

BIOLOGY

Biology Mission Statement

The Chadron State College biology program cultivates an understanding of scientific inquiry and its limitations, the differences and interconnectedness among various scales of focus, and the components and emergent properties inherent between different levels of living systems.

Student Learning Outcomes

- Students will exhibit a strong knowledge base and the skills to be lifelong learners.
 - Students will exhibit a strong foundational knowledge to be able to acquire new information and apply scientific reasoning to critically evaluate information.
 - Students will apply logical reasoning and organizational skills to integrate new information into their functional knowledge base.
 - Students will integrate information from different scales of view and demonstrate understanding of components and emergent properties among different levels of living systems.
 - Students will be prepared for their profession in the science discipline.
 - Students will articulate the interrelatedness of science, technology, and society, and effectively communicate scientific knowledge to a diverse audience.
 - Students will embody the professional characteristics appropriate for their chosen career.
 - Students will effectively utilize scientific inquiry and reasoning to address issues within their profession.
- The Degree of Bachelor of Science with a Comprehensive Major in Biology (<http://catalog.csc.edu/undergraduate/programs/biology/bs-comprehensive-major-biology/>)
 - Biological Resources Option
 - General Biology Option
 - Human Biology Option
 - Molecular Biology Option
 - Organismal Biology Option
 - The Degree of Bachelor of Science with a Comprehensive Major in Health Sciences (<http://catalog.csc.edu/undergraduate/programs/biology/bs-comprehensive-major-health-sciences/>)
 - General Health Care Option
 - Pre-Chiropractic Medicine Option
 - Pre-Optometry Option
 - Pre-Pharmacy Option
 - Pre-Veterinary Medicine Option
 - Radiologic Technology Option
 - The Degree of Bachelor of Science in Education with a Subject Endorsement in Biology (Grades 7-12) (<http://catalog.csc.edu/undergraduate/programs/biology/bsed-subject-endorsement-biology-7-12/>)
 - Minor in Biology (<http://catalog.csc.edu/undergraduate/programs/biology/biology-minor/>)
 - Minor in Human Biology (<http://catalog.csc.edu/undergraduate/programs/biology/human-biology-minor/>)

- Minor in Plant Sciences (<http://catalog.csc.edu/undergraduate/programs/biology/plant-sciences-minor/>)
- Minor in Organismal Biology (<http://catalog.csc.edu/undergraduate/programs/biology/organismal-biology-minor/>)

Rural Health Opportunities Program

The Rural Health Opportunities Program (RHOP) is a cooperative program between Chadron State College (CSC) and the University of Nebraska Medical Center (UNMC). The purpose of the program is to recruit and educate traditional and non-traditional students from rural Nebraska who will return to practice in the rural areas of the state. This program represents a commitment and dedication to the education of Nebraskans and to provide quality health care to the citizens of the state. RHOP currently has options in

- medicine,
- dentistry,
- dental hygiene,
- pharmacy,
- medical laboratory science,
- physical therapy,
- nursing,
- physician assistant, and
- radiography.

Admission into each option of the program is competitive. Participants and alternates in this program will be selected by a committee of faculty members from CSC and UNMC. Participants in this program must maintain a specified minimum GPA to be "in good standing" and remain in the program. For information, application forms, admissions criteria, criteria for evaluation of progress in the program, and programs of study please contact the Health Professions Office at CSC.

Options

- Medical Laboratory Science participants in "good standing" will be automatically admitted to UNMC's School of Allied Health Professions when they have completed 95 course credits of study at CSC. The student will receive a Bachelor of Science degree in Medical Laboratory Science from UNMC upon successful completion of the four year program.
- Dental Hygiene participants in "good standing" will be automatically admitted to UNMC's School of Dentistry, West Division in Gering, NE when they have completed 63 course credits of study at CSC. The student will receive a Bachelor of Science degree in Dental Hygiene upon successful completion of the four year program.
- Dentistry participants in "good standing" will be automatically admitted to UNMC's School of Dentistry when they earn a Bachelor of Science degree at CSC. The D.D.S. degree will be awarded by UNMC upon successful completion of the professional program.
- Medicine participants in "good standing" will be automatically admitted to UNMC's School of Medicine when they earn a Bachelor of Science degree at CSC. The M.D. degree will be awarded by UNMC upon successful completion of the professional program.
- Nursing participants in "good standing" will be automatically admitted to UNMC's School of Nursing, West Division in Scottsbluff, NE when they complete the required two year program at CSC. The student will earn a Bachelor of Science degree in Nursing from UNMC upon successful completion of the four year program.

- Pharmacy participants in “good standing” will be automatically admitted to UNMC’s School of Pharmacy when they have completed 98 course credits of study at CSC. Pharmacy participants may earn a B.S. in Health Sciences through the 3+1 program at CSC. The Doctor of Pharmacy (PharmD) degree will be awarded by UNMC upon successful completion of the professional program.
- Physical Therapy participants in “good standing” will be automatically admitted to UNMC’s School of Allied Health Professions when they earn a Bachelor of Science degree at CSC. The Doctor of Physical Therapy will be awarded from UNMC upon successful completion of the professional program.
- Physician Assistant participants in “good standing” will be automatically admitted to UNMC’s School of Allied Health Professions when they earn a Bachelor of Science degree at CSC. The Master of Physician Assistant degree will be awarded from UNMC upon successful completion of the professional program.
- Radiography participants in “good standing” will be automatically admitted to UNMC’s School of Allied Health Professions when they complete the required two year program at CSC. The student will receive a Bachelor of Science degree in Radiation Science Technology from UNMC upon successful completion of the four year program.
- Successfully complete the UNMC, online *CPH 500 Foundations of Public Health* course during the spring semester of student’s junior year. Special permission for taking the course following the student’s junior year requires written approval from respective PHEAST Advisor and the UNMC MPH Program Director.
- Earn a “C” or better in each course.
- Obtain a recommended score at or above the 40th percentile on the GRE.
- Complete a Bachelor’s degree from CSC.

Public Health Early Admission Student Track (PHEAST)

PHEAST is a collaboration between the University of Nebraska Medical Center (UNMC) College of Public Health (CoPH) and Chadron State College (CSC). PHEAST students will gain provisional acceptance to the Masters of Public Health Program (MPH) CoPH following the completion of their sophomore year at CSC. PHEAST students in good standing will receive a tuition waiver their junior and senior year at CSC. The CoPH will accept up to three PHEAST students per year. While the CoPH and CSC will encourage students with rural backgrounds to apply to PHEAST, the program will be open to individuals who meet PHEAST requirements listed below:

- Nebraska residents who will have completed approximately 60 credit hours, but no more than 80 credit hours toward their undergraduate program of study at the time of entry into the PHEAST program
- Students must complete and submit a projected plan of study along with their application documents
- If the 3 campus slots are not filled, students who have completed more than 80 credit hours at time of entry into PHEAST may be considered on a case-by-case basis for admission into the program
- Students are required to be in good academic standing and have a cumulative 3.2 grade point average

Prior to matriculation into the MPH program, PHEAST students are required to:

- Visit the UNMC campus and mentors in the fall of their junior and senior years.
- Complete his/her chosen course of study at his/her respective undergraduate institution.
- Successfully complete an undergraduate college level statistics course with a grade of B or higher. High school dual credit courses cannot be considered.
- Complete courses in a timely manner and must be prepared to enter the UNMC College of Public Health Master of Public Health (MPH) Program following successful completion of course of study at his/her respective undergraduate institution.

BIOL 121 HUMAN BIOLOGY2 Credits

An introductory study of the structure and function of the human body.

Essential Studies: SLO #6

Co-requisites: BIOL 121L

Notes: Not for Biology or Health Science majors and minors.

BIOL 121L HUMAN BIOLOGY LABORATORY1 Credit

Laboratory experience in the structure and function of the human body.

Essential Studies: SLO #6

Co-requisites: BIOL 121

BIOL 132 MEDICAL TERMINOLOGY2 Credits

The study of prefixes, suffixes and roots of words used in medical and biological fields, emphasizing their origin in the Greek and Latin languages.

Notes: Designed for biology majors and pre-professional students in the health care fields; this course does not satisfy any essential studies requirements.

BIOL 136 BIOLOGICAL SCIENCE2 Credits

A survey of biological knowledge and principles designed to meet the needs of the non-science major.

Essential Studies: SLO #6

Co-requisites: BIOL 136L

Notes: No credit towards biology major or minor.

BIOL 136L BIOLOGICAL SCIENCE LABORATORY1 Credit

Laboratory experience in biological study, including technology to explore and to gather scientific data.

Essential Studies: SLO #6

Co-requisites: BIOL 136

BIOL 137 PRINCIPLES OF CELLULAR SYSTEMS3 Credits

Cellular principles, including biological chemistry, cell structure and function, cellular metabolism, genetics, and cellular interactions.

Essential Studies: SLO #6

Co-requisites: BIOL 137L

Notes: This course does not apply toward a Science (Biology or Physical Science 4-year majors); the course can be applied toward the Human Biology Minor, the Health Sciences Radiography program, specific 2-year pre-health professions preparation programs, or as an elective toward graduation.

BIOL 137L PRINCIPLES OF CELL SYSTEMS LABORATORY1 Credit

Investigatory inquiry into cell systems and technologies used to study those systems and use of models in understanding cellular systems.

Essential Studies: SLO #6

Co-requisites: BIOL 137

Notes: This course does not apply toward a Science (Biology or Physical Science 4-year majors); the course can only be used for the Human Biology Minor, in specific 2-year pre-health professions preparation programs, in the Health Sciences Radiography program, or as an elective toward graduation.

BIOL 138 GENERAL BIOLOGY: BOTANY3 Credits

A survey of flowering plants, focusing on anatomy, foundational cellular and organismal physiology, and classification. Plant importance to humans and role in climate moderation and responses to climate change will be introduced.

Essential Studies: SLO #6

Co-requisites: BIOL 138L

BIOL 138L GENERAL BIOLOGY: BOTANY LABORATORY1 Credit

Laboratory experience in flowering plants.

Essential Studies: SLO #6

Co-requisites: BIOL 138

BIOL 139 GENERAL BIOLOGY: ZOOLOGY3 Credits

General scientific principles, diversity and origin of life, and fundamental cell biology, genetics, classification, ecology, anatomy, behavior of animals, phylogenetic relationships of major animal groups, and an introduction to the systematics, ecology and importance of fungi.

Essential Studies: SLO #6

Co-requisites: BIOL 139L

BIOL 139L GENERAL BIOLOGY: ZOOLOGY LABORATORY1 Credit

Laboratory experience in major animal group anatomy and phylogeny.

Essential Studies: SLO #6

Co-requisites: BIOL 139

BIOL 200 INDEPENDENT STUDY OR RESEARCH1-3 Credits

Study or research in an area of special interest.

Add Consent: Department Consent

Notes: The number of credit hours is determined by the topic and the amount of work required.

Requirements: Approval of instructor, School Dean, and Academic Vice President.

BIOL 225 CELLULAR BIOLOGY3 Credits

The form, functions, and physiology of eukaryotic cells, prokaryotic cells, viruses, and prions. This course assumes proficiency in freshman chemistry.

BIOL 230 HISTOLOGY2 Credits

In Human Histology Students will explore general tissue characteristics, while examining their composition, structures and the structure-function relationship in different tissues and organs. This course is designed for students who are planning on continuing on to professional school.

BIOL 237 ENVIRONMENTAL SCIENCE3 Credits

Human interactions and impacts on the physical, chemical and biological components of the global ecosystem.

Essential Studies: SLO #6

BIOL 239 ANIMAL CLASSIFICATION3 Credits

The phylogenetic treatment of vertebrate and invertebrate animals, living and extinct.

Prerequisites: BIOL 138, 138L and 139, 139L

Co-requisites: BIOL 239L

BIOL 239L ANIMAL CLASSIFICATION LABORATORY1 Credit

Laboratory experience in the phylogenetic relationships of animals.

Co-requisites: BIOL 239

BIOL 240 ANATOMY AND PHYSIOLOGY I3 Credits

The anatomy and physiology of the human body will be studied through the ten body systems. The content of this course includes the microscopic organization of the tissues of the body and the integument, skeletal, muscular, nervous systems.

Prerequisites: BIOL 137 and BIOL 137L or BIOL 138 and BIOL138L, BIOL 139, BIOL 139L and CHEM 131 and CHEM 131L or CHEM 140 and CHEM 140L

Co-requisites: BIOL 240L

Notes: This is the first semester of a two semester sequence with BIOL 242 Anatomy and Physiology II; this course is designed for students preparing for 2 year health professional schools.

BIOL 240L GROSS HUMAN ANATOMY LABORATORY1 Credit

Gross human anatomy laboratory uses donor bodies.

Co-requisites: BIOL 240

BIOL 241 MICROBIOLOGY3 Credits

Study of bacteria, molds, yeasts, algae, protozoa, viruses, and rickettsias.

Prerequisites: BIOL 137 and BIOL 137L or BIOL 138 and BIOL 138L, BIOL 139, and BIOL 139L

Co-requisites: BIOL 241L

BIOL 241L MICROBIOLOGY LABORATORY1 Credit

Laboratory experience in techniques for microbe identification.

Co-requisites: BIOL 241

BIOL 242 ANATOMY AND PHYSIOLOGY I13 Credits

The anatomy and physiology of the human body will be studied through the ten body systems. The content of this course includes the microscopic organization of the tissues of the endocrine, cardiovascular, lymphatic, respiratory, urinary, digestive, and reproductive systems.

Prerequisites: BIOL 240 and BIOL 240L

Co-requisites: BIOL 242L

Notes: This is the second semester of a two semester sequence with BIOL 240 Anatomy and Physiology I; this course is designed for students preparing for the 2 year health professional schools.

BIOL 242L HUMAN PHYSIOLOGY LABORATORY1 Credit

Laboratory experience in physiology of human systems, using technology and donor bodies.

Co-requisites: BIOL 242

BIOL 270 TOPICS IN BIOLOGY1-3 Credits

Special topics appropriate for lower division credit.

Notes: May be repeated with different emphasis for up to six hours credit.

BIOL 314 BIOTECHNOLOGY3 Credits

Hands-on procedures with lectures and readings to provide theoretical understanding and historical background of biotechnology work.

Cross-Listed: BIOL314/CHEM314

Prerequisites: BIOL 332 (can also be taken as Co-Requisite) and Sophomore or above status

BIOL 315 REGIONAL ANATOMY1 Credit

Regional anatomy of the human body will be studied. The purpose of this course is to be an accompaniment to the BIOL 340: Anatomy Cadaver lab experience.

Prerequisites: BIOL 240, 242 and instructor approval

Co-requisites: BIOL 340L

Add Consent: Instructor Consent

Requirements: Students must have previously taken a 200 level Anatomy (anatomy/physiology) course to a 300 level anatomy course. Instructor approval required.

BIOL 316 PHYSIOLOGY OF THE HUMAN SYSTEMS1 Credit

Physiology of the systems of the human body will be studied. The purpose of this course is to be an accompaniment to the BIOL 342: Physiology Lab.

Prerequisites: BIOL 240, 242 and instructor approval

Co-requisites: BIOL 342L

Add Consent: Instructor Consent

Requirements: Students must have previously taken a 200 level physiology (anatomy/physiology) course or a 300 level physiology course. Instructor approval required.

BIOL 320 SUPERVISED STUDY IN LAB AND FIELD METHODS1-2 Credits

Students will prepare, supervise, and evaluate laboratory exercises under the direction of faculty members. Designed to give students practical experience teaching in the laboratory setting.

Cross-Listed: BIOL/CHEM/GEOS/PHYS320

Prerequisites: Sophomore or above status

BIOL 323 BASIC HEMATOLOGY1 Credit

Basic hematology and urinalysis including microscope usage and care; blood cell formation, function and destruction; abnormal blood cells; blood clotting; coagulation disorders; and the chemical and physical examination of urine.

Prerequisites: BIOL 138, BIOL 138L, BIOL 139, BIOL 139L, BIOL 240, BIOL 240L, BIOL 242, BIOL 242L, CHEM 231, CHEM 231L and Sophomore or above status

Co-requisites: BIOL 323L

BIOL 323L BASIC HEMATOLOGY LABORATORY1 Credit

Laboratory experience in basic hematology and urinalysis.

Co-requisites: BIOL 323

Requirements: All students must have received two of the three hepatitis B vaccinations prior to beginning this course.

BIOL 332 GENETICS3 Credits

Transmission of traits from generation to generation, including Mendelian, molecular, and population genetics.

Prerequisites: BIOL 137 and BIOL 137L or BIOL 138 and BIOL 138L and BIOL 139, BIOL 139L, and CHEM 132 and CHEM 132L or CHEM 140 and CHEM140L, completion of Essential Studies SLO#4 and Sophomore or above status

BIOL 332L GENETICS LABORATORY1 Credit

Laboratory experience in inheritance, molecular genetic analysis, and genomic studies.

Prerequisites: Sophomore or above status

Co-requisites: BIOL 332

BIOL 333 HUMAN DISEASES IN THE RURAL ENVIRONMENT3 Credits

An introduction to the causes and spread of human diseases within populations and factors associated with distribution, including cellular/physiological, biological, behavior, sociocultural, evolutionary, and environmental factors. Using epidemiological and biological terminology and methods, critical thinking and basic analysis, students will be able to describe how diseases distribute through a populations and communities, as well as interpret and evaluate epidemiological and physiological studies. The U.S. and global view of epidemiology will also be discussed with an emphasis on the rural/urban divide in disease spread and health care access.

Prerequisites: BIOL 240, BIOL 340 or instructor permission and sophomore or above status

BIOL 336 GENERAL ECOLOGY2 Credits

The structure and function of nature with emphasis on biomes, ecosystems, communities, and populations.

Prerequisites: 6 hours from BIOL 138, BIOL 138L, BIOL 139, BIOL 139L, AGRI 141, AGRI 242 or AGRI 242L and Sophomore or above status

Co-requisites: BIOL 336L

BIOL 336L GENERAL ECOLOGY LABORATORY1 Credit

Laboratory experience in describing and quantifying organismal populations.

Prerequisites: Sophomore or above status

Co-requisites: BIOL 336

BIOL 337 ENVIRONMENTAL MANAGEMENT3 Credits

Ecosystem management, environmental planning, history of environmental protection, the roles of federal and state agencies, environmental law, environmental ethics, and professional skills relevant to those interested in land-management related careers in the public and private sector.

Prerequisites: 9 hours from AGRI, BIOL, CHEM and/or GEOS; sophomore or junior status

BIOL 339 COMPARATIVE ANATOMY AND PHYSIOLOGY3 Credits

A systemic approach to vertebrate anatomy and physiology examining how structures and organ systems have evolved through the different vertebrate groups from fish to mammals. The structure and function of vertebrate organ systems will be discussed in the context of developmental and evolutionary history.

Prerequisites: BIOL 138/138L, BIOL 139/139L and Sophomore or above status

Co-requisites: BIOL 339L

BIOL 339L COMPARATIVE ANATOMY AND PHYSIOLOGY LABORATORY1 Credit

Investigation of vertebrate anatomy and physiology through dissection of a variety of vertebrates and microscopic examination of selected histological preparations of tissues.

Prerequisites: BIOL 138/138L, BIOL 139/139L and Sophomore or above status

Co-requisites: BIOL 339

BIOL 340 HUMAN ANATOMY3 Credits

An advanced study of the microscopic and gross structure of the human body. This course will prepare the student for entry into BIOL 342. Donor bodies are used.

Prerequisites: BIOL 138, BIOL138L, BIOL 139, BIOL 139L, CHEM 132, CHEM 132L, and Sophomore or above status

Co-requisites: BIOL 340L

BIOL 340L GROSS HUMAN ANATOMY LABORATORY1 Credit

Gross human anatomy laboratory uses donor bodies.

Prerequisites: Sophomore or above status

Co-requisites: BIOL 340

BIOL 342 HUMAN PHYSIOLOGY3 Credits

The detailed human physiology of each organ system of the body is discussed at an advanced level. BioPac computer laboratory equipment and donor bodies are used.

Prerequisites: BIOL 340, BIOL 340L and CHEM 140 and CHEM 140L or CHEM 132 and CHEM 132L, and Sophomore or above status

Co-requisites: BIOL 342L

Notes: This is the second semester of a two semester sequence with BIOL 340; this course is designed for students preparing for 3-4 year professional schools.

BIOL 342L HUMAN PHYSIOLOGY LABORATORY1 Credit

Laboratory experience in physiology of human systems, using technology and donor bodies.

Prerequisites: Sophomore or above status

Co-requisites: BIOL 342

BIOL 343 PARASITOLOGY2 Credits

Taxonomy, morphology, physiology, life history, and control of the parasitic protozoans, helminthes, and arthropods.

Prerequisites: BIOL 138, BIOL 138L and BIOL 139, BIOL 139L or BIOL 225 and Sophomore or above status

BIOL 343L PARASITOLOGY LABORATORY1 Credit

Laboratory experience in identifying and understanding parasites of living systems.

Prerequisites: Sophomore or above status

Co-requisites: BIOL 343

BIOL 347 CRYPTOGAMIC BOTANY2 Credits

Phylogeny and ecology of bacteria, algae and fungi.

BIOL 347L CRYPTOGAMIC BOTANY LABORATORY1 Credit

Laboratory survey of bacteria, algae and fungi. Field trips required.

BIOL 350 FIELD BIOLOGY1-6 Credits

Two to five week field course offered between semesters, spring break, or during the summer.

Prerequisites: Sophomore or above status

Notes: One hour of credit may be earned for each week of full time participation; itinerary for each class will be announced several weeks prior to registration.

Requirements: Fees in addition to tuition will be charged; early registration required.

BIOL 390 INTERNSHIP IN BIOLOGY1-12 Credits

Provides practical experience as a biologist in government, business, or industry. Open to upper division students majoring in the area of biology.

Add Consent: Department Consent

Notes: Interested students should contact the Internship and Career Services office to secure application materials; application should be made prior to the semester the internship will be started; the amount of credit will be based on the availability of a suitable work position, the qualifications of the applicant, and the work hours.

BIOL 400 INDEPENDENT STUDY OR RESEARCH1-3 Credits

Study or research in an area of special interest.

Add Consent: Instructor Consent

Notes: The number of credit hours is determined by the topic and the amount of work required.

Requirements: Approval of instructor, School Dean, and Academic Vice President is required.

BIOL 401 ORNITHOLOGY2 Credits

Biology of birds, including their classification, anatomy, physiology, life history, behavior, ecology, and identification with emphasis on local species.

Prerequisites: Junior or above status

Co-requisites: BIOL 401L

BIOL 401L ORNITHOLOGY LABORATORY1 Credit

Laboratory and field experience in anatomy, behavior, and identification of birds.

Prerequisites: Junior or above status

Co-requisites: BIOL 401

BIOL 404 ANATOMY AND PHYSIOLOGY MENTOR2 Credits

Students will assist BIOL 231L, Anatomy and Physiology Lab instructor in the preparation and delivery of laboratory instruction using anatomical specimens and conduct additional optional "open-lab" study sessions.

Prerequisites: Junior or above status

Co-requisites: BIOL 422

Add Consent: Instructor Consent

Requirements: Written permission of instructor is required.

BIOL 405 HUMAN ANATOMY MENTOR2 Credits

Students will assist BIOL 340L, Human Anatomy Lab instructor in the preparation and delivery of laboratory instruction using anatomical specimens and conduct additional optional "open-lab" study sessions.

Prerequisites: Junior or above status

Co-requisites: BIOL 422

Add Consent: Instructor Consent

Requirements: Written permission of instructor is required.

BIOL 406 HUMAN PHYSIOLOGY MENTOR2 Credits

Students will assist BIOL 342L, Human Physiology Lab instructor in the preparation and delivery of laboratory instruction using live physiologic experimentation and computer simulations and conduct additional occasional "open-lab" study sessions.

Prerequisites: BIOL 422 and Junior or above status

Add Consent: Instructor Consent

Requirements: Written permission of instructor is required.

BIOL 409 SENIOR BIOLOGY RESEARCH1-3 Credits

Original investigation in biology under a faculty member's supervision and guidance. A public presentation of results will occur.

Add Consent: Instructor Consent

Notes: May be repeated up to four times, for no more than 6 credits total.

BIOL 422 ADVANCED HUMAN ANATOMY1 Credit

The advanced study of human anatomy through human gross dissection, histological analysis and clinical anatomy of each system of the body.

Prerequisites: BIOL 340, BIOL 340L, BIOL 342, BIOL 342L with C or better and Junior or above status

Add Consent: Instructor Consent

Requirements: Written permission by the course instructor required.

BIOL 424 ADVANCED PHYSIOLOGY1 Credit

The advanced study of human physiology through a group research project monitoring physiological processes in human subjects for the duration of the semester, class discussions of primary and secondary literature relevant to the group project, and writing assignments designed to help students with their end of semester project reports. Appropriate channels for the ethical use of human subjects will be followed within the guidelines for Chadron State College.

Prerequisites: BIOL 340, BIOL 340L, BIOL 342, BIOL 342L and junior or above status

Add Consent: Instructor Consent

BIOL 425 PLANT MORPHOLOGY2 Credits

Origin and structure of plant cell types and tissues along with a survey of the plant world illustrated by specific examples from both living and fossil plants.

BIOL 425L PLANT MORPHOLOGY LABORATORY1 Credit

Laboratory experience.

BIOL 427 BIOLOGY OF POPULATIONS3 Credits

Population ecology and the genetic processes of adaptation and evolution. Lectures and class discussion of current literature, plus application of concepts in a literature review paper is required.

Prerequisites: BIOL 332, BIOL 332L, BIOL 336, BIOL 336L and Junior or above status

BIOL 428 BIOINFORMATICS3 Credits

Introduction to the use of bioinformatics data and methods to study DNA and protein sequences and evaluate differences in gene expression between cells. Methods taught in this class are useful for studies in biotechnology, genetics, nutrition, molecular biology, microbiology, epidemiology, pharmacology, and ecology. Students will learn to use available information and databases to ask complex biological questions using a project-based approach.

Prerequisites: Upper division science student or instructor permission

BIOL 429 AQUATIC MICROBIOLOGY3 Credits

The detection and study of bacteria in streams, lakes, wells, etc. and a basic review of water-borne viruses that are of public health significance. Oral and written presentations, laboratory and field trips required.

Prerequisites: Junior or above status

BIOL 430 IMMUNOLOGY3 Credits

Function of the human immune system including the structure and function of bone marrow, blood cells, and lymphatic tissue.

Prerequisites: BIOL 241, BIOL 241L, and Junior or above status

BIOL 431 ENTOMOLOGY2 Credits

Taxonomy, morphology, physiology, life history, behavior, ecology and economic importance of insects. Lecture, laboratory and field trips.

Prerequisites: Junior or above status

Co-requisites: BIOL 431L

BIOL 431L ENTOMOLOGY LABORATORY1 Credit

Laboratory and field experience in insect morphology and taxonomy.

Prerequisites: Junior or above status

Co-requisites: BIOL 431

BIOL 432 DEVELOPMENTAL BIOLOGY2 Credits

Molecular and cellular aspects of development, including the regulation and expression of the genome during development, fertilization, cleavage, gastrulation, morphogenesis, and organogenesis.

Prerequisites: BIOL 332 and Junior or above status

Co-requisites: BIOL 432L

BIOL 432L DEVELOPMENTAL BIOL LABORATORY1 Credit

Laboratory experience in vertebrate embryology and morphological development.

Prerequisites: Junior or above status

Co-requisites: BIOL 432

BIOL 433 HUMAN BIOMECHANICS2 Credits

Utilization of anatomy, physiology, biochemistry, and physics in the study of human movement, with emphasis on biomechanics, control and integration of muscle groups in maintaining posture and producing complicated movements, bioenergetics, adaptation of the body to stress and exercise, and training regimens.

Prerequisites: BIOL 342, BIOL 342L, PHYS 151, PHYS 151L, and Junior or above status

BIOL 433L HUMAN BIOMECHANICS LAB1 Credit

Laboratory experience in human movement. Technology and donor bodies will be used.

BIOL 435 MAMMALOLOGY2 Credits

Systematics, life history, physiology, and behavior of mammals. Field trips required.

Cross-Listed: AGRI445/BIOL435

Prerequisites: Junior or above status

Co-requisites: BIOL 435L

BIOL 435L MAMMALOLOGY LABORATORY1 Credit

Laboratory experience in mammal structure and function.

Cross-Listed: AGRI445L/BIOL435L

Prerequisites: Junior or above status

Co-requisites: BIOL 435

BIOL 436A RESEARCH MICROSCOPY1 Credit

Microscopic principles and techniques focusing on the use of microscopes in scientific inquiry and diagnosis. Includes light and optic theory, specimen preparation, image collection and interpretation, and types of research microscopes.

Cross-Listed: BIOL436A/GEOS426A

Notes: Recommend taking BIOL 436B.

BIOL 436B INTRODUCTION TO SCIENTIFIC RESEARCH2 Credits

Scientific research methodology, including development of testable hypotheses, research design, data analysis introduction, grant proposal writing, and writing research papers.

Cross-Listed: BIOL436B/GEOS426B

Notes: Recommend taking BIOL 436A.

BIOL 438 TAXONOMY OF PLANTS2 Credits

Applied taxonomy of vascular plants, with emphasis on families of flowering plants in the northern Great Plains.

Prerequisites: BIOL 138, BIOL 138L, and Junior or above status

Co-requisites: BIOL 438L

Requirements: Field trips required.

BIOL 438L TAXONOMY OF PLANTS LABORATORY1 Credit

Laboratory experience in collecting, identifying and preparing vascular plant specimens, with emphasis on family recognition. A student plant collection project is required.

Prerequisites: Junior or above status

Co-requisites: BIOL 438

BIOL 439 PLANT PHYSIOLOGY2 Credits

Physiological and developmental processes occurring in cells, tissues, and organs of plants, with emphasis on hormonal, environmental and other control mechanisms of plant behavior and development.

Prerequisites: BIOL 138 and BIOL 138L or AGRI 141 and CHEM 131 and CHEM 131L or CHEM 140 and CHEM 140L and Junior or above status

Co-requisites: 439L

BIOL 439L PLANT PHYSIOLOGY LABORATORY1 Credit

Laboratory experience in plant structure and function, with an emphasis on applied plant biochemistry.

Prerequisites: Junior or above status

Co-requisites: BIOL 439

BIOL 440 TOPICS IN BIOLOGY1-3 Credits

Designed to meet the needs of students desiring knowledge in areas of biology not covered in another biology course. Study topics and credit will be arranged to meet the needs of the students. Laboratory work and field work.

Notes: Can be repeated with a change in emphasis for a total of six hours of credit.

Requirements: Extra fees may be required.

BIOL 443 TOPICS IN BIOLOGY1-3 Credits

Designed to meet the needs of different groups of people desiring knowledge in an area of biology not covered in another biology course. Study topics and credit will be arranged to meet the needs of the students. Laboratory work and field work.

Notes: Can be repeated with a change in emphasis for a total of six hours of credit.

Requirements: Extra fees may be required.

BIOL 444 LIMNOLOGY2 Credits

Biological, chemical and physical studies of inland surface waters. Field trips required.

BIOL 444L LIMNOLOGY LABORATORY1 Credit

Laboratory and field experience in freshwater systems.

BIOL 446 REGIONAL FLORA3 Credits

The plants and plant communities of the region. Field trips required.

Notes: Workshop format for majors and non-majors.

BIOL 447 PLANT PHYLOGENY1 Credit

The phylogenetic treatment of land plants, living and extinct.

BIOL 447L PLANT PHYLOGENY LABORATORY2 Credits

Survey of land plant groups, with emphasis on the taxonomy and ecology of bryophytes.

BIOL 448 ETHNOBOTANY2 Credits

Plants useful or harmful to man, their origins and history, botanical relationships, chemical constituents which make them economically important, roles in prehistoric and modern cultures and civilizations, and the potential of the plant kingdom for new economically important species. Field trips required.

Essential Studies: SLO #10

Prerequisites: Junior or above status

Co-requisites: BIOL 448L

BIOL 448L ETHNOBOTANY LABORATORY1 Credit

Laboratory experience in plant-human interactions.

Essential Studies: SLO #10

Prerequisites: Junior or above status

Co-requisites: BIOL 448L

BIOL 449 MOLECULAR BIOLOGY OF THE CELL3 Credits

In-depth analysis of eukaryotic cellular biology, including cell-cell communication, signal transduction, apoptosis, control of cell cycle, and other advanced topics (cancer, gene therapy, prokaryotic cells, viruses).

Prerequisites: BIOL 332, BIOL 332L, BIOL 241, BIOL 241L and CHEM 231 and CHEM 231L or CHEM 333 and CHEM 333L and Junior or above status

BIOL 450 FIELD LIMNOLOGY3 Credits

Lecture and field methods for studying the biological, chemical and physical processes in lakes and streams. Includes an extended field trip to Yellowstone National Park or other areas.

Requirements: Fees in addition to tuition will be charged; early registration required; one year of college-level science required.

BIOL 451 HUMAN DIMENSIONS OF WILDLIFE MANAGEMENT3 Credits

Overviews the historic and current public viewpoints of wildlife and wildlife/human conflicts. Examines the policies which affect wildlife research and management and the impacts public opinion has on policy formation. Identifies the various stakeholders involved in natural resource management and policy and incorporates the idea that wildlife management is people management.

Cross-Listed: AGRI451/BIOL451

BIOL 456 PATHOGENIC MICROBIOLOGY2 Credits

Major communicable diseases of humans caused by bacteria, fungi, and viruses. Global and regional impact, host-parasite relationships, morphology and physiology, diagnostic techniques used in isolation and identification, treatment, prevention, and modes of transmission are discussed. Field trips required.

Prerequisites: BIOL 241, BIOL 241L and Junior or above status

BIOL 456L PATHOGENIC MICROBIOLOGY LABORATORY1 Credit

Laboratory experience in isolation and clinical identification of pathogenic microbes.

Prerequisites: Junior or above status

Co-requisites: BIOL 456

BIOL 458 BIOLOGICAL EVOLUTION3 Credits

Study of the fundamental theory of evolution, including phylogeny and earth history, macro-evolutionary patterns, micro-evolutionary processes, and synthesis.

Prerequisites: BIOL 332 and Junior or above status

BIOL 499 BIOLOGY CAPSTONE3 Credits

Students will integrate information from their undergraduate biology program to select a topic, which must be approved by the biology faculty. Students will examine the scientific research supporting the thesis, the broad shift in ideas and knowledge relating to the topic and its interaction with society, and political and ethical considerations relating to the subject. Students will find appropriate primary research articles to support the thesis and will complete original research paper or literature review (senior thesis) on the topic, a public presentation, and a poster.

Essential Studies: SLO #12

Prerequisites: BIOL 332, BIOL 332L and Junior or senior status

Notes: Course is intended for biology majors.