

## BIOL - Biology

Courses numbered 100 to 299 = *lower-division*; 300 to 499 = *upper-division*; 500 to 799 = *undergraduate/graduate*.

### **BIOL 103. Microbes & You (3).**

*General education math and natural sciences introductory course.* Surveys general information about microbial physiology, biochemistry and ecology that supports more detailed discussion of interesting topics in food, medical and environmental microbiology. Includes subjects of general interest and current newsworthy topics. Credit will not be given if the student has completed any biology course beyond the 100-level prior to enrollment. Suitable for general education requirements, but cannot be used for credit toward the major or minor in biological sciences.

### **BIOL 106. The Human Organism (3).**

*General education math and natural sciences introductory course.* Introduces the nonscience major to certain biological principles as they relate to the human organism, provides biological information and understanding of subjects which are relevant to the student's own well-being and role as a world citizen, and increases awareness of the human place in the biosphere. Concurrent or subsequent enrollment in BIOL 107 is recommended for students needing general education credit for a natural sciences laboratory experience. Credit for this course may not be applied toward the requirements for a major or minor in biological sciences. Only one of the following may be taken for credit: BIOL 104, 105, 106 and/or 107. Students wishing to repeat BIOL 105 (no longer offered) should enroll in BIOL 106 and 107.

### **BIOL 107. The Human Organism Laboratory (1).**

2 Lab hours. *General education math and natural sciences introductory course.* For the nonscience major. Supplements and reinforces the material covered in BIOL 106 with a laboratory experience. Uses a hands-on approach and covers topics relevant to students and their role in the biosphere. Topics include cell structure, human organ systems, the role of microorganisms in the environment, metabolism, genetics and cancer. Requires no animal dissection. Credit for this course may not be applied toward the requirements for a major or minor in biological sciences. Only one of the following may be taken for credit: BIOL 104, 105, 106 and/or 107. Students wishing to repeat BIOL 105 (no longer offered) should enroll in BIOL 106 and 107.

### **BIOL 210. General Biology I (4).**

3 Classroom hours; 3 Lab hours. *General education math and natural sciences introductory course.* Introduces fundamental concepts in cellular and molecular biology. Includes basic biological chemistry; cell and membrane structure and function; aerobic and anaerobic respiratory pathways; intermediary metabolism and photosynthesis; regulation of cellular activities at genetic and protein levels; cellular reproduction; mechanisms of inheritance at molecular, organismal and population levels; phylogeny and evolution. The laboratory develops skills in the experimental method, basic laboratory procedures and written communication of scientific information using topics related to the lectures. Students may not receive credit for both BIOL 204 (no longer offered) and BIOL 210. Students wishing to repeat BIOL 204 may enroll in this course, subject to the credit limitations indicated above. Corequisite: BIOL 210L, CHEM 211 recommended.

### **BIOL 211. General Biology II (4).**

3 Classroom hours; 3 Lab hours. *General education math and natural sciences introductory course.* Introduces fundamental concepts of biology as they apply to levels of organization from organisms through ecosystems. Focuses on morphology, physiology, diversity and ecology of organisms. Introduces growth and anatomy, transport of materials, regulatory mechanisms and reproduction in plants; also nutrient

procurement, circulation, neural and hormonal regulation, reproduction, immune responses and behavior in animals. Principles of ecology presented include population growth and regulation, interspecific interactions and food webs, and energy flow and material cycling through ecosystems. The laboratory includes a survey of organismal diversity including prokaryotes, protists, fungi, plants and animals. Emphasizes evolutionary trends in the plant and animal kingdoms. Prerequisite: BIOL 210. Corequisite: BIOL 211L; concurrent enrollment in CHEM 212 is recommended.

### **BIOL 220. Introduction to Microbiology (4).**

3 Classroom hours; 2 Lab hours. *General education math and natural sciences introductory course.* For students in allied health fields. Introduces eucaryotic and procaryotic microorganisms and viruses and develops an understanding of microbial growth, including the use of antiseptics, disinfectants, and antibiotics; DNA as the genetic material including DNA replication, protein synthesis, gene regulation, mutation and gene exchange in bacteria; applied and environmental microbiology including water and sewage treatment and food microbiology; resistance to infection, basic mechanisms of pathogenesis, and selected microbial diseases. The lab reinforces concepts learned in lecture and helps the student gain an understanding of and develop competence in basic microbial techniques including the safe handling of microorganisms. Credit earned in this course may not be applied toward the requirements for a major or minor in biological sciences. Students may not receive credit for both BIOL 120 (no longer offered) and BIOL 220. Students wishing to repeat BIOL 120 may enroll in this course. Prerequisite: CHEM 101 or 103 or 211. Corequisite: BIOL 220L.

### **BIOL 223. Human Anatomy and Physiology (5).**

4 Classroom hours; 2 Lab hours. *General education math and natural sciences introductory course.* Presents the structure and function of the major human body systems. Demonstrates the structure and function of certain systems further in the laboratory setting. For students majoring in programs other than biological sciences or biochemistry. Students who have completed BIOL 225 or 226 (both no longer offered) may not receive credit for prior enrollment in these courses and subsequent enrollment in BIOL 223. Students seeking to repeat BIOL 225 or 226 may enroll in this course, subject to the credit limitations indicated above. Students may receive credit for only one of the following: HS 290 or BIOL 223. Prerequisite: CHEM 101 or 103 or 211. Corequisite: BIOL 223L.

### **BIOL 309. Foundations of Human Heredity (3).**

*General education math and natural sciences advanced further study course.* Introduces the mechanisms and societal significance of development, transmission and population genetics of humans. Draws attention to inborn errors of metabolism and development and the roles of genetic counseling and genetic engineering in their management. Designed for students majoring outside the natural sciences and cannot carry credit toward a biological sciences major or minor.

### **BIOL 309H. Foundations of Human Heredity Honors (3).**

*General education math and natural sciences advanced further study course.* Introduces the mechanisms and societal significance of development, transmission and population genetics of humans. Draws attention to inborn errors of metabolism and development and the roles of genetic counseling and genetic engineering in their management. Designed for students majoring outside the natural sciences and cannot carry credit toward a biological sciences major or minor.

### **BIOL 310. Human Reproduction: Issues and Perspectives (3).**

*General education math and natural sciences advanced issues and perspectives course.* Comprehensive survey of the many biological aspects of reproduction. Covers structure and function of the reproductive system, as well as information on in vitro fertilization,

fertility testing, contraception, population problems, AIDS, cancer, reproductive issues, ethical problems and other concerns about the control of human reproduction. Prerequisite: BIOL 106 or 210 or 223.

**BIOL 330. General Microbiology (5).**

3 Classroom hours; 6 Lab hours. Introduces the structure, function, systematics, ecology and population dynamics of microorganisms emphasizing prokaryotes. Prerequisites: BIOL 204 (no longer offered) or 211, CHEM 212. Corequisite: BIOL 330L.

**BIOL 370. Introductory Environmental Science (3).**

*General education math and natural sciences advanced issues and perspectives course.* Examines the relationship of the earth's human populations to resource use/depletion and to the impact of human activities on the environment. Introduces and uses basic concepts relating to energy, populations and ecosystems as a basis for understanding environmental problems on the local, regional, national and international levels. *Course includes diversity content.*

**BIOL 408. Biology of Aging (3).**

Cross-listed as AGE 408. An introduction to the phenomenon of aging, including a survey of age-related processes and mechanisms of senescence, emphasizing humans. Prerequisite: a basic course in biology that satisfies the general education requirements.

**BIOL 418. General Ecology (4).**

3 Classroom hours; 3 Lab hours. Principles underlying the interrelationships of living organisms and their environments from the biosphere to the population level of organization. Some laboratory exercises and class projects conducted at local field sites. *Course includes diversity content.* Prerequisites: BIOL 204 (no longer offered) or 211, CHEM 212. Corequisite: BIOL 418L.

**BIOL 419. Genetics (4).**

3 Classroom hours; 3 Lab hours. The mechanisms of heredity and variation in animals, plants, and prokaryotes with a critical review of gene structure and function. Prerequisites: BIOL 204 (no longer offered) or 211, CHEM 212. Corequisite: BIOL 419L.

**BIOL 420. Molecular Cell Biology (4).**

3 Classroom hours; 3 Lab hours. Concerned primarily with the molecular biology of eukaryotic cells. Covers individual cellular components (organelles) and processes including the plasma membrane, mitochondrion and energy conversion, intracellular sorting, the cell nucleus and genetic mechanisms, control of gene expression, cell signaling, cell growth and division, cancer, and cellular mechanisms of development. Reviews and demonstrates current techniques and experimental approaches for studying cells. Prerequisites: BIOL 204 (no longer offered) or 211, CHEM 212. Corequisite: BIOL 420L.

**BIOL 481. Cooperative Education (1-4).**

Course complements and enhances the student's academic program by providing an opportunity to apply knowledge gained through coursework to job-related situations. For information, contact the coordinator of undergraduate studies or the cooperative education program office. No more than 4 credit hours earned in BIOL 481 may be applied toward satisfying the requirements for a major in biological sciences. Prerequisite: applicant and cooperative education position approved by the departmental affairs committee.

**BIOL 481N. Internship (2-3).**

Complements and enhances the student's academic program by providing an opportunity to apply and acquire knowledge in a workplace environment as an intern. Prerequisite: departmental consent.

**BIOL 497. Biology Colloquium (1).**

Research seminars presented by graduate students, faculty and visiting researchers. Requires a written term paper on one of the presented

topics. Repeatable once for credit. Prerequisites: two of the following - BIOL 418, 419, 420.

**BIOL 498. Undergraduate Independent Reading (1-2).**

Students perform library scholarship under the direct supervision of faculty and write a report. No more than 6 credit hours earned from BIOL 498, 499 or equivalent independent study courses may be applied toward departmental major graduation requirements. Prerequisites: at least 20 credit hours of biology coursework that satisfies the major requirements, instructor's consent, a Directed Independent Study Abstract form, and departmental consent.

**BIOL 499. Undergraduate Research (1-4).**

Students perform library scholarship under the direct supervision of faculty and write a report. No more than 6 credit hours earned from BIOL 498, 499 or equivalent independent study courses may be applied toward departmental major graduation requirements. Prerequisites: at least 20 credit hours of biology coursework that satisfies the major requirements, instructors consent, a Directed Independent Study Abstract form, and departmental consent.

**BIOL 502. Vascular Plants (4).**

2 Classroom hours; 4 Lab hours. Introduces the structure, reproduction, and evolution of the major groups of living and extinct vascular plants. Includes an introduction to flowering plant systematics. Students earning graduate credit perform a primary literature survey on a topic selected in consultation with the instructor and deliver a 30-minute oral presentation to the class. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212.

**BIOL 503. Field Botany (4).**

Introduces the field identification of common flowering plants using technical scientific keys, distributional patterns and general principles of taxonomy. In addition to lecture and laboratory activities, numerous field trips develop botanical skills and reinforce principles covered in lecture. Prerequisites: BIOL 211, CHEM 212, or instructor's permit.

**BIOL 510. Ecosystem Management & Restoration (3).**

Examines the design, implementation, and evaluation of land management plans and restoration projects. Restoration case studies covering a wide-array of ecological systems (e.g. grassland, forest, wetland, aquatic and marine) are used to examine the strengths and weakness of different approaches in these contexts with particular attention to key ecological principles and socio-economic realities. Students produce a written management plan for a site in south-central Kansas. *Course includes diversity content.* BIOL 418 is recommended. Prerequisite: BIOL 211 or instructor's permission.

**BIOL 523. Freshwater Invertebrates (4).**

2 Classroom hours; 4 Lab hours. Emphasizes the ecology, taxonomy, form and function of free-living, freshwater invertebrates. Half of the course deals with arthropods. Includes methods of collecting, culturing and preserving specimens. Part of the course grade is based on a collection of invertebrates correctly prepared and identified. For graduate credit, students submit a term paper or a more extensive collection within a given taxon. Prerequisites: BIOL 211, CHEM 212.

**BIOL 524. Vertebrate Zoology (3).**

Evolution, distribution, natural history and special characters of vertebrate animals. Students earning graduate credit produce a term paper based on the technical literature on a topic chosen in consultation with instructor. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212; BIOL 527 is also recommended.

**BIOL 527. Comparative Anatomy (5).**

3 Classroom hours; 4 Lab hours. Intensive study of representative chordates emphasizing vertebrate anatomy. Students earning graduate credit complete additional assignments chosen in consultation with the

instructor, such as a term paper based on technical literature, dissection of additional animals, etc. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212. Corequisite: BIOL 527L.

**BIOL 528. Parasitology (4).**

2 Classroom hours; 4 Lab hours. Studies the parasites of man and other vertebrate hosts. Students earning graduate credit produce a term paper based on the technical literature on a topic chosen in consultation with the instructor. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212.

**BIOL 530. Applied and Environmental Microbiology (3).**

A characterization of the roles of microbes in natural and man-made environments. Discussions of microbial ecology and communities, interrelationships with higher organisms, biogeochemical cycling, biotechnology and bioremediation. Students earning graduate credit produce an additional research paper based on primary literature on a topic chosen in consultation with the instructor. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212.

**BIOL 532. Entomology (4).**

2 Classroom hours; 4 Lab hours. Introduces the morphology, physiology, life cycles, behavior, ecology and economic significance of insects. Students earning graduate credit produce a term paper based on the technical literature on a topic chosen in consultation with the instructor or develop proficiency in a specific taxon by performing an individual systematics project. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212.

**BIOL 534. Human Physiology (3).**

Organ systems approach to human physiology. Emphasizes nervous and endocrine control systems and the coordination of body functions. Students earning graduate credit submit a term paper based upon library research on a topic in human physiology chosen in consultation with the instructor. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 531, or instructor's consent.

**BIOL 535. Human Physiology Lab (2).**

4 Lab hours. Empirical approach to human physiology. Students seeking graduate credit submit an additional laboratory report relating the results of a laboratory experiment to those found in the current technical literature. Pre- or corequisite: BIOL 534.

**BIOL 540. Developmental Biology (4).**

2 Classroom hours; 4 Lab hours. Developmental processes in animals emphasizing vertebrates. Centered on the cell interactions controlling differentiation and morphogenesis. Students earning graduate credit complete additional assignments chosen in consultation with the instructor. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212. BIOL 420 recommended. Corequisite: BIOL 540L.

**BIOL 560. Plant Ecology (2).**

2 Classroom hours. Examines the relationship of plants to their environment at the organismal, population, community and ecosystem levels. For graduate credit, a student must prepare and present a 30-minute lecture over one of the topics covered in this course. Prerequisites: BIOL 418 and CHEM 212 or instructor's consent.

**BIOL 561. Plant Ecology Lab (2).**

Laboratory component of BIOL 560. Field trips are an integral part of the course. Emphasizes an experimental approach to plant ecology. For graduate credit, a student must present the results of the library/laboratory project orally, as well as in writing. Pre- or corequisite: BIOL 560.

**BIOL 570. Conservation Biology (3).**

Examines the application of fundamental concepts in ecology, evolutionary biology and genetics to the preservation of biological diversity at the levels of genotypes, species and ecosystems. Topics

covered include (1) how biologists quantify biological diversity, (2) threats to biological diversity, (3) tools used to evaluate the level of threat to individual species and to design species management plans, and (4) concepts and considerations for preserve design. Decisions related to biodiversity conservation often have social and economic consequences, students explore these complexities through case studies. Skills developed in this course include critical reading of primary scientific literature, scientific writing and oral presentation. Prerequisite: BIOL 418.

**BIOL 575. Field Ecology (3).**

9 Lab hours. Techniques for analysis of systems consisting of living organisms and their environments. Field trips are required. Students earning graduate credit perform an individual project on comparative community structure and report the results as a technical paper. Prerequisite: BIOL 418 or instructor's consent.

**BIOL 578. Aquatic Ecology (4).**

2 Classroom hours; 4 Lab hours. Introduces the biological and physical processes that operate in lakes, streams and estuaries. Requires assigned readings, individual projects and field trips. Students earning graduate credit investigate and compare the characteristics and properties of two freshwater ecosystems or investigate a specific taxon or trophic level in a freshwater ecosystem. The results of this investigation are reported as a technical paper. Prerequisite: BIOL 418 or instructor's consent.

**BIOL 590. Immunobiology (3).**

The nature of antigens and antibodies and their interactions. Includes cellular and humoral aspects of immunologic phenomena. Students earning graduate credit prepare a term paper based on the technical literature on a topic chosen in consultation with the instructor. Prerequisites: BIOL 204 (no longer offered) or 211, CHEM 531.

**BIOL 595. Avian Biology (3).**

Presents birds (class Aves) as models in contemporary animal behavior, physiological ecology, evolutionary biology, population ecology and conservation. The laboratory portion of the course teaches field identification of resident and migratory species by sight, song and call note on frequent field trips to a diversity of habitats, and culminates in a field survey of avian species diversity and abundance conducted by each student. Additional laboratory topics are bird banding, determination of age, sex, body lipid reserves, morphological measurement and population census. Student-led discussions of current papers in avian biology are required, as is an all-day Saturday field trip during spring migration through the Central Flyway, which includes south central Kansas. Graduate students must write a term paper on an approved topic in avian biology. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212, or instructor's consent.

**BIOL 610. Topics in Botany (1-5).**

Selected offerings in botany. Consult the Schedule of Courses for current offering(s). Students wishing to enroll in courses not listed in the current schedule must complete a Directed Independent Study Abstract form and obtain approval prior to enrollment. Students earning graduate credit produce a term paper based on the technical literature on a topic chosen in consultation with the instructor. Repeatable for credit. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212 and instructor's consent.

**BIOL 610A. Cell and Molecular Biology Lab (1).**

Acquire current techniques and experimental approaches for studying cells. Prerequisite: departmental approval.

**BIOL 610M. Topics in Genetics Lab (1).**

Students acquire knowledge in current genetics techniques, and know how to apply that knowledge to analyze genetic data, which helps to



improve their trouble shooting and problem solving skills. Prerequisite: departmental approval.

**BIOL 610N. Plant Ecology Lecture and Lab (4).**

Focuses on identifying and explaining key ecological patterns found in plant populations and communities.

**BIOL 626. Reproductive Biology (3).**

Covers the basic organization and function of vertebrate reproductive systems. Includes current concepts and contemporary research from the molecular to the population level. Students earning graduate credit prepare a term paper based on the technical literature on a topic chosen in consultation with the instructor. BIOL 526 is strongly recommended. Prerequisite: BIOL 420.

**BIOL 630. Behavioral Ecology (3).**

Studies the biological basis of social behavior, stressing the underlying evolutionary and ecological mechanisms. Lectures examine altruism and kin selection, kin recognition mechanisms, sexual behavior, sexual selection and mate choice, mating systems, and reproductive strategies from the perspective of natural selection. Students earning graduate credit write a term paper based on the technical literature and present this in a class seminar. Prerequisite: BIOL 418.

**BIOL 640. Topics in Zoology (1-4).**

Selected offerings in zoology. Consult the Schedule of Courses for the current offering(s). Students wishing to enroll in courses not listed in the current schedule must complete a Directed Independent Study Abstract form and obtain approval prior to enrollment. Students earning graduate credit produce a term paper based on the technical literature on a topic chosen in consultation with the instructor. Repeatable for credit. Prerequisites: BIOL 204 (no longer offered) or BIOL 211, CHEM 212 and instructor's consent.

**BIOL 640AA. Ecology Lab (1).**

Laboratory explores the principles underlying the interrelationships of living organisms and their environments from the biosphere to the population level of organization. Prerequisite: departmental approval.

**BIOL 640AB. Human Anatomy (3).**

Gives students an understanding of the anatomy of the human body at the 600 level. Emphasis is on the detailed structural anatomy and classification of each of the human body's organ systems. Students are challenged to begin thinking clinically so as to prepare for a future in the health professions. Includes weekly lectures and laboratories that the student is expected to attend.

**BIOL 640AL. Human Anatomy Lab (2).**

The gross and microscopic anatomy of each human body system is examined in lab through the use of models, diagrams, lab activities and dissections. Dissections include fetal pig full dissection and organ dissections of the following sheep organs: brain, eyeball, heart and kidney.

**BIOL 640G. Topics in Neurobiology (3).**

The course covers fundamental neuroanatomy, cellular and molecular neuroscience, development, sensory systems, motor systems, and regulatory systems.

**BIOL 640OL. ST: General Biology I - Lab (1).**

Biology is a laboratory science and the laboratory portion of General Biology I introduces students to experimental methods and scientific communication. Prerequisite: departmental approval.

**BIOL 640P. Evolution (3).**

Students in this course will learn basic aspects of evolutionary pattern and process with a focus on changes within populations. Topics include: 1) an overview of natural selection and its effects; 2) the micro evolutionary process in natural populations (drift, selection, mutation,

etc.); 3) quantitative genetics; 3) testing hypotheses of adaptation; 4) the evolution of genomes; and 5) lineage divergence (speciation).

**BIOL 640QL. ST: General Biology II - Lab (1).**

The laboratory includes a survey of organismal diversity including prokaryotes, protists, fungi, plants and animals. Prerequisite: departmental approval.

**BIOL 660. Topics in Microbiology (1-4).**

Selected offerings in botany. Consult the Schedule of Courses for current offering(s). Students wishing to enroll in courses not listed in the current schedule must complete a Directed Independent Study Abstract form and obtain approval prior to enrollment. Students earning graduate credit produce a term paper based on the technical literature on a topic chosen in consultation with the instructor. Repeatable for credit. Prerequisites: BIOL 330 and instructor's consent.

**BIOL 660J. General Microbiology Lab (2).**

Hands on general microbiology laboratory skills will be performed, including; microscopy, staining, aseptic and culturing techniques, isolation and identification of bacterial species, and other standard techniques used in microbiology. Prerequisite: departmental approval.

**BIOL 661. Pathogenic Microbiology (3).**

Focuses on those microbes that produce disease. Most coverage is given to those microbes that cause disease in humans, but zoonotic diseases are also covered. In addition to describing the features of each microbe that enable its pathogenesis, attention is given to the distinctive aspects of its epidemiology, its means of spread and effective countermeasures. Prerequisite: BIOL 330 or instructor's consent.

**BIOL 662. Virology (3).**

Focuses on the following aspects of viruses: structure, function, replication strategy, host cell interactions and mechanism of variability. Additional topics include the coevolution of viruses and their host cells, the unique ecological niche occupied by viruses, and the challenge that viruses present when attempting to draw clear distinctions between living and nonliving entities. Prerequisite: BIOL 330 or instructor's consent.

**BIOL 666. Special Topics in Biochemistry (3).**

Primarily for students who choose the biochemistry field major. Discusses a small number of current problems in biochemistry in depth. Requires reading published research papers in the field. Students earning graduate credit produce a term paper based on the technical literature on a topic chosen in consultation with the instructor. Prerequisites: BIOL 211, CHEM 662 and 663.

**BIOL 666B. Cancer Biology (3).**

The basic mechanisms of carcinogenesis are covered by discussing the control of normal and abnormal cell growth in several model systems. Students earning graduate credit also submit a term paper dealing with a specific topic to be determined by discussion with the instructor. Prerequisite: BIOL 420.

**BIOL 669. Research In Biochemistry (2).**

Cross-listed as CHEM 669. Students in the biochemistry field major participate in a biochemistry research project under the direction of a faculty member. Requires a written report summarizing the results. For undergraduate credit only. Repeatable once for credit. Prerequisites: BIOL 420, and CHEM 662 or 663, and CHEM 664 and instructor's consent.

**BIOL 710. Glycobiology (3).**

Introduces glycoprotein biosynthesis, structure and function. Covers the various roles of carbohydrates in modifying protein structure and function. Students earning graduate credit prepare a term paper based on the technical literature on a topic chosen in consultation with the instructor. Prerequisite: BIOL 420.

**BIOL 725. Biodiversity Analyses (3).**

Surveys the theory, principles, metrics and applications of biodiversity sciences including systematics, biogeography and phylogeny. The pervasive role of phylogenetic data in evolutionary biology (e.g., biogeography, coevolution, speciation, conservation) and other fields (e.g., epidemiology, anthropology, agriculture) are highlighted. Species diversity, species radiations, structure of the tree of life, the wealth of comparative data (from genes to proteins and morphology) and the role of systematics in conservation biology are discussed. Offered fall, even years.

**BIOL 730. Cancer Biology (3).**

The basic mechanisms of carcinogenesis are covered by discussing the control of normal and abnormal cell growth in several model systems. Students earning graduate credit also submit a term paper dealing with a specific topic to be determined by discussion with the instructor. Prerequisite: BIOL 420.

**BIOL 737. Aquatic Toxicology (3).**

The qualitative and quantitative study of the fate and effects of toxic agents in the aquatic environment. Examines the concentrations or quantities of chemicals that occur in the aquatic environment. Includes a detailed study of the transport, distribution, transformation and ultimate fate of various environmentally important chemicals. Class is for undergraduate or graduate students interested in advanced training in toxicology. Prerequisites: BIOL 418 or equivalent, CHEM 531 or equivalent, or instructor's consent.

**BIOL 738. Plant and Animal Interactions (3).**

Develops and expands basic ecological and evolutionary concepts presented in earlier biology courses including natural selection, coevolution, population growth and factors structuring ecological communities. Applies these concepts to the study of herbivory, pollination by animals and seed dispersal by animals. Designed to improve students' abilities to read current primary scientific literature critically with particular emphasis on identifying and evaluating evidence for hypotheses in ecology and evolutionary biology. Introduces the peer review process and hones students' scientific writing skills. Students write a mini-review article of a current hypothesis in the field of plant-animal interaction. An oral presentation based on the findings of the mini-review is also required. Prerequisites: BIOL 418 or equivalent general ecology course.

**BIOL 740. Topics in Graduate Biology (2-4).**

Lecture, laboratory, field techniques, selected readings or discussion course pertaining to a specific biological topic not available in the regular curriculum. May include oral presentations(s) and/or written paper(s). Topics are developed by individual faculty members and reflect current topics, in-depth analysis and biological specialties. Repeatable for credit up to 6 credit hours. Prerequisites: any two of the following three courses - BIOL 418, 419, 420; and instructor's consent.

**BIOL 740F. Biology of Arthropod Vectors (2).**

Overview of the major groups of parasites and arthropod-borne pathogens that infect humans throughout southeastern Kansas with a focus on understanding the biology of these organisms including their life history and behavior.

**BIOL 740G. Special Topics in Microbiology (3).**

Closely examines the primary literature in a narrow topic area. Students present and discuss reviews of these reports from both a scientific and editorial standpoint. Successful students learn in-depth information about the concepts and methods in this area of science. They also acquire the skills needed to understand and perform peer-review, while becoming better authors. Focuses on microbial ecology and astrobiology.

**BIOL 740J. Kansas Rove Beetle Identification (4).**

Links grassland management to plant, insect and bird abundance and diversity. The goal of the study is to examine trophic interactions in grassland food webs between plants, insects and birds.

**BIOL 740K. Kansas Bee Identification (4).**

Links grassland management to plant, insect and bird abundance and diversity. The goal of the study is to examine trophic interactions in grassland food webs between plants, insects and birds.

**BIOL 760. Experimental Molecular Biology (4).**

2 Classroom hours; 4 Lab hours. Introduces upper-level undergraduate and graduate students to molecular biology techniques. The methodology primarily involves the manipulation of DNA and the expression of genetic material in prokaryotic and eukaryotic systems. Prerequisite: BIOL 419 or 420.

**BIOL 767. Mechanisms of Hormone Action (3).**

The mechanism of action of several hormones is described and used to illustrate the major intracellular signal transduction pathways. Includes gonadotropin-releasing hormone, the glycoprotein hormones, luteinizing hormone, follicle-stimulating hormone, chorionic gonadotropin, thyroid-stimulating hormone, steroid hormones, thyroid hormone, activating/inhibin, prostaglandins, insulin and growth hormone. Mostly lectures covering signal transduction pathways. Students write brief summaries of recent research papers related to the current week's lecture topics. Each student makes an oral presentation of a research paper in journal club format. Students earning graduate credit write a term paper describing in detail a hormone not described in class and its mechanism of action. Prerequisites: BIOL 420 and CHEM 662 or their equivalents, plus either BIOL 526 or 534 or their equivalents, and instructor's consent.

**BIOL 773. Statistical Applications in Biology (3).**

Introduces experimental designs and statistical analyses that are commonly used in biological research. Focuses on univariate statistical analyses including t-tests, analysis of variance, nonparametric equivalents of ANOVA, linear regression, goodness-of-fit tests and categorical data analysis. Applications to research questions that arise in biological research, including the students' own research, are emphasized. Students also receive training in the use of statistical analysis computer software. Previous enrollment in STAT 370 is recommended.

**BIOL 780. Molecular Genetics (3).**

Studies the physiochemical nature of genetic material and the mechanisms of genetic regulation of metabolism. Students earning graduate credit produce a term paper and deliver a class seminar based on the technical literature on a topic chosen in consultation with the instructor. Prerequisite: BIOL 419.

**BIOL 781. Cooperative Education (1-4).**

Students pursuing the no thesis MS degree may gain practical professional experience, under academic supervision, that complements the student's academic program. BIOL 781N is for internships that last no more than one semester or summer and may be unpaid. The intern experience to be used for credit must be approved by the student's graduate capstone project committee. An academic product from the experience, such as a written summary and/or oral presentation is assigned by the graduate capstone committee. Prerequisite: acceptance into MS program.

**BIOL 781N. Internship in Biology (1-4).**

Students pursuing the no thesis MS degree may gain practical professional experience, under academic supervision, that complements the student's academic program. BIOL 781N is for internships that last no more than one semester or summer and may be unpaid. The intern experience to be used for credit must be approved by the student's

graduate capstone project committee. An academic product from the experience, such as a written summary and/or oral presentation is assigned by the graduate capstone committee. Prerequisite: acceptance into MS program.

**BIOL 797. Departmental Seminar (1).**

Forum for the weekly presentation and discussion of research projects performed by invited scientists from outside departments and institutions, departmental faculty and graduate students. All MS degree-bound graduate students are required to attend the seminar each semester and must enroll in the course for credit during two semesters. Students enrolled in the course must attend all seminars presented in the course, fill out an evaluation of each seminar and make one 15 minute professional-meeting style presentation of their research. Repeatable for credit up to 5 credit hours. Prerequisite: acceptance into MS program.