret results and assess the validity of conclusions based on data.
3. Apply scientific methods and cross-disciplinary knowledge to help address grand challenges in biology, such as climate change, the biodiversity crisis, emerging infectious disease, cancer, human genetics, and biotechnology development.
4. Reflect on and communicate skills and knowledge acquired through independent research, field experiences, or practicums to varied audiences.

Graduates with the human health and disease option will also be able to:

- Apply fundamental concepts and principles from across subdisciplines of biology to problems of human health, such as human anatomy and physiology; infectious and genetic diseases; and development of treatments such as vaccines.

Academic and Career Advising

Academic and Career Advising Center
Not sure where to go or who to ask? The Advising Center team in 107 Oldfather Hall can help. The Academic and Career Advising Center is the undergraduate hub for CAS students in all majors. Centrally located and easily accessed, students encounter friendly, knowledgeable people who are eager to help or connect students to partner resources. Students also visit the Advising Center in 107 Oldfather Hall to:

- Choose or change their major, minor, or degree program.
- Check on policies, procedures, and deadlines.
- Get a college approval signature from the Dean's representatives.

CAS Career Coaches are available by appointment (in-person or Zoom) and located in the CAS Academic and Career Advising Center, 107 Oldfather Hall. They help students explore majors and minors, gain experience, and develop a plan for life after graduation.

Assigned Academic Advisors
Academic advisors are critical resources dedicated to students’ academic, personal, and professional success. Every CAS student is assigned an academic advisor based on their primary major. Since most CAS students have more than just a single major, it is important to know the advisor for any minors or additional majors. Academic advisors work closely with the faculty to provide the best overall support and the discipline specific expertise. They are available for appointments (in-person or Zoom) and through weekly virtual drop-ins. Assigned advisors are listed in MyRED (https://its.unl.edu/myunl/) and their offices may be located in or near the department of the major for which they advise.

Students who have declared a pre-health or pre-law area of interest will also work with advisors in the Exploratory and Pre-Professional Advising Center (Explore Center) in 127 Love South, who are specially trained to guide students preparing to enter a professional school.

For complete and current information on advisors for majors, minors, or pre-professional areas, visit https://cas.unl.edu/major-advisors (https://cas.unl.edu/major-advisors/), or connect with the Arts and Sciences Academic and Career Advising Center, 107 Oldfather Hall, 402-472-4190, casadvising@unl.edu.

Career Coaching
The College believes that Academics + Experience = Opportunities and encourages students to complement their academic preparation with real-world experience, including internships, research, education abroad, service, and leadership. Arts and sciences students have access to a powerful network of faculty, staff, and advisors dedicated to providing information and support for their goals of meaningful employment or advanced education. Arts and sciences graduates have unlimited career possibilities and carry with them important career competencies—communication, critical thinking, creativity, context, and collaboration. They have the skills and adaptability that employers universally value. Graduates are prepared to effectively contribute professionally and personally with a solid foundation to excel in an increasingly global, technological, and interdisciplinary world.

Students should contact the career coaches in the Arts and Sciences Academic and Career Advising Center in 107 Oldfather Hall, or their assigned advisor, for more information. The CAS career coaches help students explore career options, identify ways to build experience and
prepare to apply for internships, jobs, or graduate school, including help with resumes, applications, and interviewing.

**ACE Requirements**

Students must complete one course for each of the ACE Student Learning Outcomes below. Certified course choices are published in the degree audit, or visit the ACE (http://ace.unl.edu) website (http://ace.unl.edu) for the most current list of certified courses.

**ACE Student Learning Outcomes**

ACE 1: Write texts, in various forms, with an identified purpose, that respond to specific audience needs, integrate research or existing knowledge, and use applicable documentation and appropriate conventions of format and structure.

ACE 2: Demonstrate competence in communication skills.

ACE 3: Use mathematical, computational, statistical, logical, or other formal reasoning to solve problems, draw inferences, justify conclusions, and determine reasonableness.

ACE 4: Use scientific methods and knowledge to pose questions, frame hypotheses, interpret data, and evaluate whether conclusions about the natural and physical world are reasonable.

ACE 5: Use knowledge, historical perspectives, analysis, interpretation, critical evaluation, and the standards of evidence appropriate to the humanities to address problems and issues.

ACE 6: Use knowledge, theories, and research perspectives such as statistical methods or observational accounts appropriate to the social sciences to understand and evaluate social systems or human behaviors.

ACE 7: Use knowledge, theories, or methods appropriate to the arts to understand their context and significance.

ACE 8: Use knowledge, theories, and analysis to explain ethical principles and their importance in society.

ACE 9: Exhibit global awareness or knowledge of human diversity through analysis of an issue.

ACE 10: Generate a creative or scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation, presentation, and reflection.

• Internship (395 or 495), independent study or readings (396 or 496), research (398 or 498), and thesis (399, 399H, 499, or 499H) will not satisfy distribution requirements.
• Other courses with a 9 in the middle number (ex. PSYC 292) will not satisfy distribution requirements unless approved by an advisor.
• Cross-listed courses from interdisciplinary programs will be applied in the same area as courses from the lead department.

**College Distribution Requirements**

**CDR: Written Communication**

Select from courses approved for ACE outcome 1.

**CDR: Natural, Physical, and Mathematical Sciences**

Select a course from ASTR, BIOS, CHEM, GEOL, LIFE, METR, MATH, PHYS, or ANTH 242, GEOG 155, GEOG 181, POLS 250, or PSYC 273.

**CDR: Laboratory**

Laboratory courses may be embedded in a 4-5 credit course used in CDR Natural, Physical, and Mathematical Science (example GEOG 155), or stand alone (example LIFE 120L).

**CDR: Humanities**

Select a course from ARAB, CHIN, CLAS, CZEC, ENGL, FILM, FREN, GERM, GREK, HIST, JAPN, LATN, PHIL, RELG, RUSS, or SPAN.

**CDR: Social Science**

Select a course from ANTH, COMM, GEOG, NSST, POLS, PSYC, or SOCI.

**CDR: Human Diversity in U.S. Communities**

Select from the following approved courses also listed in your degree audit: ANTH 130, ANTH 412, ANTH 473, ARAB 313, COMM 311, COMM 364, COMM 465, ENGL 212, ENGL 245N, ENGL 312, ENGL 345D, ENGL 345N, ENGL 346, ENGL 376, ENGL 380, ENGL 445, ETHN 100, ETHN 201, ETHN 202, ETHN 205, FILM 344, GEOG 271, GEOG 403, GLST 350, HIST 115, HIST 246, HIST 251, HIST 323, HIST 340, HIST 351, HIST 356, HIST 357, HIST 402, PHI 105, PHI 106, PHI 218, PHI 323, PHI 325, POLS 333, POLS 338, POLS 347, PSYC 310, PSYC 330, PSYC 421, PSYC 425, RELG 134, RELG 226, RELG 227, RELG 313, SOC 101, SOC 180, SOC 200, SOC 217, SPAN 206, SPAN 486, WMNS 101, WMNS 201, WMNS 202, WMNS 210, WMNS 356

**CDR: Language**

Fulfilled by the completion of the 4th level of a single language (either in H.S. or in college). Language study at UNL is available in: ARAB, CHIN, CZEC, FREN, GERM, GREK, JAPN, LATN, RUSS, SLPA, or SPAN.

Credit Hours Subtotal: **12-33**

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1 Excluded courses: BIOC 101, BIOS 100, CHEM 101, MBIO 101, PHYS 201, MATH 100A, MATH 101, MATH 102, MATH 103.

2 ANTH 242L, ASTR 224, BIOS 101L, BIOS 110L, BIOS 111, BIOS 116, BIOS 213L, BIOS 214, CHEM 105L, CHEM 106L, CHEM 109L, CHEM 110L, CHEM 113L, GEOG 155, GEOL 101, GEOL 103, LIFE 120L, LIFE 121L, METR 100, PHYS 141, PHYS 142, PHYS 153, PHYS 221, or PHYS 222.

3 ARAB, CHIN, CZEC, FREN, GERM, GREK, JAPN, LATN, RUSS, and SPAN courses must be numbered 300 or above. ENGL courses must be ENGL 170, ENGL 180, or ENGL 200 level and above. Excluded courses: CLAS 116, ENGL 254, ENGL 300, ENGL 354, SPAN 300A, SPAN 303, and SPAN 304.
4 Excluded courses: ANTH 242/ANTH 242L, GEOG 155, GIST 111, GIST 311, POLS 101, POLS 250, PSYC 100, PSYC 273.
5 ARAB 202, CHIN 202, CZEK 202, FREN 202 or FREN 210, GER 202, GREK 301 and GREK 302, JAPN 201 and JAPN 202, LATN 301 and LATN 302, RUSS 202, SLPA 202, or SPAN 202 or SPAN 210.

Language Requirement - BA and BS
The University of Nebraska–Lincoln and the College of Arts and Sciences place great value on academic exposure and proficiency in a second language. The University of Nebraska–Lincoln entrance requirement of two years of the same foreign language or the College's language distribution requirement (CDR: Language) will rarely be waived and only with relevant documentation. See the main College of Arts and Sciences page for more details.

Experiential Learning Requirement - BA and BS
All undergraduates in the College of Arts and Sciences must complete an Experiential Learning (EL) designated course. This may include 0-credit courses designed to document co-curricular activities recognized as Experiential Learning.

Scientific Base – BS Only
The bachelor of science degree requires students to complete 60 hours in mathematical, physical, and natural sciences from disciplines within the College of Arts and Sciences or required in its majors: ACTS, ASTR, BIOC, BIOS, CHEM, CSCE, GEO, LIFE, METR, MATH, PHYS, STAT or ANTH 242, ANTH 242L, ANTH 341, ANTH 385, ANTH 386, ANTH 389, ANTH 416, ANTH 422, ANTH 430, ANTH 442, ANTH 443, ANTH 444, ANTH 448, ANTH 473, ANTH 484, ANTH 487D, ENV 201, GEOG 155, GEOG 181, GEOG 217, GEOG 281, GEOG 308, GEOG 317, GEOG 408, GEOG 417, GEOG 418, GEOG 419, GEOG 421, GEOG 422, GEOG 425, GEOG 427, GEOG 432, GEOG 444, GEOG 461, GEOG 467, PHIL 211, POLS 250, PSYC 273, PSYC 368, PSYC 370, PSYC 450, PSYC 451, PSYC 456, PSYC 458, PSYC 460, PSYC 461, PSYC 463, PSYC 464, or PSYC 465. Excluded courses include: BIOC 101, BIOS 100, CHEM 101, MATH 100A, MATH 101, MATH 102, MATH 103, MBIO 101, PHYS 201 as well as any number course numbered 395, 495, 399H, 499, or 499H.

Up to 12 hours of scientific and technical courses offered by other colleges may be accepted toward this requirement with approval of the College of Arts and Sciences. See your assigned academic advisor to start the approval process.

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 cumulative 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 domestic institutions except for UNO and UNK. All courses taken at UNO and UNK impact the UNL transcript. No transfer of 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. International coursework (including education abroad) with a final grade equivalent to a C- or lower will not be validated by the College of Arts and Sciences departments to be degree applicable.

Pass/No Pass Privilege
University policy for the Pass/No Pass (P/N) privilege:
• Neither the P nor the N grade factor into your GPA.
• ‘P’ is interpreted to mean a grade of C or above. A grade of C- or lower results in a ‘N’.
• A change to or from a Pass/No Pass may be made until mid-term (1/2 of the course - see the 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 policy governing the grading options.
• Changing to or from the Pass/No Pass grading option requires using MyRED, or processing a Schedule Adjustment Form.
• For undergraduates, the University maximum of 24 ‘Pass’ credit hours and/or college and department limits will apply. These limits do not include courses offered on a 'Pass/No Pass' basis only. Consult your advisor or the Undergraduate Catalog (https://catalog.unl.edu/undergraduate/) for restrictions on the number of 'Pass' hours you can apply toward your degree.
• The ‘Pass/No Pass’ grading option cannot be used for the removal of ‘C’, ‘D+’, ‘D’, ‘D-’, or ‘F’ grade factors.

NOTE: See Course Repeats (https://registrar.unl.edu/academic-standards/course-repeats/)

College of Arts and Sciences policy on the Pass/No Pass (P/N) privilege:
• Pass hours can count toward fulfillment of University ACE requirements and college distribution requirements up to the 24-hour maximum.
• Most arts and sciences majors and minors do not permit any courses graded Pass/No Pass to apply, or limit them to no more than 6 hours. Students should refer to the major section of the catalog for clarification.
• Departments may specify that certain courses of theirs can be taken on a P/N-only or on a graded-only basis.

Grading Appeals
A student who feels that he/she has been unfairly graded must ordinarily initiate 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 at the 300 or 400 Level
Thirty (30) of the 120 semester hours of credit must be in courses numbered at the 300 or 400 level. Of those 30 hours, 15 hours (1/2) must be completed in residence at the University of Nebraska–Lincoln.

Residency Requirement
The term "Residency" refers to courses taken at UNL. 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 18
hours of their major coursework, and 15 of the 30 hours required at the 300 or 400 level, at UNL.

**Catalog to Use**

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 the University of Nebraska–Lincoln 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.

**Transfer Students**: Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with academic advisors, provided the student a) was enrolled in a community college during the catalog year they are utilizing, b) maintained continuous enrollment at the previous institution for 1 academic year or more, and c) continued enrollment at the University of Nebraska-Lincoln within 1 calendar year from their last term at the previous institution. Students must complete all degree requirements from a single catalog year and within the time frame allowable for that catalog year.

**Major Requirements**

Complete the Biological Sciences Core Requirements, Ancillary Requirements, and one of two options: Standard or Human Health and Disease.

**Core Requirements**

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 100</td>
<td>Pathways to Success in the Biological Sciences Major</td>
<td>1</td>
</tr>
<tr>
<td>LIFE 120</td>
<td>Fundamentals of Biology I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 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>&amp; 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 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>
<tr>
<td>BIOS 99</td>
<td>Assessment of the Major</td>
<td>0</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 19

Total Credit Hours 19

**Ancillary Requirements**

**Mathematics and Quantitative Reasoning**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 106</td>
<td>Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>CSCE 155T</td>
<td>Computer Science: Informatics Focus</td>
<td></td>
</tr>
<tr>
<td>ECON 215</td>
<td>Statistics</td>
<td></td>
</tr>
<tr>
<td>EDPS 459</td>
<td>Statistical Methods</td>
<td></td>
</tr>
<tr>
<td>MATH 107</td>
<td>Calculus II</td>
<td></td>
</tr>
</tbody>
</table>

**Chemistry**

Select one sequence from: 7-8

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 109A</td>
<td>General Chemistry I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 109L</td>
<td>and General Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 110A</td>
<td>and General Chemistry II</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 110L</td>
<td>and General Chemistry II Laboratory</td>
<td></td>
</tr>
<tr>
<td>or CHEM 111:Fundamental Chemistry I Laboratory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 113 and Fundamental Chemistry II</td>
<td></td>
<td></td>
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<tr>
<td>&amp; CHEM 114</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 11-13

**Biochemistry**

Select one course from: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 401</td>
<td>Elements of Biochemistry</td>
<td></td>
</tr>
<tr>
<td>or BIOC 431: Biochemistry I: Structure and Metabolism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOS 431</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 3

**Physics**

Select one sequence from: 8-10

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 141</td>
<td>Physics for Life Sciences I</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 142</td>
<td>and Physics for Life Sciences II</td>
<td></td>
</tr>
<tr>
<td>or PHYS 211:General Physics I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 212</td>
<td>and General Physics II</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 8-10

Total Credit Hours 30-35

**Standard Option**

**Biological Sciences Electives**

Select 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. 1

Credit Hours Subtotal: 18

Total Credit Hours 18

1 The following courses will NOT count toward the biological sciences major: BIOS 101, BIOS 101L, BIOS 110, BIOS 110L, or BIOS 395.

**Human Health and Disease Option**

**Foundation Courses**

Select three courses or sequences from: 11-13

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 213</td>
<td>Human Physiology</td>
<td></td>
</tr>
<tr>
<td>&amp; BIOS 213L</td>
<td>and Human Physiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOS 214</td>
<td>Human Anatomy</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 11-13
BIOS 312  Microbiology
& BIOS 314 and Microbiology Laboratory
BIOS 303  Molecular Biology
or BIOS 337 Applications of Bioinformatics
Credit Hours Subtotal: 11-13

Human Health and Disease Electives ¹,²
Select two courses or sequences from: 6-8
ANTH 448  Human Growth and Development
BIOS 300 / Toxins in the Environment
ENTO 300 / NRES 300
BIOS 326  Biology of Viruses
BIOS 368  Plants in Human Medicine: Biological, Social, and Ethical Dimensions
BIOS 383  Comparative Neurobiology
BIOS 385  Parasitology
BIOS 408 / Functional Histology
VBMS 408
BIOS 427  Practical Bioinformatics Laboratory
BIOS 440 / Microbial Physiology
MBIO 440
BIOS 441 / Pathogenic Microbiology
VBMS 441
BIOS 442 / Endocrinology
ASCI 442
BIOS 443 / Immunology
MBIO 443
BIOS 445 / Food Microbiology
FDST 405
& BIOS 446 / Food Microbiology Laboratory
FDST 406
BIOS 465 / Behavioral Neuroscience
PSYC 465
BIOS 477  Bioinformatics and Molecular Evolution
Credit Hours Subtotal: 6-8

Human Health and Disease ACE 10 Course ²
Select one of the following: 3-4
BIOS 402  Cancer Biology
BIOS 412  Human Genetics
BIOS 418  Advanced Genetics
BIOS 420 / Molecular Genetics
MBIO 420
BIOS 421 / Microbial Diversity
MBIO 421
BIOS 422  Comparative Physiology
& BIOS 422L and Comparative Physiology Laboratory
BIOS 429  Phylogenetic Biology
BIOS 435  Evolutionary Medicine
BIOS 452  Field Epidemiology
BIOS 472  Evolution
BIOS 487  Field Parasitology
Credit Hours Subtotal: 3-4

Total Credit Hours 20-25

¹ Research credit is strongly recommended through BIOS 498, BIOS 499, or BIOS 499H.
² Human Health and Disease ACE 10 courses not used to fulfill ACE 10 may be used as electives.

Additional Major Requirements

Grade Rules

C- and D Grades
A grade of C or above is required for all courses in the major, including ancillary requirements.

Pass/No Pass
Except for BIOS 100 and BIOS 310, no course taken Pass/No Pass can be counted toward the major.

Requirements for Minor Offered by Department

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

BIOS 205  Genetics, Molecular and Cellular Biology Laboratory 2
BIOS 206  General Genetics 4
BIOS 207  Ecology and Evolution 4
LIFE 120  Fundamentals of Biology I 4
& LIFE 120L and Fundamentals of Biology I laboratory
LIFE 121  Fundamentals of Biology II 4
& LIFE 121L and Fundamentals of Biology II Laboratory

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 major.

BIOS 100 Pathways to Success in the Biological Sciences Major

Prerequisites: Biological Sciences Major and freshman or sophomore standing

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
Grading Option: Pass No Pass
Offered: FALL/SPR
BIOS 101 General Biology  
**Prerequisites:** Parallel registration in BIOS 101L.  
**Notes:** 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. Credit toward the degree cannot be earned in both BIOS 101 and BIOS 110. BIOS 101 does not count in the Biological Sciences major.  
**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  
**Grading Option:** Graded with Option  
**Prerequisite for:** ASCI 240; ASCI 243; ASCI 271; BIOS 111; BIOS 213; BIOS 213L; BSEN 317; ENTO 308; GEOG 308, GEOL 308, NRES 308; NRES 220; NRES 302, PLAS 302; NRES 310; PLAS 240, RNGE 240, GRAS 240; PLAS 278; PLPT 210  
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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR  
**Prerequisite for:** BIOS 111; BIOS 213; BIOS 213L; ENTO 308; GEOG 308, GEOL 308, NRES 308  
**Course and Laboratory Fee:** $60

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  
**Grading Option:** Graded with Option  
**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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR  
**Prerequisite for:** BIOS 111; BIOS 213; BIOS 213L  
**Course and Laboratory Fee:** $60

BIOS 111 Introduction to Microbiology and Human Health  
**Prerequisites:** BIOS 101 and BIOS 101L or BIOS 110 and BIOS 110L or LIFE 120 and LIFE 120L.  
**Description:** Comparative study of microorganisms important for human health and disease (bacteria, fungi, viruses, prions), principles and applications of microbiology.  
**Credit Hours:** 4  
**Max credits per semester:** 4  
**Max credits per degree:** 4  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR  
**Prerequisite for:** BIOS 111; BIOS 213; BIOS 213L  
**Course and Laboratory Fee:** $60

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  
**Grading Option:** Graded with Option  
**Prerequisite for:** ENTO 200; ENTO 400; PLPT 210  
ACE: ACE 4 Science  
**Course and Laboratory Fee:** $10

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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR  
**Prerequisite for:** BIOS 111; BIOS 213; BIOS 213L  
**Course and Laboratory Fee:** $15
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
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: BIOS 137
Course and Laboratory Fee: $70

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
Grading Option: Graded with Option
Offered: SPRING

BIOS 180 Biological Sciences Learning Community Freshman Seminar
Prerequisites: Permission.
Notes: Open to Biological Sciences Learning Community students only.
Description: An exploration of biological sciences for undergraduates in the Biological Sciences Learning Community. Topics vary.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

BIOS 189H University Honors Seminar
Prerequisites: Good standing in the University Honors Program.
Description: Topic varies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
ACE: ACE 4 Science

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
Grading Option: Graded with Option
Prerequisite for: FORS 401
Course and Laboratory Fee: $80

BIOS 206 General Genetics
Prerequisites: A grade of C, P, or better in 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
Grading Option: Graded with Option
Prerequisite for: AGRO 815, PLAS 415; ASCI 330; ASCI 486; BIOC 433H; 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, VBMS 443; BIOS 802, BIOS 402; FORS 401; NUTR 820, NUTR 420; PLPT 418, PLPT 818, MBIO 418

BIOS 207 Ecology and Evolution
Prerequisites: A grade of C, P, or better in 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
Grading Option: Graded with Option
Prerequisite for: BIOS 99; BIOS 472; NRES 311; NRES 374
Course and Laboratory Fee: $35

BIOS 213 Human Physiology
Prerequisites: A grade of C, P, or better in 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
Grading Option: Graded with Option
Prerequisite for: ASCI 341; ASCI 342; NUTR 355; NUTR 450; NUTR 455; SLPA 455; VBMS 303; VBMS 403; VBMS 410

BIOS 213L Human Physiology Laboratory
Prerequisites: A grade of C, P, or better in 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
Grading Option: Graded with Option
Prerequisite for: VBMS 303; VBMS 403
Course and Laboratory Fee: $25
BIOS 214 Human Anatomy
Prerequisites: Sophomore standing.
Notes: Cadaver prossections 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
Grading Option: Graded
Prerequisite for: BIOS 206; CHEM 251 or CHEM 255
Course and Laboratory Fee: $35

BIOS 291 Special Topics in Biological Sciences
Description: Topics vary.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded with Option

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: Independent work directed by faculty.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

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
Grading Option: Pass No Pass

BIOS 312 Microbiology
Prerequisites: A grade of C, P or better in LIFE 121 and 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
Grading Option: Graded with Option
Prerequisite for: BIOS 421, BIOS 821, MBIO 421; BIOS 440, BIOS 840, VBMS 840, MBIO 440, VBMS 440; FDST 455, FDST 855, MBIO 455; PLPT 400L; VBMS 403

BIOS 314 Microbiology Laboratory
Prerequisites: A grade of C, P or better in LIFE 121 and 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: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: BIOS 440, BIOS 840, VBMS 840, MBIO 440, VBMS 440
Course and Laboratory Fee: $60

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
Grading Option: Graded with Option
Course and Laboratory Fee: $30

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
Grading Option: Graded with Option
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  
Grading Option: Graded with Option  
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  
Grading Option: Graded with Option  
Offered: FALL  

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  
Grading Option: Graded with Option  
Course and Laboratory Fee: $40  

BIOS 383 Comparative Neurobiology  
Prerequisites: LIFE 120  
Notes: BIOS 206 and BIOS 213 are recommended.  
Description: Introduction to behavioral neurobiology research, theory, and practice as well as to the scientists and the ongoing research conducted across this field.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
Offered: FALL  

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  
Grading Option: Graded with Option  
Course and Laboratory Fee: $40  

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  
Grading Option: Graded  
Offered: SPRING  
Course and Laboratory Fee: $35  

BIOS 395 Internship  
Prerequisites: Permission  
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  
Grading Option: Pass No Pass  

BIOS 397 Undergraduate Education Assistant Practicum  
Prerequisites: Permission  
Notes: Open to students who are interested in life sciences education and want to train to become a Teaching Assistant or Learning Assistant in the School of Biological Sciences. Students must have earned a grade of C or better in the BIOS or LIFE course they will assist in.  
Description: A structured training experience in the professional skills used by teaching and learning assistants in life science laboratories, recitations and lectures.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Grading Option: Graded  

BIOS 397A Anatomy and/or Physiology Practicum  
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  
Grading Option: Graded  
Experiential Learning: Student Teaching/Education Practicum
BIOS 400 Intermediate Plant Pathology
Crosslisted with: PLPT 400, PLPT 800
Prerequisites: PLPT 210 or BIOS 312; concurrent enrollment in PLPT 400L
Description: Exploring the biology of plant pathogens, pathogen-host plant interactions, and environmental influences on plant diseases. Examining cultural, chemical, and biological strategies, along with host resistance, for plant disease management. Builds on topics covered in PLPT 210, with additional emphasis on the strategies employed by the four major groups of plant pathogens, plant responses to disease-causing organisms, and approaches to disease management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING

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
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

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
Grading Option: Graded with Option

BIOS 408 Functional Histology
Crosslisted with: BIOS 808, VBMS 408, VBMS 808
Prerequisites: BIOS 101 and 101L or LIFE 120 and 120L; 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 organizational 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
Grading Option: Graded with Option

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
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

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
Grading Option: Graded with Option
Course and Laboratory Fee: $10

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
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 420 Molecular Genetics
Crosslisted with: BIOS 820, VBMS 820, M BIO 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
Grading Option: Graded with Option
Prerequisite for: AGRO 963, HORT 963, PLPT 963; BIOS 945; BIOS 964, VBMS 964; FDST 908B
ACE: ACE 10 Integrated Product
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Crosslisted with</th>
<th>Prerequisites</th>
<th>Description</th>
<th>Notes</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 421</td>
<td>Microbial Diversity</td>
<td>BIOS 821, Mbio 421</td>
<td>BIOS 206 and BIOS 312 and Senior Standing</td>
<td>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.</td>
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<tr>
<td>BIOS 422</td>
<td>Comparative Physiology</td>
<td>BIOS 822</td>
<td>BIOS 213</td>
<td>Comprehensive survey of comparative physiology with emphasis on where 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.</td>
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<tr>
<td>BIOS 422L</td>
<td>Comparative Physiology Laboratory</td>
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<td>Parallel registration in BIOS 422/822</td>
<td>Letter grade only.</td>
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<tr>
<td>BIOS 423</td>
<td>Quaternary Paleoclimatology and Paleocology</td>
<td>BIOS 823, GEOL 423, GEOL 823</td>
<td>12 hrs GEOL or BIOS</td>
<td>Analysis and interpretation of the Quaternary period's paleoecological data. Patterns of long-term climate variation. Distribution patterns and responses of organisms and ecosystems to Quaternary environmental change.</td>
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<tr>
<td>BIOS 424</td>
<td>Biogeochemical Cycles</td>
<td>BIOS 824, GEOL 424, GEOL 824</td>
<td>CHEM 109A and 109L or CHEM 113A and 113L; 12 hrs GEOL or BIOS</td>
<td>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.</td>
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<tr>
<td>BIOS 425</td>
<td>Plant Biotechnology</td>
<td>BIOS 825</td>
<td>BIOS 206</td>
<td>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.</td>
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<td>BIOS 426</td>
<td>Systems Biology</td>
<td>BIOS 826</td>
<td>LIFE 120 and LIFE 121 or BIOS 101; STAT 218 or STAT 380 or EDPS 459 or PSYC 350 or ECON 215</td>
<td>Fundamental 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.</td>
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<tr>
<td>BIOS 427</td>
<td>Practical Bioinformatics Laboratory</td>
<td>BIOS 827</td>
<td>BIOS 206</td>
<td>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.</td>
<td>No computer programming skill is required.</td>
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<tr>
<td>BIOS 428</td>
<td>Systems Biology</td>
<td>BIOS 828</td>
<td>LIFE 120 and LIFE 121 or BIOS 101; STAT 218 or STAT 380 or EDPS 459 or PSYC 350 or ECON 215</td>
<td>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.</td>
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<tr>
<td>BIOS 429</td>
<td>Phylogenetic Biology</td>
<td>BIOS 829</td>
<td>BIOS 207 and Senior Standing</td>
<td>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.</td>
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</tbody>
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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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR

BIOS 431 Biochemistry I: Structure and Metabolism  
**Crosslisted with:** BIOC 431, BIOC 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 PLAS 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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR

**Prerequisite for:** BIOS 431 or parallel; or CHEM 435/835.  
**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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR

BIOS 432 Biochemistry II: Metabolism and Biological Information  
**Crosslisted with:** BIOC 432, BIOC 832, CHEM 432, CHEM 832, BIOS 832  
**Prerequisites:** BIOL 431/831 with a grade of C or better; BIOS 206 or PLAS 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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR

**Prerequisite for:** ASCI 949, BIOC 949, NUTR 949; BIOC 435; BIOS 932, BIOS 932, CHEM 932; BIOC 933, BIOS 933, CHEM 933; BIOS 934, BIOS 934, CHEM 934; BIOC 935, BIOS 935, CHEM 935; BIOS 998; VBMS 919; VBMS 950; VBMS 951

BIOS 433 Biochemistry Laboratory  
**Crosslisted with:** BIOC 433, BIOC 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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR

**Prerequisite for:** BIOC 437, BIOC 837, BIOS 837, CHEM 837  
**Course and Laboratory Fee:** $50

BIOS 434 Plant Biochemistry  
**Crosslisted with:** PLAS 434, BIOC 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834  
**Prerequisites:** 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  
**Grading Option:** Graded with Option  
**Offered:** FALL/SPR

BIOS 435 Evolutionary Medicine  
**Crosslisted with:** BIOS 835  
**Prerequisites:** BIOS 207 and senior standing  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option  
**Offered:** SPRING

ACE: ACE 10 Integrated Product

BIOS 436 Macroecology  
**Crosslisted with:** BIOS 836  
**Prerequisites:** BIOS 207  
**Description:** Species-area relationships, latitudinal gradients in species richness, abundance diversity relationships, ecological scaling relationships with body size, community assembly, evolutionary dynamics, climate change, and human impacts on the ecology of the Anthropocene.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option
BIOS 437 Research Techniques in Biochemistry
Crosslisted with: BIOC 437, BIOC 837, BIOS 837
Prerequisites: BIOS/BIOC/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
Grading Option: Graded with Option
Prerequisite for: VBMS 919
Course and Laboratory Fee: $50

BIOS 439 Dynamics of Biochemical and Biological Networks
Crosslisted with: BIOC 439, BIOC 839, BIOS 839
Prerequisites: BIOC 206 or PLAS 215; BIOC 401 or BIOC 431
Notes: Letter grade only.
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
Grading Option: Graded
Offered: SPRING
Prerequisite for: ASCI 494, ASCI 949, NUTR 949; BIOS 932, BIOS 933, CHEM 932; BIOS 933, CHEM 933; BIOC 998

BIOS 440 Microbial Physiology
Crosslisted with: BIOS 840, VBMS 840, MBIO 440, VBMS 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
Grading Option: Graded with Option
Course and Laboratory Fee: $20

BIOS 441 Pathogenic Microbiology
Crosslisted with: BIOS 441, VBMS 441, 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
Grading Option: Graded with Option
Offered: SPRING
Prerequisite for: VBMS 805; VBMS 949
Course and Laboratory Fee: $25

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
Grading Option: Graded with Option

BIOS 443 Immunology
Crosslisted with: BIOS 843, VBMS 843, MBIO 443, VBMS 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
Grading Option: Graded with Option
Prerequisite for: VBMS 852; VBMS 908; VBMS 910; VBMS 948; VBMS 949

BIOS 444 Earth and Environmental Microbiology
Crosslisted with: BIOS 844, GEOL 444, GEOL 844
Prerequisites: 3 hours of BIOS or 3 hours of LIFE; 3 hours of CHEM
Description: An introduction into the role that microorganisms play and have played in natural and man-made environments. Topics covered include microbial diversity and physiology in soil, sediment, and water; microbes in Earth history; biogeochemical cycling; mineral formation and dissolution; biodegradation and bioremediation; biotechnology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

BIOS 445 Food Microbiology
Crosslisted with: BIOS 845, FDST 405, FDST 805
Prerequisites: BIOS 312
Notes: BIOS 401 or BIOS 431 recommended
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: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: BIOS 446, BIOS 846, FDST 406, FDST 806; FDST 424, FDST 824; FDST 425, FDST 825; FDST 455L, FDST 855L; MBIO 455L; FDST 460, FDST 860; FDST 867; FDST 875; 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
Grading Option: Graded with Option
Course and Laboratory Fee: $40

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
Grading Option: Graded with Option
Offered: SPRING

BIOS 451 Invertebrate Paleobiology
Crosslisted with: GEOL 451, BIOS 851, GEOL 851
Prerequisites: At least one of: GEOL 103, GEOL 105, LIFE 121
Description: Overview of the key traits, relationships and evolutionary dynamics of invertebrate animals over Earth’s history, particularly over the Phanerozoic (i.e., the last 540 million years). Emphasis on the use of invertebrate fossil record to test ideas about long term evolutionary patterns as well as learning the histories and basic anatomies of major invertebrate taxa.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
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
Grading Option: Graded with Option
Offered: SUMMER
Prerequisite for: VBMS 949
ACE: ACE 10 Integrated Product
Experiential Learning: Fieldwork

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
Grading Option: Graded with Option
Offered: SUMMER
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: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
ACE: ACE 10 Integrated Product

BIOS 455 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
Grading Option: Graded

BIOS 456 Ecosystem Ecology
Crosslisted with: BIOS 857, GEOL 457, GEOL 857
Prerequisites: BIOS 207 and CHEM 110A and 110L 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
Grading Option: Graded with Option
Prerequisite for: BSEN 954, NRES 954
ACE: ACE 10 Integrated Product
BIOS 458 Wetlands
Crosslisted with: NRES 468, NRES 868, BSEN 468, BSEN 868
Prerequisites: CHEM 109A and 109L and CHEM 110A and 110L, or CHEM 105A and 105L and CHEM 106A and 106L; Junior or Senior Standing.
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
Grading Option: Graded with Option
Course and Laboratory Fee: $40

BIOS 459 Limnology
Crosslisted with: BIOS 859, NRES 459, NRES 859
Prerequisites: BIOS 207 or NRES 220; CHEM 106A & CHEM 106L or CHEM 110A & CHEM 110L
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
Grading Option: Graded with Option
Offered: SPRING
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $25

BIOS 460 Soil Microbial Ecology
Crosslisted with: PLAS 460, NRES 460, SOIL 460, AGRO 860, BIOS 860, NRES 860
Prerequisites: Senior standing.
Notes: Recommend having a strong science background, including courses from the agronomic, environmental, microbiology, engineering or medicine disciplines.
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
Grading Option: Graded with Option
Offered: SPRING

BIOS 461 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
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

BIOS 465 Behavioral Neuroscience
Crosslisted with: BIOS 865, PSYC 465, PSYC 865
Prerequisites: PSYC 273
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
Grading Option: Graded with Option

BIOS 466 Advanced Methods in Neurobiology
Crosslisted with: BIOS 866
Prerequisites: LIFE 120
Notes: BIOS 206 and BIOS 213 are recommended.
Description: Examination of current technologies and methodologies used in neuroscience pertaining to medical, laboratory, and industrial applications across several organisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING

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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

BIOS 474 Herpetology
Crosslisted with: BIOS 874, NRES 474, NRES 874
Prerequisites: NRES/BIOS 386
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
Grading Option: Graded with Option
Offered: FALL
Course and Laboratory Fee: $90
BIOS 475 Avian Biology
Crosslisted with: BIOS 875, NRES 471, NRES 871
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
Grading Option: Graded with Option
Experiential Learning: Fieldwork

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
Grading Option: Graded with Option

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
Grading Option: Graded with Option
Course and Laboratory Fee: $25

BIOS 477 Bioinformatics and Molecular Evolution
Crosslisted with: BIOS 877
Prerequisites: BIOS 206 or parallel; CHEM 251 or CHEM 255 or CHEM 251.
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
Grading Option: Graded with Option

BIOS 478 Plant Anatomy
Crosslisted with: BIOS 878, PLAS 478, AGRO 878, HORT 878
Prerequisites: 8 hrs biological sciences
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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

BIOS 481 Stream and River Ecology
Crosslisted with: WATS 881K, NRES 481K, NRES 881K
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
Grading Option: Graded
Course and Laboratory Fee: $20
Experiential Learning: Fieldwork

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
Grading Option: Graded with Option
Prerequisite for: BIOS 485L, BIOS 885L, ENTO 402L, ENTO 802L, BIOS 880, BIOS 880K, BIOS 880L, 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
Grading Option: Graded with Option
Course and Laboratory Fee: $25
BIOS 497 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
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product
Experiential Learning: Fieldwork

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
Grading Option: Graded with Option

BIOS 491 Special Topics in Biological Sciences
Crosslisted with: BIOS 891
Prerequisites: BIOS 206 or BIOS 207
Description: Topics vary.
Credit Hours: 1-4
Min credits per semester: 1
Max credits per semester: 4
Max credits per degree: 9
Grading Option: Graded with Option

BIOS 498 Independent Research in Biological Sciences
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: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
Grading Option: Graded with Option
Experiential Learning: Research

BIOS 499 Undergraduate Thesis
Prerequisites: Permission.
Description: Independent research leading to a thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

BIOS 499H Honors Undergraduate Thesis
Prerequisites: Permission
Description: Independent research leading to an honors thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

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
- Hospital Lab Assistant, Labcorp – Lincoln, NE
- Data Analyst, Neogen Geneseek – Lincoln, NE
- Medical Research Assistant, Celerion – Lincoln, NE
- Home Health Aide, Caretech – Hastings, NE
- Zookeeper, Omaha Henry Doorly Zoo – Omaha, NE
- Clinical Research Assistant – The Medical College of Wisconsin
- Veterinary Assistant, Yankee Hill Veterinary Hospital – Lincoln, NE
- Patient Care Technician, Vanderbilt Children’s Hospital – Nashville, TN
- Associate Scientist, Catalent – Kansas City, MO
- Recruiter, Prolink Healthcare – Chicago, IL

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, UNMC 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, Biology Department - Lincoln NE

Graduate & Professional Schools
• Master's Degree, Health Informatics, University of Michigan – Ann Arbor, MI
• Master's Degree, Ecology and Evolutionary Biology, Queen Mary University of London – London, United Kingdom
• Master's Degree, Sustainability Planning and Management, University of Colorado at Boulder – Boulder, CO
• Master's Degree, Business Administration in Health Care Delivery and Sciences, University of Tulsa – Tulsa, OK
• Master's Degree, Emerging Infectious Disease and Microbiology, George Washington University – Washington D.C.
• Master's Degree, Geosciences and Paleontology, East Tennessee State University – Johnson City, TN
• Master's Degree, Public Health, University of Nebraska Medical Center – Omaha, NE
• Doctor of Medicine, University of Nebraska Medical Center – Omaha, NE
• Doctor of Dentistry, University of Nebraska Medical Center College of Dentistry – Lincoln, NE
• Doctoral Degree, Molecular Biology, Princeton University – Princeton, NJ