

Life Sciences / Biology (BIO)
Life Sciences Department
School of Natural & Social Sciences
Carhart Science Building

Objectives: The Biology/Life Sciences major provides students with career choices in biotechnology, organismal biology, environmental biology, or biology education. The Biology/ Life Sciences program also offers courses to students preparing for further study in Clinical Laboratory Science, Mortuary Science, Respiratory Therapy, other health science fields, Agriculture, Forestry, or Wildlife Management. Courses in Biology offer majors and non-majors the background required to think critically about the role of the living world in their lives.

Life Sciences Major (BA or BS) 42-55 hours

Life Sciences Core: 12 hours

BIO	110 Biology Concepts.....	4
CHE	106 General Chemistry I.....	4
PHY	201 General Physics I.....	3
	321 Physics Laboratory I.....	1

Plus one of the following concentrations:

Biology Concentration: 43 hours + 12 hour core

Biology concentration majors must complete MAT 180 Applied Probability and Statistics (3) for the Block 2 Mathematics General Education requirement. Students must take BIO 370 before taking BIO 394 or 465.

BIO	200 Zoology.....	4
	210 Botany.....	4
	301 Biology Seminar.....	1
	320 Molecular Genetics.....	4
	370 Introduction to Research.....	2
	425 Evolution.....	3
	394 Biology Cooperative Education or	
	465 Continuing Research.....	1
	469 Senior Seminar in Biology or	
	470 Research Project	1
CHE	107 General Chemistry II.....	4
	208 Intro Organic Chem or	
	314 Organic Chem I	4

Select one of the two tracks of study below:

Biology Track:

BIO	325 Ecology.....	4
BIO	electives numbered 300 or above	11

OR

Biomedical Track:

BIO	330 Histology	4
	434 Advanced Cellular Biology.....	3
BIO	electives numbered 300 or above.....	8

CHE 326 Biochemistry I (4) may be taken in lieu of one Biology elective course in either track.

Biology/Food Science Concentration: 38 hours + 12 hour core

Students graduating with a biology/food science

concentration major must complete MAT 180 Applied Probability and Statistics (3) to satisfy the Block 2 Mathematics General Education requirement. Students must take BIO 370 before taking BIO 394 or 465.

BIO	200 Zoology.....	4
	210 Botany	4
	320 Molecular Genetics.....	4
	370 Introduction to Research.....	2
	385 Microbiology.....	4
	425 Evolution.....	3
	394 Biology Cooperative Education or	
	465 Continuing Research	1
	469 Senior Seminar in Biology or	
	470 Research Project	1
CHE	107 General Chemistry II.....	4
	314 Organic Chemistry.....	4
FDST	405 Food Microbiology.....	3**
	406 Food Micro Lab.....	2**
	451 Seminar.....	2**

UNL classes (**)

Students completing this major are strongly encouraged to take CHE 315 Organic Chemistry II (4), CHE 326 Biochemistry I (4) and MAT 140 Calculus I (5) before transferring to UNL.

In addition to the required courses above, students must complete a minimum of 40 credit hours of 300 level or above course work and a minimum of 125 credit hours for a biology degree from WSC. WSC will waive the requirement that 24 of the last 30 hours be completed at WSC, as long as the student completes 95 credit hours* prior to transferring to the University of Nebraska-Lincoln to complete the Biology/Food Science Major. *Note: 30 of the 95 credit hours must be taken at WSC.

The courses listed below are required of the Food Science program at the University of Nebraska-Lincoln and will be accepted by WSC toward the appropriate minimum credit hour requirements.

FDST	203 Food Composition.....	2
	207 Food Analysis.....	3
	403 Quality Assurance.....	2
	448 Food Chemistry.....	3
	449 Food Chem Lab.....	1
	464 Heat/Mass Tran.....	2
	465 Unit Operations.....	3
CHE	221 Quantitative Analysis.....	4

In addition to these courses, students must complete 6 credit hours of course work in any of the following 3 credit hour Food Science Commodities courses offered at UNL only (FDST 412 Cereal Science (3), 418 Eggs (3), 429 Dairy Prod. Technology (3), 420 Post-Harvest Physiology (3), 455 Bioprocessing of Foods (3), ASCI 310 Fresh Meats (3) or 410

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Processed Meats (3). And take either NUTR 445 or ASCI 421.

Subject Endorsement-Life Sciences/Biology Education

Concentration: 30 hours + 12 hour core

MAT 180 Applied Probability and Statistics (3) **or both** MAT 121 College Algebra (3) **and** MAT 122 Applied Trigonometry (1) must be taken as the Block 2 Mathematics General

Education requirement.

BIO	200 Zoology.....	4
	210 Botany.....	4
	220 Human Anatomy.....	4
	325 Ecology.....	4
	340 Human Physiology.....	4
	385 Microbiology.....	4
	393 Laboratory Techniques.....	2

EAS 110 Intro to Meteorology.....4

EDU 409 Science Content Area Methods and Materials is required. A second subject endorsement is required for a Nebraska teaching certificate.

The B.S. in Health Sciences will be awarded by completing either of the following options:

(Life Sciences) Health Sciences 3+1 Concentration: 12 hours core + hours by advisement to total 95 hours + 30 hours of HSC 498

This 3+1 concentration requires students to complete 95 semester hours of a prescribed pre-professional curriculum including the above courses accepted by WSC and successfully complete the first year of the approved professional program at a professional school awarding Master's or Doctoral degrees. Students register at WSC for HSC 498 (no tuition requirement) for 30 hours and complete one year of course work in an approved professional program.

(Life Sciences) Health Sciences 2+2 Concentration: 63 hours by advisement + 62 hours of HSC 498

This 2+2 concentration requires students to complete a minimum of 63 hours of a prescribed pre-professional curriculum accepted by WSC and successfully complete the first two years of the approved professional program at a professional school awarding Master's or Doctoral degrees, where a Master's or Doctorate is the sole professional degree offered. Students register at WSC for 31 hours of HSC 498 (no tuition requirement) in both their junior and senior years and complete two years of course work in an approved professional program.

Students in these programs are exempted from the requirement that the last 30 hours be taken at WSC.

Clinical Laboratory Science Concentration: 12 hour core + 43 hours + Clinical year

MAT 180 Applied Probability and Statistics (3) must be taken for the Block 2 Mathematics General Education requirement.

BIO	220 Human Anatomy.....	4
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BIO	320 Molecular Genetics.....	4
	340 Human Physiology.....	4
	385 Microbiology.....	4
	486 Immunology.....	2
CHE	107 General Chemistry II.....	4
	208 Intro Organic Chem.....	4
	301 Introduction to Clinical Chemistry.....	1
	326 Biochemistry I.....	4

MAT 121 College Algebra.....3

Elective courses numbered 300 or above from any department.....9

HSC 498 Professional Clinical Year Experience at an Affiliated Hospital.....30

A minimum of 95 semester hours is required prior to the clinical year. No minor is required.

The Clinical Laboratory Science Program satisfies the requirements and standards established by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS).

Sequence of Clinical Laboratory Science Program:

1. Freshman year: Declare the major and begin taking the required courses with counsel of advisor.
2. Sophomore year: Continue courses in the required sequence.
3. Junior year: Make application to the affiliated hospital (hospitals) of your choice.
4. Senior year: Register at WSC for HSC 498 (no tuition requirements) and complete the course work at one of our affiliates.
5. Make application for graduation to the Records & Registration Office at WSC a semester before the expected date of graduation.

Mortuary Science Concentration: 12 hour core + 41 hours + Clinical year.

MAT 121 College Algebra (3) must be taken as the Block 2 Mathematics General Education requirement.

PSY 101 General Psychology (3) and SOC 110 Introduction to Anthropology (3) must be taken as part of the Block 3 Social Sciences General Education requirement.

BIO	220 Human Anatomy.....	4
	340 Human Physiology.....	4
BUS	222 Business Law I.....	3
	240 Accounting I.....	3
	241 Accounting II.....	3
CHE	107 General Chemistry II.....	4
	208 Intro Organic Chem.....	4
PSY	316 Social Psychology.....	3
	Elective courses numbered 300 or above from any department.....	13
HSC	498 Clinical Year at an affiliated	

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Mortuary Science School.....30
 A minimum of 95 semester hours is required prior to the Professional Clinical Year at an affiliated Mortuary Science School.

Sequence of Mortuary Science Program:

1. Freshman year: Declare the major and begin taking the required courses with the counsel of advisor.
2. Sophomore year: Continue courses in the required sequence. Take application to an affiliate in the Professional Training Schools Inc.
3. Junior year: Complete all necessary courses both those in General Education and those required by the affiliate. Complete the application to the affiliate and secure approval from the department chair.
4. Senior year: Register at WSC for HSC 498 and complete the courses at one of our affiliates.
5. Make application for graduation to the Records & Registration Office at WSC at least three months before the expected date of graduation.

Respiratory Therapy Concentration: 12 hour core + 41 hours + Clinical year at an approved Respiratory Therapist program.

MAT 121 College Algebra (3) must be taken for the Block 2 Mathematics General Education requirement.

BIO	220 Human Anatomy.....	4
	340 Human Physiology.....	4
	385 Microbiology.....	4
	486 Immunology.....	2
BUS	360 Management Theory and Practice.....	3
CHE	107 General Chemistry II.....	4
	208 Intro Organic Chem.....	4
FCS	207 Nutrition.....	3
HSC	345 CPR-Healthcare Provider.....	1
PSY	230 Lifespan Development.....	3
	Elective courses numbered 300 or above from any department.....	9
HSC	498 Professional Clinical Year.....	35

Minor in Biology: 20 hours

A minor must include a minimum of 12 hours unduplicated by the student's major(s) and minor(s).

BIO	110 Biology Concepts.....	4
	16 hours of Biology electives.....	16

At least 12 of the additional 16 hours of Biology electives must be numbered 300 or above.

Minor in Environmental Studies: 20 hours

A minor must include a minimum of 12 hours unduplicated by the student's major(s) and minor(s).

BIO	145 Environmental Studies Seminar.....	1
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BIO	345 Conservation Biology.....	3
GEO	430 Geographic Information Systems.....	3
POS	380 Public Policy.....	3
SOC	420 Environmental Sociology.....	3
	Plus 7 hours of electives from the following:.....	7
BIO	104 Environmental Concerns (3) 325 Ecology (4)	
BUS	418 Legal Environment of Business (3)	
CHE	400 Environmental Chemistry (3)	
EAS	110 Introduction to Meteorology (4)	
EAS	120 Introduction to Geology (4)	
ECO	360 Global Economics (3)	
GEO	315 World Economic Geography (3)	
PSY	316 Social Psychology (3)	
SOC	355 Human Populations (3)	

Undergraduate Courses

BIO 102 Biology for General Education (3) Selected topics in Biology to be presented by the laboratory oriented approach, and in compliance with the requirements of General Education. Does not apply to any major, minor, or endorsement in any science area (BIO, CHE, EAS, NAT) unless specified. (4 hours lecture-lab combined)

BIO 104 Environmental Concerns for General Education (3) Selected topics of Environmental Concerns to be presented by the laboratory-oriented approach, and in compliance with the requirements of General Education. Does not apply to any major, minor, or endorsement in any science area (BIO, CHE, EAS, NAT) unless specified. (4 hours lecture-lab combined)

BIO 110 Biology Concepts (4) Prerequisite: One year of high school Biology or BIO 102. The first course for biology majors. A grade of C- or better in this course is a prerequisite for all biology courses in the biology concentration. A study of the microscope, basic cell structure and function, DNA replication, mitosis, meiosis, genetics, evolution, population biology, and diversity. (3 hours lecture, 3 hours lab)

BIO 145 Environmental Studies Seminar (1) A discourse on environmental problems and opportunities through research, discussion and guest lectures. May be repeated once for a maximum of two (2) hours.

BIO 200 Zoology (4) Prerequisite: A grade of C- or better in BIO 110. A study of the principles of biology as they apply to the uniformity, diversity and organization of the animal kingdom. (3 hours lecture, 3 hours lab)

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BIO 210 Botany (4) Prerequisite: A grade of C- or better in BIO 110. A study of the biological principles applicable to the diversity, form and function, evolution, and ecology of plants and plant-like organisms. (3 hours lecture, 3 hours lab)

BIO 220 Human Anatomy (4) Prerequisite: BIO 110. Study of the anatomic structure of the human organism. The 11 organ systems of the human and representative quadrupeds will be examined in detail with lecture, dissection and other laboratory exercises. Dissection is required of all students taking this course. An understanding of human anatomy is beneficial for students that will ultimately enroll in advanced courses of cell biology, histology, comparative vertebrate embryology and anatomy, and parasitology. Having training in human anatomy is also beneficial for students interested in health-related and biomedical careers. (3 hours lecture and one 3 hour lab)

BIO 280 Biology in Society – Honors (3). An investigation of biological principles, as well as their applications and impacts in society. Discussion and laboratory topics include evolution, biodiversity, and recombinant DNA technology. (4 hours lecture-lab combined)

BIO 300 Invertebrate Zoology (4) Prerequisite: BIO 200. The morphology, anatomy, paleontology, evolution and distribution of representative invertebrate groups. (3 hours lecture, 3 hours lab)

BIO 301 Biology Seminar (1) Prerequisite: A grade of C- or better in BIO 110. Lecture and discussion of topics relevant to the science and practice of biology. Topics vary based on the faculty member leading the course. The course may be repeated for a maximum of four (4) credit hours, by advisement, when no duplication of topic exists but a maximum of only two (2) credit hours can count towards any Life Sciences major.

BIO 305 Vertebrate Zoology (4) Prerequisite: BIO 200. The morphology, anatomy, paleontology, evolution, physiology, and distribution of representative vertebrate groups. (3 hours lecture, 3 hours lab)

BIO 320 Molecular Genetics (4) Prerequisites: A grade of C- or better in BIO 110, CHE 106. A study of the mechanisms of inheritance, the molecular basis of gene action and the use of molecular techniques and molecular technology in biomedical, agricultural, and industrial research. The lab component of this course focuses on hands-on use of molecular

equipment and technologies used in graduate and industrial molecular based research. (3 hours lecture, 3 hours lab)

BIO 325 Ecology (4) Prerequisite: 8 hours of Biology. An evolution-based study of the interrelationships of organisms and their environment. (3 hours lecture, 3 hours lab)

BIO 330 Histology (4) Prerequisite: BIO 110. Study of the structure and function of cells, tissues, and organs of organisms. Prepared slides of human and other vertebrate organs and tissues will be studied with light microscopy. Students will also learn techniques associated with slide preparation and slide organization. An understanding of human anatomy would be beneficial to students taking this course. Histology is highly recommended for students interested in health-related, biomedical, and biological careers. (3 hours lecture, 3 hours lab)

BIO 340 Human Physiology (4) Prerequisites: BIO 220, CHE 106. A study of the fundamental physiological processes of the human body. Functions of the 11 organ systems will be studied. (3 hours lecture and one 3-hour lab)

BIO 345 Conservation Biology (3) Prerequisite: Junior Standing. A study of habitat assessment, ecosystem management and ecological restoration. Students will integrate knowledge gained from various disciplines to develop conservation management plans.

BIO 370 Introduction to Research (2) Prerequisite: A grade of C- or better in BIO 110, 8 hours of Biology. This course is designed for Biology majors as an introduction to scientific writing, library research, data collection and data analysis. The student will be expected to use the skills learned in this course to establish a proposal for a research project for BIO 465 and 470.

BIO 385 Microbiology (4) Prerequisites: A grade of C- or better in BIO 110, CHE 106. Topics of study detail the structure and physiology of microorganisms including mechanisms of pathogenesis. Beneficial aspects of microorganisms are also discussed with regard to both the human body and the environment. Lab techniques include microbial identification, enumeration procedures and student designed research. (3 hours lecture, 3 hours lab)

BIO 393 Laboratory Techniques (1) Prerequisite: Junior standing. Assisting in the preparation and evaluation of laboratory activities. Course may be repeated for a maximum of two (2) credits. Instructor approval required.

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BIO 400/500 Advanced Zoology (3) Prerequisite: BIO 200. A laboratory and field course oriented on the morphology, taxonomy, and ecology of selected animal groups such as insects, fish, reptiles and amphibians, mammals, or other groups. (3 hours lecture-lab combined)

BIO 405/505 Advanced Plant Biology (3) Prerequisite: BIO 210. Classification, structure, and/or physiology of plants and plant-like organisms. (3 hours lecture-lab combined)

BIO 409 Comparative Embryology and Anatomy (4) Prerequisite: BIO 110 and CHE 107. A comparative study of vertebrate embryonic development and anatomy with emphasis on morphogenesis, function, and evolution of organ systems. (3 hours lecture, 3 hours lab)

BIO 425 Evolution (3) Prerequisites: A grade of C- or better in BIO 110, and BIO 200, BIO 210, and BIO 320. The study of the history of evolutionary thought, beginning with pre-Darwinian ideas and ending with our current understanding of evolutionary mechanisms. The course will explore the evidence for evolution by examining the fossil record, comparative anatomy/physiology, and model field studies. Students will learn the model systems demonstrating the mechanisms that drive evolution: mutation, selection, genetic drift, gene flow, and inbreeding. Evolution is a unifying theme in biology which integrates knowledge from all biological disciplines. (3 hours lecture-lab combined)

BIO 430/530 Parasitology (3) Prerequisite: BIO 110. Study of animal parasites and the effects they have on their hosts. Studies in this course center on parasites of humans, other vertebrates and invertebrates. Taxonomy, morphology, development, physiology, identification, epidemiology and pathogenesis are emphasized. An understanding of human anatomy and histology would be beneficial to students taking this courses. Parasitology is highly recommended for students interested in health-related, biomedical and biological careers. (3 hours lecture-lab combined)

BIO 434 Advanced Cellular Biology (3) Prerequisites: BIO 320, CHE 107. An advanced study of the structure and function of the eukaryotic cell. Topics will include the basics of modern cell biology including signal transduction, cell cycle regulation, and gene expression. (3 hours lecture-lab combined)

BIO 445 Molecular Biology (3) Prerequisite: BIO 320. This course is designed to give students a working knowledge in the field of molecular biology. It will introduce cloning

techniques, DNA sequencing, site directed mutagenesis, electrophoresis and the polymerase chain reaction. A discussion of these techniques and current developments in gene therapy, forensic analysis and molecular systematics will be included. (3 hours lecture/lab combined)

BIO 451/551 Advanced Ecology (3) Prerequisite: BIO 325. The study of interrelationships of organisms to their environment in terrestrial and freshwater habitats. (3 hours lecture-lab combined)

BIO 465 Continuing Research (1) Prerequisites: A grade of C- or better in BIO 110, BIO 370. This course is a continuation of BIO 370. Students taking this course will be actively involved in research under their chosen advisor. This course is to be taken after BIO 370 but prior to BIO 470.

BIO 469 Senior Seminar in Biology (1) Prerequisite: A grade of C- or better in BIO 110, 370, and 394. Students will develop an oral and written presentation of their Biology Cooperative Education experience. Students will incorporate current research literature into their presentations.

BIO 470 Research Project (1) Prerequisites: A grade of C- or better in BIO 110, 370 and 465. This course is a continuation of BIO 370 and 465. Students will take this course as a means of completing their individual research project under the direction of a chosen instructor. A presentation of this research in both oral and written form is required at the conclusion of the course.

BIO 486/586 Immunology (2) The topics for this course will include the biological, physical and chemical properties of antigens and antibodies, host-antigen interaction, humoral and cellular response mechanisms, serologic reactions, mechanisms of antibody formation, hypersensitivity. (2 hours lecture-lab combined) Graduate students will be required to do an additional project and write a paper.

Eligible seniors may enroll in 500 level graduate courses.
Graduate Courses

BIO 500 Advanced Zoology (3) See BIO 400. Students registering for BIO 500, a graduate level, dual numbered course will be assigned an additional project that focuses on the application of the course materials to the secondary education classroom.

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BIO 505 Advanced Plant Biology (3) See BIO 405. Students registering for BIO 505, a graduate level, dual numbered course will be assigned an additional project that focuses on the application of the course materials to the secondary education classroom.

BIO 530 Parasitology (3) See BIO 430. Students registering for BIO 530, a graduate level, dual numbered course will be assigned an additional project that focuses on the application of the course materials to the secondary education classroom.

BIO 551 Advanced Ecology (3) See BIO 451. Use of field collecting methods by group participation to analyze and compare ecological systems. Simulations and published data will be used to study effects of local conditions on ecosystems. Students registering for BIO 551, a graduate level, dual numbered course will be assigned an additional project that focuses on the application of the course materials to the secondary education classroom.

BIO 586 Immunology (2) See BIO 486. Students registering for BIO 586, a graduate level, dual numbered course will be assigned an additional project that focuses on the application of the course materials to the secondary education