Biological Sciences (BIO_SC)

**BIO_SC 1001: Topics in Biological Science - General**
Selected topics not covered in current offerings. May not be used in partial fulfillment of requirements for a biological science in general education. May be graded on A-F or S/U basis.

*Credit Hour*: 1-3

**BIO_SC 1002: Topics in Biological Sciences- Biological/Physical/Mathematics**
Selected topics not in regularly offered courses. Selected sections of this course may be graded either on A-F or S/U basis only.

*Credit Hour*: 1-3

**BIO_SC 1010: General Principles and Concepts of Biology**
Emphasizes connections and applications to society and the human condition, science literacy, and critical thinking skills. A discussion of general principles and fundamental concepts of living things. This course is intended for non-science majors. No more than 5 credits for BIO_SC 1010, BIO_SC 1020, and BIO_SC 1030.

*Credit Hours*: 3

*Recommended*: MATH 1100

**BIO_SC 1020: General Biology Laboratory**
Laboratory exercises dealing with representative organisms and methods of modern biological sciences. This course is intended for non-science majors. No more than 5 credits for BIO_SC 1010, BIO_SC 1020, and BIO_SC 1030.

*Credit Hours*: 2

*Prerequisites*: BIO_SC 1010 or BIO_SC 1400 or BIO_SC 1010 concurrently

**BIO_SC 1030: General Principles and Concepts of Biology with Laboratory**
Survey of general principles and basic concepts of life science, emphasizing applications to society and the human condition. Lectures address science literacy and critical thinking and laboratory exercises use representative organisms to complement lecture topics. This course is intended for non-science majors. No more than 5 credits for BIO_SC 1010, BIO_SC 1020, and BIO_SC 1030.

*Credit Hours*: 5

*Recommended*: MATH 1100 or concurrent enrollment

**BIO_SC 1060: Basic Environmental Studies**
Considers the ecosystem, energy and biogeochemical cycles and population dynamics; relation of the environment to agriculture and technology, pollution, power and food production; politico-economic considerations; moral and ethical issues. For non-science majors.

*Credit Hours*: 3

**BIO_SC 1100: Introductory Zoology with Laboratory**
(same as F_W 1100). Introduces important principles and concepts of zoology. Emphasizes cell biology; evolution; genetics; ecology; structure, function, development of the organism.

*Credit Hours*: 5

**BIO_SC 1200: General Botany with Laboratory**
Introduction to study of plants. Emphasis on structure, growth, physiology, genetics and reproduction of plants.

*Credit Hours*: 5

**BIO_SC 1400: Evolution for Everyone**
This course will explore the application of evolutionary theory to modern human affairs. We will study the processes involved in evolution and investigate evolutionary interpretations of human social behavior (e.g., psychology, mate choice, economics, religion, and morality). No credit if student has received credit for BIO_SC 2060 or BIO_SC 4600.

*Credit Hours*: 3

*Recommended*: One course in Biology

**BIO_SC 1500: Introduction to Biological Systems with Laboratory**
Basic concepts and principles of the structure and function of living systems, from cells to populations. Foundation course for science students intending to complete a 3-semester sequence that also includes genetics and cell biology.

*Credit Hours*: 5

*Recommended*: MATH 1100 or sufficient ALEKS score

**BIO_SC 1500H: Introduction to Biological Systems with Laboratory Honors**
Basic concepts and principles of the structure and function of living systems, from cells to populations. Foundation course for science students intending to complete a 3-semester sequence that also includes genetics and cell biology.

*Credit Hour*: 3-5

*Prerequisites*: MATH 1100 and high school chemistry. Honors eligibility required

**BIO_SC 2001: Topics in Biological Sciences - General**
Selected topics not covered in current offerings. May not be used in partial fulfillment of requirements for a biological science in general education. May be graded on A-F or S/U basis.

*Credit Hour*: 1-3

*Recommended*: One course in Biology

**BIO_SC 2002: Topics in Biological Sciences- Biological/Physical/Mathematics**
Selected topics not covered in regularly offered courses. Selected sections of this course may be graded either on A-F or S/U basis only.

*Credit Hour*: 1-3

*Recommended*: a course in general biology
BIO_SC 2002H: Topics in Biological Sciences- Biological/Physical/Mathematics - Honors
Selected topics not covered in regularly offered courses. Recommended: a course in biology.
Credit Hour: 1-3
Prerequisites: Honors eligibility required

BIO_SC 2010: Undergraduate Seminar in Biological Sciences
Discussion and critical evaluation of current topics in biological sciences for intermediate-level students. Some sections may be graded on either A-F or S/U basis only.
Credit Hour: 1-3
Prerequisites: sophomore standing

BIO_SC 2015: Biological Career Explorations
Students will learn about career options and choices, construct career portfolios, and interact with current biological professionals. Graded on S/U basis only.
Credit Hour: 1
Prerequisites: Departmental consent
Recommended: Sophomore standing

BIO_SC 2020: How the Brain Works
Basic structure and function of the brain; left and right brain studies; gender differences; learning and memory; brain disorders.
Credit Hour: 1
Prerequisites: C- or above in BIO_SC 1010 or BIO_SC 1500

BIO_SC 2030: Life of the Cell
This course will help students understand basic concepts of biomolecular structure, cell organization, cell membranes, energy and metabolism, cellular communication, and cell division. This course is intended for non-science majors and may not be used to satisfy requirements for either a major or a minor in biological sciences.
Credit Hours: 3
Prerequisites: BIO_SC 1010

BIO_SC 2060: Community Biology
Principles of population biology, ecology, and evolution, including consideration of human impacts on biological communities and ecosystems.
Credit Hours: 3
Prerequisites: BIO_SC 1010 or equivalent. Not open to biology majors

BIO_SC 2100: Infectious Diseases
An introduction to the basic science of bacterial, viral, protozoan, fungal and helminth infections, including discussions of how illness has influenced or been affected by public policy and culture.
Credit Hours: 3
Prerequisites: BIO_SC 1010. Not open to Biology Majors

BIO_SC 2150: Genetic Diseases
This course will discuss the biological basis for genetic diseases, including inherited diseases and non-inherited diseases such as cancer.

BIO_SC 2150H: Genetic Diseases - Honors
The units will include an introduction providing necessary background information, as section studying the technology used to study genetic diseases and several units discussing specific diseases and their impact on history and society. This course is intended for non-science majors. Cannot be used to satisfy degree requirements for biology major or biology minor.
Credit Hours: 3
Prerequisites: BIO_SC 2150

BIO_SC 2200: General Genetics
Principles of inheritance in plants and animals; structure and use of genetic material, transmission of genetic information, linkage, modification of genetic information, regulation of genetic activity, population genetics.
Credit Hours: 4
Prerequisites: BIO_SC 1500 and CHEM 1320 (or concurrent enrollment)

BIO_SC 2300: Introduction to Cell Biology
Analysis of cellular organization and function at the molecular level. The mechanisms underlying cellular trafficking, cell motility, and signaling within cells and between cells and their environment will be emphasized.
Credit Hours: 4
Prerequisites: BIO_SC 2200

BIO_SC 2300H: Introduction to Cell Biology- Honors
Analysis of cellular organization and function at the molecular level. The mechanisms underlying cellular trafficking, cell motility, and signaling within cells and between cells and their environment will be emphasized.
Credit Hours: 4
Prerequisites: BIO_SC 2200. Honors eligibility required

BIO_SC 2300HW: Introduction to Cell Biology - Honors/Writing Intensive
Analysis of cellular organization and function at the molecular level. The mechanisms underlying cellular trafficking, cell motility, and signaling within cells and between cells and their environment will be emphasized.
Credit Hours: 4
Prerequisites: BIO_SC 2200. Honors eligibility required

BIO_SC 2600: Ornithology
(same as F_W 2600). Structure, identification, habits, importance of regional birds. Field work, lectures, lab.
Credit Hours: 4
Recommended: 5 hours of Biological Sciences

BIO_SC 2700: Ichthyology
(same as F_W 2700). A broad introduction to the biology and ecology of fishes. Emphasis will be placed on understanding the adaptations fishes exhibit to aspects of their environment. Includes lab.
Credit Hours: 4
Recommended: 8 hours biology or equivalent
Biological Sciences (BIO_SC)

BIO_SC 2940: Internship in Biological Science
Work experience in a non-profit, for profit, or governmental organization relevant to the biological sciences. Intended for students doing internships in which independent research is less than 50% of the experience. Graded on S/U basis only.

Credit Hour: 1-3
Prerequisites: instructor's consent
Recommended: junior standing, 12 hours of biological science and 2.70 GPA

BIO_SC 2950: Directed Independent Research
Participation in faculty research activities. May not be used to satisfy degree requirements for BA or BS in biological sciences or the minor in biological sciences.

Credit Hour: 1-3
Prerequisites: Departmental consent

BIO_SC 2960: Readings in Biological Science
Supervised reading in biological literature. May be repeated up to six hours total credit. Selected sections of this course may be graded either on A-F or S/U basis only. May not be used in partial fulfillment of Arts and Science foundation requirement.

Credit Hour: 1-3
Prerequisites: instructor's consent

BIO_SC 2965H: Honors Readings in Biological Literature
Selected readings in biological literature for Honors, in consultation with instructor. May not be used in partial fulfillment of Arts and Science foundation requirement.

Credit Hour: 1-3
Prerequisites: overall 3.3 GPA; instructor's consent. Honors eligibility required

BIO_SC 3002: Topics in Biological Sciences- Biological/Physical/Mathematics
Selected topics not in regularly offered courses. Selected sections of this course may be graded either on A-F or S/U basis only.

Credit Hour: 1-3
Recommended: Junior Standing

BIO_SC 3002H: Topics in Biological Sciences- Biological/Physical/Mathematics - Honors
Selected topics not offered in regular curriculum.

Credit Hour: 1-3
Prerequisites: Honors eligibility required

BIO_SC 3002W: Topics in Biological Sciences- Biological/Physical/Mathematics - Writing Intensive
Selected topics not in regularly offered courses. Selected sections of this course may be graded either on A-F or S/U basis only.

Credit Hour: 1-3
Recommended: Junior Standing

BIO_SC 3010: Professional Skills
This course will focus on application and interview skills for students interested in medical school. Graded on S/U basis only.

Credit Hour: 1
Prerequisites: instructor's consent
Recommended: junior standing; 3.4 GPA, and biological sciences majors

BIO_SC 3050: Genetics and Society
Introduction to genetics, emphasizing the impact of genetics on human society. Human evolution, molecular genetics, genetic engineering in medicine and agriculture. An intensive writing course.

Credit Hours: 3

BIO_SC 3050W: Genetics and Society - Writing Intensive
Introduction to genetics, emphasizing the impact of genetics on human society. Human evolution, molecular genetics, genetic engineering in medicine and agriculture. An intensive writing course.

Credit Hours: 3

BIO_SC 3075: The Human Microbiome
This course examines the astonishing diversity and medical significance of the microbes that inhabit our bodies. Interactive discussions explore scientific and ethical dimensions of topics ranging from probiotics and "poop transplants" to the role of microbes in asthma and obesity.

Credit Hours: 3
Prerequisites: BIO_SC 2200

BIO_SC 3075W: The Human Microbiome - Writing Intensive
This course examines the astonishing diversity and medical significance of the microbes that inhabit our bodies. Interactive discussions explore scientific and ethical dimensions of topics ranging from probiotics and "poop transplants" to the role of microbes in asthma and obesity.

Credit Hours: 3
Prerequisites: BIO_SC 2200

BIO_SC 3210: Plant Systematics
Principles of classification of plants; survey of diversity in flowering plant families; identification of local flora; use of keys. Includes lab.

Credit Hours: 4
Recommended: 8 hours of Biological Sciences

BIO_SC 3250: Parasitology
(parame as BIOMED 3250). Parasitism is considered as a fundamental type of interspecies interaction. Principles of parasitism as they apply to animals are presented with emphasis on parasite morphology, biology and host parasite relationships. Includes lab. Recommend: 8 hours of biology.

Credit Hours: 4

BIO_SC 3260: Invertebrate Zoology
Structure, ecology and phylogeny of the invertebrate phyla. Includes lab.

Credit Hours: 4
Prerequisites: BIO_SC 1100 or BIO_SC 1500
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO_SC 3260W</td>
<td>Invertebrate Zoology - Writing Intensive</td>
<td>Structure, ecology and phylogeny of the invertebrate phyla. Includes lab.</td>
<td>4</td>
<td>BIO_SC 1100 or BIO_SC 1500</td>
<td>Junior Standing</td>
</tr>
<tr>
<td>BIO_SC 3360</td>
<td>Herpetology</td>
<td>The biology, ecology, taxonomy, and distribution of amphibians and reptiles. Some Saturday field trips.</td>
<td>4</td>
<td>8 hours Biological Sciences or equivalent</td>
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<tr>
<td>BIO_SC 3400</td>
<td>Evolution and Ecology</td>
<td>Introduction to principles of evolution and ecology. Topics include natural selection, adaptation, phylogenetic analysis, human evolution, population growth and regulation, population interactions, ecosystem ecology, and human impacts on ecological processes. No credit for this course if either BIO_SC 3650 or BIO_SC 4600 already completed; may not co-enroll in this course and BIO_SC 4600.</td>
<td>3</td>
<td>BIO_SC 2200</td>
<td></td>
</tr>
<tr>
<td>BIO_SC 3510</td>
<td>Biology of Fungi</td>
<td>(same as PLNT_S 3510). The diverse roles of fungi in the biosphere will be explored by considering fungi we eat, fungi which destroy our food, fungi in folklore and fungi as global nutrient recyclers. Includes lab.</td>
<td>3</td>
<td>BIO_SC 1200 or BIO_SC 1500 or equivalent</td>
<td></td>
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<tr>
<td>BIO_SC 3650</td>
<td>General Ecology</td>
<td>Principles of populations, coevolution, density factors, competition; physical environment; concept of community, trophic structure, biotic succession; characterization of biomes, man in ecosystem. Biology majors having completed BIO_SC 3100: 2 hours credit.</td>
<td>5</td>
<td>Junior standing</td>
<td>10 hours in Biology</td>
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<tr>
<td>BIO_SC 3650W</td>
<td>General Ecology - Writing Intensive</td>
<td>Principles of populations, coevolution, density factors, competition; physical environment; concept of community, trophic structure, biotic succession; characterization of biomes, man in ecosystem. Biology majors having completed BIO_SC 3100: 2 hours credit.</td>
<td>5</td>
<td>Junior standing</td>
<td>10 hours in Biology</td>
</tr>
<tr>
<td>BIO_SC 3655</td>
<td>Tropical Ecology: Methods and Applications</td>
<td>Field study of tropical community; additional fee for transportation and accommodations required.</td>
<td>3</td>
<td>BIO_SC 3650 or BIO_SC 4600 or BIO_SC 4660</td>
<td></td>
</tr>
<tr>
<td>BIO_SC 3660</td>
<td>Mammalogy</td>
<td>(same as F_W 3660). Taxonomy, distribution, structure, habits, importance of mammals; emphasizes those of central United States. Includes lab.</td>
<td>4</td>
<td>Junior Standing or instructor's consent</td>
<td></td>
</tr>
<tr>
<td>BIO_SC 3700</td>
<td>Animal Physiology</td>
<td>Introduces concepts of vertebrate organ function and homeostatic control emphasizing mammalian physiology. Some comparisons to function in other vertebrates and strategies for coping with environmental stresses introduced. Includes lab.</td>
<td>5</td>
<td>BIO_SC 2300</td>
<td></td>
</tr>
<tr>
<td>BIO_SC 3710</td>
<td>Introductory Entomology</td>
<td>(same as PLNT_S 3710). Emphasizes the role insects play in the scheme of life. Topics include insect structure, development, diversity, ecology, communication and behavior, and management. Prerequisites: Completion of 60 credit hours and one of the following: BIO_SC 1100 (or F_W 1100) or BIO_SC 1200, or BIO_SC 1500.</td>
<td>3</td>
<td>PLNT_S 3710 (or BIO_SC 3710) or concurrent registration</td>
<td></td>
</tr>
<tr>
<td>BIO_SC 3750</td>
<td>General Microbiology</td>
<td>Principles of microbiology. Includes lab.</td>
<td>3-4</td>
<td>BIO_SC 2200 and BIO_SC 2300</td>
<td>grades in C range for prerequisites</td>
</tr>
<tr>
<td>BIO_SC 3780</td>
<td>Genetics Laboratory</td>
<td>Experimental genetic studies of Drosophila, corn and microorganisms.</td>
<td>2</td>
<td>C range grade or better in BIO_SC 2200 or instructor's consent</td>
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<tr>
<td>BIO_SC 3790</td>
<td>Developmental Biology Laboratory</td>
<td>Laboratory studies of development in sea urchin, chicken and roundworm.</td>
<td>2</td>
<td>BIO_SC 3800 or co-enrollment in BIO_SC 3800</td>
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<tr>
<td>BIO_SC 4002</td>
<td>Topics in Biological Science - Biological/Physical/Mathematics</td>
<td>Selected topics not in regularly offered courses. May be repeated up to 2 times for credit.</td>
<td></td>
<td>BIO_SC 3800</td>
<td></td>
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</tbody>
</table>
BIO_SC 4085: Problems in Biological Sciences
Individual supervised work to supplement regularly organized courses in biology; introduction to research. Selected sections of this course may be graded either on A-F or S/U basis only.
Credit Hours: 1-3
Prerequisites: senior standing

BIO_SC 4100: Limnology
(same as F_W 4100; cross-leveled with BIO_SC 7100, F_W 7100).
(lecture/lab: 4 hrs.; lecture only: 3 hrs.) Ecology of inland waters with emphasis on productivity.
Credit Hours: 3-4
Prerequisites: senior standing

BIO_SC 4300: Analysis of Biological Macromolecules
(cross-leveled with BIO_SC 7300). Theory/application of techniques used for characterization of proteins, nucleic acids; topics: sedimentation velocity; equilibrium; sucrose density gradients; electrophoresis; spectrophotometry.
Credit Hours: 3
Prerequisites: BIO_SC 2300 or BIOCHM 4270, and MATH 1500
Recommended: one year Physics

BIO_SC 4310: Physics in Cell and Developmental Biology
(same as PHYSCS 4310; cross-leveled with BIO_SC 7310, PHYSCS 7310, MPP 7300). Discusses the role of physical mechanisms in specific cellular and developmental processes and phenomena, in particular those characterizing the embryonic stage of multicellular organisms. Each process and phenomenon is first described in biological terms and then within a physical model, with special emphasis on the interplay between the two descriptions.
Credit Hours: 3
Prerequisites: PHYSCS 1220 or PHYSCS 2760 and BIO_SC 2300, or instructor's consent

BIO_SC 4320: Molecular Plant Physiology
(same as PLNT_S 4320; cross-leveled with BIO_SC 7320, PLNT_S 7320). Modern physiology of higher plants using common cultivated plants as examples.
Credit Hours: 3
Prerequisites: BIO_SC 1200 or BIO_SC 1500 and CHEM 1320

BIO_SC 4328: Introductory Radiation Biology
(same as NU_ENG 4328, RADIOL 4328; cross-leveled with BIO_SC 7328, NU_ENG 7328, RADIOL 7328). Concepts of ionizing radiations, their actions on matter through effects on simple chemical systems, biological molecules, cell, organisms, man.
Credit Hours: 3
Prerequisites: junior standing, Sciences/Engineering; one course in Biological Sciences and Physics/Chemistry; or instructor's consent

BIO_SC 4400: Plant Anatomy
(same as PLNT_S 4400; cross-leveled with BIO_SC 7400, PLNT_S 7400). Comparative structure, growth of meristems; development, structure of important cell types, tissues, tissue systems; comparative anatomy of stem, root, leaf. Emphasizes anatomy of gymnosperms, angiosperms. Includes lab.
Credit Hours: 4
Prerequisites: BIO_SC 1200 or BIO_SC 1500

BIO_SC 4500: Neurobiology
(cross-leveled with BIO_SC 7500). Vertebrate and invertebrate neurobiology, including cell and molecular biology of the neuron, neurophysiology, neuroanatomy, neuroethology and developmental neurobiology.
Credit Hours: 3
Prerequisites: BIO_SC 2300 or instructor's consent
Recommended: BIO_SC 3700

BIO_SC 4560: Sensory Physiology and Behavior
(cross-leveled with BIO_SC 7560). Basic principles of coding and integration of sensory stimuli; neural correlates of animal behavior; environmental influences on postnatal sensory development. Graded on A-F basis only.
Credit Hours: 3
Prerequisites: BIO_SC 4500

BIO_SC 4580: Computational Neuroscience
(same as ECE 4580, BIOL_EN 4575;; cross-leveled with BIO_SC 7580, ECE 7580, BIOL_EN 7575). An interdisciplinary course with a strong foundation in quantitative sciences for students in biological and behavioral science and an introduction to experimental methods for students from quantitative sciences.
Credit Hours: 4
Prerequisites: BIO_SC 1010 or BIO_SC 1500; MATH 1500

BIO_SC 4580: Computational Neuroscience
(same as ECE 4580, BIOL_EN 4575; cross-leveled with BIO_SC 7580, ECE 7580, BIOL_EN 7575). An interdisciplinary course with a strong foundation in quantitative sciences for students in biological and behavioral science and an introduction to experimental methods for students from quantitative sciences.
Credit Hours: 4
Prerequisites: BIO_SC 1010 or BIO_SC 1500; MATH 1500

BIO_SC 4600: Evolution
Surveys various processes in organic evolution and underlying genetic mechanisms.
Credit Hours: 3
Prerequisites: BIO_SC 2200

BIO_SC 4640: Behavioral Biology
(cross-level with BIO_SC 7640). Comparative study of animal ethology. Principles of animal ethology illustrated in different animal phyla. May be taken with Laboratory for 4 credits.
Credit Hours: 3-4
Prerequisites: BIO_SC 1500
Recommended: one additional upper-level course in Biological Sciences or Psychology

BIO_SC 4642: Animal Communication
Physical properties of sensory stimuli, receptor mechanisms, functional significance of communication behavior, and multidisciplinary and experimental approaches to current research in animal communication.
Credit Hours: 3
Prerequisites: BIO_SC 3400 or BIO_SC 4600

**BIO_SC 4660: Plant Population Biology**
(cross-leveled with BIO_SC 7660). Covers the ecological and evolutionary processes that influence the distribution and abundance of plant species. Topics include evolution of life history schedules, gender evolution, population growth and demography, competition, herbivory, plant-pollinator interactions, clonal growth, and plant community structure. Includes lab.

**Credit Hours:** 4

**Recommended:** 2 courses in Biological Sciences

**BIO_SC 4670: Avian Ecology**
(cross-level with BIO_SC 7670). Advanced examination of ecological patterns in birds. Explores the environmental factors affecting the evolution of avian behavior, morphology, community structure and distribution.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2600 or BIO_SC 3650

**BIO_SC 4950: Undergraduate Research in Biology**
Individually directed field or laboratory research for upperclass students under faculty supervision. Project must be arranged by student and faculty member prior to registration. May be repeated to a maximum of 6 hours.

**Credit Hour:** 1-3

**Prerequisites:** instructor's consent

**Recommended:** Overall GPA 2.75; 20 hours of Biological Sciences and/or Chemistry

**BIO_SC 4950H: Honors Research in Biology**
Individually directed field or laboratory research for upper-level Honors students, in consultation with a faculty member. Project must be arranged by student and faculty member prior to registration. May be repeated for credit. Graded on A-F basis only.

**Credit Hour:** 1-3

**Prerequisites:** overall GPA 3.3; instructor's consent; biology or microbiology major. Honors eligibility required

**BIO_SC 4952: Undergraduate Research in Biology**
Individually directed field or laboratory research for upperclass students under faculty supervision. Project must be arranged by student and faculty member prior to registration. May be repeated to a maximum of 6 hours.

**Credit Hour:** 1-3

**Prerequisites:** BIO_SC 4950; overall GPA 2.75; instructor's consent

**BIO_SC 4952H: Honors Research in Biology**
Continuation of research program. Successful completion requires public presentation and leads to degree with Honors in biological sciences. May be repeated for credit for maximum of 6 hours. Graded on A-F basis only.

**Credit Hour:** 1-3

**Prerequisites:** BIO_SC 4950H; overall GPA 3.3; instructor's consent. Honors eligibility required

**BIO_SC 4960: Special Readings in Biological Sciences**
Independent readings and discussions of topics in biology selected in consultation with supervising faculty member. Selected sections of this course may be graded either on A-F or S/U basis only.

**Credit Hour:** 1-3

**Prerequisites:** senior standing in Biological Sciences and instructor's consent

**BIO_SC 4970: Neurobiology Laboratory**
Laboratory experience with experimental neurobiology, with emphasis on neural networks, motor systems, and developmental neurobiology.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 3700 or BIO_SC 4500 or instructor's consent

**BIO_SC 4972: Developmental Biology**
Analysis of the molecular, genetic, cellular, and morphological processes responsible for phenotypic changes in developing organisms. A variety of experimental systems are discussed to identify common mechanisms used by developing organisms.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2200, BIO_SC 2300, CHEM 2100

**BIO_SC 4972W: Developmental Biology**
Analysis of the molecular, genetic, cellular, and morphological processes responsible for phenotypic changes in developing organisms. A variety of experimental systems are discussed to identify common mechanisms used by developing organisms.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2200, BIO_SC 2300

**BIO_SC 4974: Molecular Biology Laboratory**
Emphasizes recently developed genetic and biochemical techniques; illustrates how they apply to contemporary problems in biological research. Prerequisites: BIO_SC 2200 or BIOCHM 4272 or

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2200, BIO_SC 2300, CHEM 2100

**BIO_SC 4976: Molecular Biology**
(cross-leveled with BIO_SC 7976). Molecular mechanisms of DNA replication, mutation, recombination and gene expression in prokaryotes, eukaryotes, and their viruses; gene fine structure; genetic engineering.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2200 and BIO_SC 2300

**BIO_SC 4978: Cancer Biology**
(same as BIOCHM 4978; cross-leveled with BIO_SC 7978, BIOCHM 7978). The cellular and molecular basis of cancer, with emphasis on the application of genomics, proteomics, and genetic manipulations in model organisms to the study of cancer biology.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2200 and BIO_SC 2300

**Recommended:** BIO_SC 4976 or BIOCHM 4270 and BIOCHM 4272
BIO_SC 4980: Cellular Interactions in Health and Disease
(cross-leveled with BIO_SC 7980). The cell as a functional unit.
Credit Hours: 3
Prerequisites: 10 hours Biological Sciences and 5 hours Physics and 5 hours Organic Chemistry
Recommended: some background in Biochemistry and/or Molecular Biology

BIO_SC 4982: Human Inherited Diseases
(cross-leveled with BIO_SC 7982). Analysis of the molecular and cellular mechanisms underlying inherited diseases in humans. Topics include genetics of sex determination, metabolic disorders, cancer, blood groups, transplantation, AIDS.
Credit Hours: 3
Prerequisites: BIO_SC 2200 and BIO_SC 2300

BIO_SC 4982W: Human Inherited Diseases - Writing Intensive
(cross-leveled with BIO_SC 7982). Analysis of the molecular and cellular mechanisms underlying inherited diseases in humans. Topics include genetics of sex determination, metabolic disorders, cancer, blood groups, transplantation, AIDS.
Credit Hours: 3
Prerequisites: BIO_SC 2200 and BIO_SC 2300

BIO_SC 4983: Molecular Ecology
Application of molecular genetic techniques to topics in ecology and population biology such as sex ratios, dispersal, mating systems, biogeography and conservation genetics.
Credit Hours: 4
Prerequisites: BIO_SC 3400 or BIO_SC 2200 and BIO_SC 3650

BIO_SC 4984: Mammalian Reproductive Biology
Adult reproductive anatomy, physiology and behavior; gametogenesis and fertilization; placentaion; sexual differentiation; parturition; maternal behavior and lactation; puberty; reproductive aging; reproductive ecology.
Credit Hours: 3
Prerequisites: junior standing
Recommended: 15 hours of Biological Sciences

BIO_SC 4986: Neurology of Motor Systems
(cross-leveled with BIO_SC 7986). Examination of the function of neural networks at all levels, from properties of single neurons to large collections of neural elements.
Credit Hours: 3
Prerequisites: BIO_SC 3700 or instructor's consent

BIO_SC 4988: Nerve Cells and Behavior
The cellular basis of behavior. Molecular and cellular properties of nerve cells, as related to behavior, will be represented and discussed.
Credit Hours: 3
Prerequisites: BIO_SC 3700 or instructor's consent

BIO_SC 4990: Vertebrate Histology and Microscopic Anatomy
Microscopic anatomy of vertebrate tissues and organs. Includes lab.
Credit Hours: 5
Prerequisites: junior standing
Recommended: BIO_SC 3700, or equivalent

BIO_SC 4994: Senior Seminar
Readings and critical evaluation of selected problems and theories in biology. Offered in one or more sections, with specialized subdisciplinary emphasis.
Credit Hour: 1-3
Prerequisites: Biological Sciences major, senior standing

BIO_SC 4994H: Senior Seminar - Honors
Readings and critical evaluation of selected problems and theories in biology. Offered in one or more sections, with specialized subdisciplinary emphasis.
Credit Hour: 1-3
Prerequisites: Biological Sciences major, senior standing; Honors eligibility required

BIO_SC 4994HW: Senior Seminar - Honors/Writing Intensive
Readings and critical evaluation of selected problems and theories in biology. Offered in one or more sections, with specialized subdisciplinary emphasis.
Credit Hour: 1-3
Prerequisites: Biological Sciences major, senior standing; Honors eligibility required

BIO_SC 4994W: Senior Seminar - Writing Intensive
Readings and critical evaluation of selected problems and theories in biology. Offered in one or more sections, with specialized subdisciplinary emphasis.
Credit Hour: 1-3
Prerequisites: Biological Sciences major, senior standing

BIO_SC 7002: Topics in Biological Sciences
Advanced topics not in regularly offered courses. May be repeated for credit. Graded on A-F basis only.
Credit Hour: 1-99
Prerequisites: instructor's consent

BIO_SC 7100: Limnology
(same as F_W 7100; cross-leveled with BIO_SC 4100, F_W 4100). (lecture/lab: 4 hrs.; lecture only: 3 hrs.) Ecology of inland waters with emphasis on productivity.
Credit Hour: 3-4
Prerequisites: graduate standing or BIO_SC 3650

BIO_SC 7300: Analysis of Biological Macromolecules
(cross-leveled with BIO_SC 4300)Theory/application of techniques used for characterization of proteins and nucleic acids. Topics include sedimentation velocity; equilibrium; sucrose density gradients; electrophoresis; spectrophotometry. Graded on A-F basis only.
Credit Hours: 3
**Prerequisites:** BIO_SC 2300; BIOCHM 4270; MATH 1500; 1 year of physics

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**BIO_SC 7310: Physics in Cell and Developmental Biology**
(same as PHYSCS 7310 and MPP 7300; cross-level with BIO_SC 4310, PHYSCS 4310). Discusses the role of physical mechanisms in specific cellular and developmental processes and phenomena, in particular those characterizing the embryonic stage of multicellular organisms. Each process and phenomenon is first described in biological terms and then within a physical model, with special emphasis on the interplay between the two descriptions.

**Credit Hours:** 3

**Prerequisites:** instructor’s consent or PHYSCS 1220 or PHYSCS 2760 and BIO_SC 2300

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**BIO_SC 7320: Molecular Plant Physiology**
(same as PLNT_S 7320; cross-level with BIO_SC 4320, PLNT_S 4320). Modern physiology of higher plants using common cultivated plants as examples. May be taken with or without laboratory.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 1200 or BIO_SC 1500 and 5 hours Chemistry

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**BIO_SC 7328: Introductory Radiation Biology**
(same as NU_ENG 7328, RADIOL 7328, V_M_S 7328; cross-level with BIO_SC 4328, NU_ENG 4328, RADIOL 4328). Concepts of ionizing radiations, their actions on matter through effects on simple chemical systems, biological molecules, cell, organisms, man.

**Credit Hours:** 3

**Prerequisites:** Sciences/Engineering; one course in Biological Sciences and Physics/Chemistry; or instructor’s consent

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**BIO_SC 7350: Summer Institute in Biotechnology**
Development of experiments in molecular genetics for use in high school biology laboratories. May be repeated for credit.

**Credit Hours:** 3

**Prerequisites:** instructor’s consent

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**BIO_SC 7374: Molecular Biology Laboratory**
Emphasizes recently developed genetic and biochemical techniques; illustrates how they apply to contemporary problems in biological research.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2200, BIOCHM 4272 or concurrent registration in BIO_SC 4976

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**BIO_SC 7400: Plant Anatomy**
(same as PLNT_S 7400; cross-level with BIO_SC 4400, PLNT_S 4400). Comparative structure, growth of meristems; development, structure of important cell types, tissues systems; comparative anatomy of stem root, leaf. Emphasizes anatomy of gymnosperms, angiosperms. Includes lab. Graded on A-F basis only.

**Credit Hours:** 4

**Prerequisites:** BIO_SC 1200 or equivalent

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**BIO_SC 7490: Vertebrate Histology and Microscopic Anatomy**
Microscopic anatomy of vertebrate tissues and organs. Graded on A-F basis only.

**Credit Hours:** 5

**Prerequisites:** BIO_SC 2300 and BIO_SC 3700, or equivalent

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**BIO_SC 7500: Neurobiology**
(cross-leveled with BIO_SC 4500). Vertebrate and invertebrate neurobiology, including cell and molecular biology of the neuron, neurophysiology, neuranatomy, neurothology and developmental biology. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2300 or BIO_SC 3700

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**BIO_SC 7560: Sensory Physiology and Behavior**
(cross-leveled with BIO_SC 4560). Basic principles of coding and integration of sensory stimuli; neural correlates of animal behavior; environmental influences on postnatal sensory development.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 4500 or equivalent

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**BIO_SC 7580: Computational Neuroscience**
(Same as BIOL_EN 7575, ECE 7580; cross-leveled with BIO_SC 4580, BIOL_EN 4575, ECE 4580). An interdisciplinary course with a strong foundation in quantitative sciences for students in biological and behavioral sciences and an introduction to experimental methods for students from quantitative sciences.

**Credit Hours:** 4

**Prerequisites:** BIO_SC 1010 or BIO_SC 1500, MATH 1500

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**BIO_SC 7640: Behavioral Biology**

**Credit Hours:** 3

**Prerequisites:** BIO_SC 1500 and one additional upper-level course in Biological Sciences or Psychology

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**BIO_SC 7660: Plant Population Biology**
(cross-leveled with BIO_SC 4660). Covers the ecological and evolutionary processes that influence the distribution and abundance of plant species. Topics include evolution of life history schedules, gender evolution, population growth and demography, competition, herbivory, plant-pollinator interactions, clonal growth, and plant community structure.

**Credit Hours:** 4

**Prerequisites:** 2 courses in Biological Sciences

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**BIO_SC 7670: Avian Ecology**
(cross-leveled with BIO_SC 4670). Advanced examination of ecological patterns in birds. Explores the environmental factors affecting the evolution of avian behavior, morphology, community structure and distribution.

**Credit Hours:** 3

**Prerequisites:** BIO_SC 2060 or BIO_SC 3650; BIO_SC 2600
BIO_SC 7976: Molecular Biology
(cross-leveled with BIO_SC 4976). Molecular mechanisms of DNA replication, mutation, recombination and gene expression in prokaryotes, eukaryotes, and their viruses; gene fine structure; genetic engineering.
Credit Hours: 3
Prerequisites: BIO_SC 2200 and BIO_SC 2300

BIO_SC 7978: Cancer Biology
(same as BIOCHM 7978; cross-leveled with BIO_SC 4978, BIOCHM 4978). The course will cover major molecular and cellular aspects of cancer. Students will read original research articles, present overviews and lead class discussions.
Credit Hours: 3
Prerequisites: BIOCHM 4270, BIO_SC 2300 and BIO_SC 4976 or equivalent

BIO_SC 7980: Cellular Interactions in Health and Disease
(cross-leveled with BIO_SC 4980). Advanced discussion of topics in cell biology and genetics as they relate to health and disease. Graded on A-F basis only.
Credit Hours: 3
Prerequisites: instructor's consent

BIO_SC 7982: Human Inherited Diseases
Advanced analysis of the molecular basis for genetic disorders in humans. Topics will include both Mendelian and complex traits with readings from the primary literature. Graded on A-F basis only.
Credit Hours: 3
Prerequisites: BIO_SC 2200 and instructor's consent

BIO_SC 7986: Neurology of Motor Systems
(cross-leveled with BIO SC 4986). Examination of the function of neural networks at all levels, from properties of single neurons to large collections of neural elements. Graded on A-F basis only.
Credit Hours: 3
Prerequisites: BIO_SC 3700

BIO_SC 7990: Non-thesis Research
Independent research not leading to a thesis. Some sections may be offered on either A-F or S/U grading basis.
Credit Hour: 1-99
Prerequisites: instructor's consent

BIO_SC 8002: Topics in Biological Sciences- Biological/Physical/Mathematics
Advanced topics not in regularly offered courses.
Credit Hour: 1-99
Prerequisites: instructor's consent

BIO_SC 8050: Professional Survival Skills
Introduction to resources, facilities, and communication skills for professional careers in biological sciences. Topics include computer resources, accessing scientific literature, making slides and figures, grantsmanship, resume preparation, manuscript review, and research presentation.
Credit Hours: 2

BIO_SC 8060: Ethical Conduct of Research
(same as BIOCHM 8060). Discussion of ethical issues in biological research, including the rules and conventions for appropriate research conduct. Graded on S/U basis only.
Credit Hour: 1

BIO_SC 8070: Professional Communication Development
The purpose of this course is to develop professional communication skills in students that are planning to attend (or are in their first year of) graduate training. Some sections may be offered with A-F or S/U grading option.
Credit Hour: 1-2

BIO_SC 8080: Workshop in Area of Specialization
Intensive course in the theory and methodology of biological investigation. Conducted by visiting scientists. Offered in one or more specialized sections. May be repeated for credit.
Credit Hour: 1
Prerequisites: instructor's consent

BIO_SC 8085: Problems in Biological Sciences
Research not expected to terminate in thesis, or individual advanced study in special subjects.
Credit Hour: 1-99
Prerequisites: instructor's consent

BIO_SC 8087: Seminar
Current topics in the biological sciences. Open to all graduate students. Graded S/U basis only.
Credit Hour: 1

BIO_SC 8090: Research in Biological Sciences
Research leading to thesis. Graded on S/U basis only.
Credit Hour: 1-99
Prerequisites: instructor's consent

BIO_SC 8187: Seminar in Areas of Specialization
Offered each semester in one or more specialized sections followed by the topic title of the seminar. Graded on S/U basis only.
Credit Hour: 1

BIO_SC 8300: Advanced Plant Genetics
Genetic approaches to molecular and biochemical studies in maize, wheat, and Arabidopsis.
Credit Hours: 3
Prerequisites: General Genetics and course in Cell Biology or Plant Physiology
BIO_SC 8310: Fungal Genetics and Biology
Introduction to fungal research, with an emphasis on genetics, biochemistry, cell and molecular biology, and pathogenicity of fungi. Graded A-F only.
Credit Hours: 3

BIO_SC 8320: Developmental Genetics
An overview of various developing systems amenable to classical and molecular genetic analysis. Specific developmental phenomena will be introduced in particular model systems, with an emphasis on experimental approaches used to address the underlying mechanisms.
Credit Hours: 3
Prerequisites: BIO_SC 2200 and BIOCHM 7270, BIOCHM 7272, or equivalent

BIO_SC 8330: Stem Cell Biology
A comparative approach to stem cell biology, with emphasis on embryonic, neural and bone marrow-derived stem cells in rodents and humans. Ethical considerations associated with the use of stem cells to study development and repair mechanisms will also be addressed. Graded on A-F basis only.
Credit Hours: 3
Prerequisites: BIO_SC 2300

BIO_SC 8340: Advanced Microscopy Techniques
Electron microscopy and modern light microscopy techniques including epiluminescence, confocal flourescence microscopy, low light video microscopy, differential interference optics, and computerized image analysis.
Credit Hours: 3
Prerequisites: BIO_SC 4990 or BIO_SC 8350 and instructor's consent

BIO_SC 8350: Advanced Cell Biology
Structure and function of membranes; cell ultrastructure; organelle function; cellular movement; microtubules; microfilaments; mitosis and meiosis.
Credit Hours: 3
Prerequisites: BIO_SC 2300; instructor's consent

BIO_SC 8362: Introduction to Plant Metabolism
(same as PLNT_S 8362, BIOCHM 8362). This course is part of a series that aims to provide a solid conceptual foundation in interdisciplinary plant biology for graduate students with a research emphasis in plant biology. This course examines the basic concepts and techniques used to understand plant metabolism. Graded on A-F basis only.
Credit Hours: 2

BIO_SC 8365: Introduction to Molecular Cell Biology
(same as BIOCHM 8365, PLNT_S 8365). This course is part of a series that aims to provide a solid conceptual foundation in interdisciplinary plant biology for graduate students with a research emphasis on plant biology. This course examines the basic concepts and techniques used to understand molecular cell biology. Graded on A-F basis only.
Credit Hours: 2

BIO_SC 8370: Plant Developmental Biology
Critical discussions of recent publications in plant development, with particular focus on developmental genetics.
Credit Hours: 3

BIO_SC 8440: Integrative Neuroscience I
(same as NEUROSCI 8440). Organization, development and function of the nervous system focusing on cellular and molecular processes. Graded on A-F basis only.
Credit Hours: 3

BIO_SC 8442: Integrative Neuroscience II
(same as NEUROSCI 8442). Organization and function of the nervous system at the systems level to examine processes of behavior and cognition. Graded on A-F basis only.
Credit Hours: 3

BIO_SC 8450: Developmental Neurobiology
Credit Hours: 3

BIO_SC 8460: Advanced Cancer Biology
A study of the molecular basis of cancer, including topics in tumor cell biology, interactions between cancer cells and normal cells, mechanisms of metastasis, and novel approaches to development of new chemotherapies.
Credit Hours: 3

BIO_SC 8505: Introduction to Plant Stress Biology
(same as PLNT_S 8505). This course is part of a series that aims to provide a solid conceptual foundation to interdisciplinary plant biology for graduate students with a research emphasis in plant biology. This course examines the basic concepts and techniques used to understand plant stress biology. Graded on A-F basis only.
Credit Hours: 2

BIO_SC 8520: Sensory Ecology
A study of information exchange and acquisition in organisms, with an emphasis on communication, orientation, and predator detection. The course will also examine the effects of biotic and abiotic factors on sensory systems.
Credit Hours: 3

BIO_SC 8600: Design of Ecological Experiments
Principles of experimental design in the context of ecological, behavioral, and evolutionary research.
Credit Hours: 2
Prerequisites: STAT 1400
BIO_SC 8610: Current Concepts in Conservation Biology
Survey of current concepts in conservation biology literature. Discussions will provide students with an appreciation of the historical development of concepts, the interdisciplinary nature of conservation problems, and the research required for effective solutions.

Credit Hours: 2

BIO_SC 8620: Phylogenetic Methods and Applications
A review of principles for constructing and testing phylogenies followed by a survey of methods for inferring ancestral characteristics and adaptive features in living species.

Credit Hours: 4

BIO_SC 8633: Molecular and Network Evolution
(same as AN_SC 8633). Evolution of biological macromolecules and networks, including sequence analysis algorithms and theory, phylogenetics, gene duplication, genome evolution, principles of biological networks. Development of computational skills emphasized.

Credit Hours: 3
Prerequisites: Instructor's consent required

BIO_SC 8650: Ecological and Evolutionary Genomics
(same as PLNT_S 8650). This course is designed to give a background in evolution and then explore an exciting new field: Ecological and evolutionary genomics. We will study genes that affect fitness and how whole genomes evolve. Graded on A-F basis only.

Credit Hours: 2

BIO_SC 8700: Ecological Genetics
Population genetics and evolutionary theory, with emphasis on studies of natural populations.

Credit Hours: 3
Prerequisites: BIO_SC 2200, BIO_SC 3100 or BIO_SC 3650, and STAT 1400 or equivalent

BIO_SC 8720: Speciation
Advanced discussion of species concepts and the processes of formation of species.

Credit Hours: 3
Prerequisites: BIO_SC 2200 and BIO_SC 4600

BIO_SC 8724: College Science Teaching
(same as LTC 8724, PHYSCS 8310, ASTRON 8310). Study of learner characteristics, teaching strategies, and research findings related to teaching science at the post-secondary level.

Credit Hours: 3

BIO_SC 8725: Science Outreach: Public Understanding of Science
(same as AN_SC 8725, PHYSCS 8350, LTC 8725). Development of presentations to adult audiences on the science underlying issues of current interest. May be repeated for credit.

Credit Hour: 1-2

BIO_SC 8726: Integrating Science with Outreach
(same as LTC 8726). This course provides an opportunity for students to earn credit for outreach activities in the community. Students will capitalize on their area of study and scientific expertise in developing, implementing, and evaluating related outreach activities. May be repeated for credit.

Credit Hour: 1-6

BIO_SC 8730: Advanced Community Ecology
Detailed examination of new happenings in population and community ecology. Topics vary but will include species interactions, community structure, reproductive strategies.

Credit Hours: 3
Prerequisites: BIO_SC 3650 or BIO_SC 4660 or equivalent

BIO_SC 8740: Plant/Animal Interactions
Discussion and lectures on herbivory, pollination biology, and dynamics of fruit and seed dispersal from ecological and evolutionary perspectives.

Credit Hours: 3
Prerequisites: BIO_SC 3650 or BIO_SC 4660 or equivalent

BIO_SC 8982: Advances in Human Genetic Disorders
Critical review of recent publications describing the molecular and cellular processes underlying genetic disorders in humans. Graded on A-F basis only.

Credit Hour: 1
Prerequisites: BIO_SC 4982 or concurrent enrollment in BIO_SC 7982

BIO_SC 9090: Research in Biological Sciences
Research leading to dissertation. Graded on S/U basis only.

Credit Hour: 1-99
Prerequisites: instructor's consent

BIO_SC 9432: Molecular Biology II
(same as MICROB 9432, BIOCHM 9432) Detailed experimental analysis of eukaryotic cellular and molecular biology relevant to cellular and viral gene expression, post-transcriptional and post-translational modifications and genome replication. Models for developmental genetic analysis and genetic determinants controlling processes utilizing the current literature will be examined.

Credit Hours: 4
Prerequisites: MICROB 9430

BIO_SC 9468: Molecular Biology of Plant Growth and Development
(same as BIOCHM 9468). Molecular biology of plant hormones, signal transduction, environmental signals.

Credit Hours: 3
Prerequisites: BIO_SC 4976