

404 Advanced Graphic Design Studio (3)

The creative exploration of digital and traditional media in accordance with the individual student's long-term goals and interests. Advertising, game design, web site design, "fine arts" applications, illustration, book design, and animation are among the options for student exploration. Finished works will be saved in a disk portfolio for evaluation. *Prerequisite: Art 403.*

407 Advanced Drawing (3)

Continued exploration of drawing problems with emphasis on developing a mature command of drawing techniques in a specialized medium. *Prerequisite: Art 307.*

421 Art Internship (0-12)

On-the-job experience in art. *Prerequisite: Cooperative Education 205 or permission. (Pass/Fail)*

Astronomy (AST)

Associate Professor Plano Clark

103 Introductory Astronomy (3)

A study of the structure and evolution of the universe with emphasis on the solar system, stellar evolution, galaxies, cosmology, and planetary systems.

103L Astronomy Laboratory (1)

An optional laboratory accompanying Astronomy 103. The laboratory work includes telescope operations and viewing, and laboratory experiments illustrating the physical principles of astronomy. Must be concurrently enrolled in Astronomy 103.

Biology (BIO)

Professor Georgi

Associate Professor Clement

Associate Professor Soucek

Assistant Professor Elder

Assistant Professor Marley

Assistant Professor Tallman

Instructor Ebmeier

Adjunct Professor Muckel

Adjunct Instructor Coe

Requirements for the Biology Major:

Complete 1 or 2.

1. Students not seeking certification for public school teaching of biology will complete the following:
 - a. Biology 101, 201, 206, 208, 252, 295, 351, 495, 496.
 - b. One course from each of the following groups plus one additional course from any group:

92 / *Biology (BIO)*

- 1) Biology 215, 216, 307, 308, 321, 322, 325.
 - 2) Biology 302, 310, 337, 342, 353.
 - 3) Biology 205, 207, 315, 317, 331, 335, 336, 412.
 - c. Three courses must be at the 300-400 level, excluding Biology 351, 495, 496, 498.
 - d. A maximum of four credits of biology directed study at any level may be counted toward the major.
 - e. Complete the following cognates:
 - 1) Chemistry 125-126.
 - 2) Eight additional credits of Chemistry **OR** Physics 107 and 108.
 - 3) Mathematics 105 or above (Math 235 is strongly recommended).
 - f. Pass a departmentally administered comprehensive examination with a score of at least 60 percent or higher. This examination is to be taken upon completion of the core requirements, but not later than the sixth semester of study. A student who does not achieve a passing score must take an oral examination given by two faculty members of the department. If a student does not successfully complete either the written or the oral examination, he/she will not be allowed to graduate with a major in biology.
 - g. Partial fulfillment of the major may be arranged through transfer of credit by successful completion of appropriate courses from an approved professional school.
2. Students seeking certification for public school teaching in biology must complete:
- a. A total of 35-36 credits of biology which includes Biology 101, 206, 208, 215 (or 216), 252, 351 and at least one course chosen from each of the following groups:
 - 1) Biology 307, 308, 321, 322, 325.
 - 2) Biology 302, 310, 337, 342, 353.
 - 3) Biology 315, 317, 331, 335, 336, 412, 425.
 - b. Cognates Chemistry 125-126; Mathematics 105 or above (Mathematics 235 is strongly recommended); Natural Science 322, 324, 326, and 327; Physics 107; either Geology 103 or 104
 - c. One additional teaching major or subject endorsement
 - d. All requirements listed under the catalog section Secondary Education.

Requirements for the Biology Subject Endorsement:

Students who are not biology majors and are seeking certification for public school teaching in biology must complete the following:

1. A total of 24 credits in biology which includes Biology 101, 206, 208, 215 (or 216), 252, and four additional 300 or 400-level biology credits.
2. Cognates Chemistry 125 and 126; Natural Science 322, 324, 326, 327; either Geology 103 or 104; Physics 107.
3. A teaching major.

4. All requirements listed under the catalog section Secondary Education.

Requirements for the Honors Program in Biology:

Qualified students are encouraged to apply to the biology faculty for admission to the biology honors program after the first semester of their sophomore year. Students participating in the biology honors program must maintain an accumulated grade point average of 3.00 overall and in the natural sciences. Students in the honors program must complete the biology major requirements plus:

1. Physics 107, 108 and an additional eight credits of chemistry beyond 125-126.
2. Mathematics 235.
3. Two semesters of a single foreign language (minimum of six credits)
4. Honors Course (Biology 498).

Requirements for the Biology Minor:

1. Complete the following:
 - a. Biology 101 and two of the following three courses: 206, 208, and 252.
 - b. Four credits in biology at the 300 or 400 level, excluding Biology 351, 495, 496, and 498.
 - c. Four additional credits in biology.
2. Complete the cognates Chemistry 125, 126.

101 Introduction to Biology (4)

An introductory course in biology utilizing the scientific method in the study of molecular, cellular, organismal, taxonomic, genetic, ecological and evolutionary aspects of life. A weekly laboratory experience emphasizes observation and problem solving.

201 Introductory Biology Seminar (1)

An introduction to the biological sciences for students expressing an interest in majoring in biology. Through a series of discussions and presentations, the course addresses current issues in the life sciences, including the scientific, ethical, political, social, and legal aspects of the discipline. **Generally taken during the first semester of the sophomore year.**

205 Comparative Physiology (4)

A general physiological principles course in which students will learn the functioning of tissues, organs, and organ systems in vertebrates, invertebrates, and plants. Mechanisms of control and integration of various systems will be covered. *Prerequisite: Biology 101, Chemistry 125. Offered spring term.*

206 Zoology (4)

A survey of the animal kingdom, stressing evolutionary relationships, anatomy, ecology, special adaptations, and biological significance of the vari-

ous groups. Upon successful completion of this course, students will gain an in-depth knowledge of zoology, providing the necessary foundation for upper-level courses. **Prerequisite:** *Biology 101. Offered every year.*

207 Evolution (3)

A multidisciplinary course covering the nature of science and the major areas of the evidence for organic evolution. Topics include astronomy, geology, paleontology, phylogeny, biogeography, taxonomy, comparative anatomy, embryology, and molecular biology. Students will become familiar with the scientific support for the major unifying concept of modern biology. **Prerequisite:** *Biology 101. Offered fall term.*

208 General Botany (4)

A survey of three major groups of organisms – algae, fungi, and plants – that are normally studied in introductory botany courses. Students will develop an understanding of the life histories, phylogeny, and systematic treatment of these ecologically and economically important groups, as well as the basic anatomy, morphology, and physiology of the vascular plants. **Prerequisite:** *Biology 101, or taken concurrently. Offered alternate fall terms and spring term.*

215, 216 Human Anatomy and Physiology (4) (4)

A study of the structure and function of the human body. The course begins with the study of the structure and function of cells and tissues and then continues with the study of the 11 major systems. **Prerequisite:** *Biology 101, or permission.*

224 Conservation Biology (3)

This course introduces students to the principles of biodiversity conservation and addresses genetic, species, community and ecosystem diversity. It examines the practical application of conservation methods through case studies, as well as addresses the economic realities of action and inaction. Upon completion of this course, students will demonstrate an understanding of conservation issues facing the world and will be able to interpret the quality of conservation policies. **Prerequisite:** *Biology 101. Offered alternate spring terms.*

252 Bacteriology (4)

A course revolving around four basic questions about microscopic life forms: 1) *What are they?* (bacteria, viruses, fungi, protozoa, algae, and cultured cells), 2) *What do they do?* (grow, reproduce, cause disease, produce human and livestock foods, produce valuable chemicals, recycle elements), 3) *How do they do it?* (derive energy from foods, produce organic molecules), and 4) *How are they controlled?* (heat, disinfectants, surfactants, antibiotics). Questions 2-4 will be dealt with almost exclusively in terms of bacteria. **Prerequisite:** *Biology 101.*

271, 371, 471 Selected Topics (1-3) (1-3) (1-3)

An investigation of topics not offered in other courses, selected on the basis of student interest and available instruction.

290, 390, 490 Directed Study (1-3) (1-3) (1-3)

An opportunity for supervised, independent study of a particular topic based on the interest of the student and the availability and approval of the faculty.

295 Biostatistics (3)

An introductory course to the use of statistics and study designs in biology in preparation for Biology 495/496, Senior Research. Upon successful completion of this course, students will be able to design experimental, quasi-experimental and observational studies that will meet regulatory guidelines; collect, analyze, and interpret data using appropriate statistical tools; and submit their study for publication. *Prerequisite: Sophomore standing.*

302 Flora of Nebraska (4)

A field-oriented course emphasizing the diversity of algae, fungi, and vascular plants found in Nebraska, with an emphasis on phylogeny, systematics, ecological relations, and life cycles. *Prerequisite: Biology 101 and 108. Offered alternate years.*

307 Plant Form and Function (4)

An integrative approach to the structure and function of higher plants. The course includes the anatomy and physiology of plant tissues which are responsible for various plant processes such as storage, photosynthesis, support, protection, conduction, and reproduction. *Prerequisite: Biology 101 and 208. Offered alternate years.*

308 Animal Behavior (4)

Questions concerning the behavior of individuals and populations are explored in a mechanistic and evolutionary context. The relationships of animal behavior studies to ecology, taxonomy, evolution, and genetics are investigated, as well as the anatomical and physiological basis of behavior. Upon successful completion of this course, students will develop an understanding of the behavior of animals in field and laboratory and will also become aware of the adaptive significance of behavior. *Prerequisite: Biology 101. Offered alternate fall terms.*

310 Natural History of Nebraska Vertebrates (4)

This course covers the history, climate, ecology, and effects on the evolution of vertebrates in Nebraska. Topics covered include: climatology, geography, biomes, taxonomy, and vertebrate adaptations such as reproductive strategies, metabolism, endothermy, locomotion, predator-prey relationships, populations, and food gathering mechanisms. Upon successful completion of this course, students will gain an understanding of the evolutionary forces resulting in today's ecology of Nebraska. *Prerequisite: Biology 101 and 206.*

315 Genetics (4)

Genetics is the study of inheritance of traits and will be explored from both the Mendelian and molecular genetic perspectives. This exploration may include such Mendelian topics as segregation of traits, independent assortment, and the chromosomal theory of inheritance, and such molecular topics as recombinant DNA technology, genomic analysis, gene mapping, and genetic

engineering. Issues of human genetics will include pedigree analysis, gene therapy and genetic counseling. Throughout, students will also explore the contributions of leading scientists to this growing field of biology. Students completing this course will have a thorough understanding of the mechanisms of inheritance and will be able to apply that understanding to more advanced course work in biology. **Prerequisite: Biology 101 and sophomore standing. Offered fall term.**

317 Introduction to Immunology (4)

People and other animals, constantly besieged by disease-causing microorganisms, are more often healthy than ill. This course introduces the student to the reasons for this relative state of good health: a complex array of organs (bone marrow, thymus, lymph nodes, etc.), cells (lymphocytes, macrophages, dendritic cells, etc.), and chemicals (antibodies, lymphokines, etc.) that constitute the immune system. **Prerequisite: Biology 101 and 252. Offered alternate years.**

321-322 Microanatomy and Histotechniques (5) (5)

First semester topics include: microscopy, tissue processing and staining, cellular ultrastructure and function, mammalian embryology epithelial tissues, connective tissues, muscle tissues, and nerve tissues. Second semester topics include: the endocrine system, the respiratory system, the digestive system, the integumentary system, the reproductive systems, the excretory system, and the sensory systems. Both form and function of these structures are discussed. Both semesters have a strong laboratory component, including scanning electron microscopy, a research project, tissue processing and staining, photomicrography and digital imaging, plus traditional slide-based learning. Upon successful completion of the course, students will gain an understanding of the embryology, cells, tissues, and organs and their function in the mammalian body. **Prerequisites: Biology 101 and 206. Offered every year.**

325 Human Anatomy (4)

This is a dissection-based course in human anatomy, utilizing cadavers and a regional approach to study the human body. Upon completion, students will be able to identify major skeletal, muscular, nervous, and vascular structures, organs, and the relationship of these structures to each other in each body area. They will learn the flow of blood from the heart through vascular structures to organs and limbs, understand the structure and significance of the cervical, brachial, and lumbosacral plexuses, and be able to explain the actions of muscles based on origin and insertions. Students will gain skills in dissection and in collaboration with colleagues to dissect and present findings to the class. Finally, students will gain an appreciation of the intricacy and detail of the human body, the importance of precision and accuracy in experimental work, and the value of collaborative learning. **Prerequisite: Biology 101 and Biology major or instructor permission. Offered alternate fall terms.**

331 Cell Biology (4)

A microscopic and molecular analysis of the structure and function of cells and their organelles. The laboratory involves an experimental approach to

the study of the structure, composition, and function of isolated cell organelles. *Prerequisite: Biology 101, and 206 (or 208); Chemistry 125, 126. Offered alternate years.*

335 Molecular Biology (4)

This course offers a detailed study of the structure and function of DNA, RNA, chromatin, transposable elements and 'junk' DNA. The student will thoroughly examine the molecular events governing the cell cycle, DNA replication, basal and regulated transcription, and translation. The lab will include extensive use of current molecular biology techniques. This course is particularly appropriate for students interested in proceeding to graduate school, professional school, or careers in biotechnology, as students completing this course will be well versed in the molecular events of the cell and familiar with the techniques used to study them. *Prerequisite: Biology 101 and 315. Offered alternate fall terms.*

336 Mammalian Physiology (4)

This course covers the basics of mammalian physiology. Students will learn to identify major organs of body systems, significant subdivisions of these organs, and the etiologies of many disease states. Students will gain skills in determining blood type, measuring respiratory volumes, and conducting urinalysis tests. Finally, students will gain an appreciation of the intricacy and detail of the human body, the importance of precision and accuracy in experimental work, and the value of collaborative learning. *Prerequisite: Biology 101, Chemistry 125, and sophomore standing. Offered alternate spring terms.*

337 Wetlands Biology (4)

This course provides an in-depth study of wetland ecosystems, including history, regulations, delineation, major types of wetland systems, hydrology, biogeochemical cycling, human impact and management of wetlands, and wetland creation and restoration. Particular emphasis will be placed on examination of and familiarization with Nebraska wetlands. Students will gain an understanding and appreciation of wetland function and the role wetlands play in the health of the environment on both local and global scales. *Prerequisite: Biology 101 and one additional lab course in biology. Offered alternate fall terms.*

342 Ecology (4)

The study of interrelationships between organisms and the environment. *Prerequisite: Biology 101, and 206 (or 208).*

351 Biology Research I (2)

Biology Research I is the biology student's introduction to research. Each student will choose a topic, investigate it thoroughly in the scientific literature, and present both a written and an oral report in a formal setting. The report will include a proposal for further research. The topic chosen will then be investigated during the student's senior research project. Biology Research I is designed to heighten information retrieval skills in regard to the primary scientific literature and to give students practice in formal scientific writing, speaking, and experimental design. *Prerequisite: Biology major and junior standing.*

353 Environmental Microbiology (4)

An examination of the roles of microbes in the environment and of several distinctly different ecosystems and their microbial components. Upon successful completion of this course, the student will have an understanding of the roles of microbes and microbial processes in shaping the earth's biosphere as we know it today. *Prerequisite: Biology 252. Offered alternate fall terms.*

400 Tutorial (1)

An organized review of biology directed toward the advanced placement tests most majors take (GRE, MCAT, DAT, etc.). The course meets one hour per week. To pass the course, students must pass the departmental Comprehensive Examination and/or other departmental requirements given as part of the course. *Prerequisite: Junior standing.*

412 Developmental Biology (4)

Animal development is a fascinating process that begins with a single cell and ends with a complex multicellular organism. This course examines the genetic and cellular mechanisms that guide development in vertebrate animals. Upon successful completion of this course, students will understand the importance of egg preparation and the stages of development, including fertilization, cleavage, gastrulation, neurulation, organogenesis, and gametogenesis. Students will also be able to integrate their knowledge of genetics and cell biology to understand the complex interplay of signals that direct the organization of the developing vertebrate. *Prerequisite: Biology 101 and 315.*

421 Biology Internship (0-12)

On-the-job experience in biology. *Prerequisite: Cooperative Education 205 or permission. (Pass/Fail)*

425 Theories and Techniques for Transmission Electron Microscopy (4)

A presentation of the theories of electron microscopy, fixation, embedding, sectioning and staining of specimens. Techniques taught include knife-making, sectioning, staining, vacuum evaporation, TEM usage and maintenance. *Prerequisite: Biology 101, 206, 321, 322 or permission. Offered alternate years.*

495 - 496 Biology Research II, III (2) (2)

A two-semester laboratory or field research project required of all senior biology majors. The course is a continuation of students' Biology 351 Biology Research I topics. Students will conduct a scientific study concluding with a report in an appropriate format. *Prerequisite: Senior Biology major, Biology 351. Biology 495 offered fall; Biology 496 offered spring.*

498 Honors in Biology (1)

Presentation of the Senior Research project at a professional scientific meeting such as that of the Nebraska Academy of Sciences. The presentation may either be oral or in a poster format. *Prerequisite: Concurrent enrollment in Biology 496 and minimum GPA of 3.00 overall and in the natural sciences. Offered spring term.*

