### BA Biology Course Descriptions 12-14

<table>
<thead>
<tr>
<th>Course Number and Title</th>
<th>Course Description and Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTRODUCTORY COURSES</strong></td>
<td></td>
</tr>
</tbody>
</table>
| BIO 311C: Introductory Biology 1             | Introduction to biological energy transformation, cell structure and physiology, and gene expression.  
**Prerequisites:** Credit or registration for CH 301 or 301H.                                                                                                                                                                                                                                                                                           |
| BIO 311D: Introductory Biology 2             | Introduction to mechanisms of inheritance, evolution, physiology, and species interactions. Basic principles of Mendelism, molecular genetics, structure and function of genes and chromosomes, populations and evolution.  
**Prerequisites:** BIO 311C with a grade of at least C-.                                                                                                                                                                                                                                                                                                |
| BIO 325: Genetics                            | Basic principles of Mendelism, molecular genetics, structure and function of genes and chromosomes, populations and evolution.  
**Prerequisites:** BIO 311C and 311D with a grade of at least C- in each                                                                                                                                                                                                                                                                                      |
| CH 301: Principles of Chemistry I            | Three lecture hours a week for one semester. Some sections also require one enrichment/discussion hour a week; these are identified in the Course.  
**Prerequisite:** Credit with a grade of at least C- or registration for one of the following: Mathematics 305G, 408C, 408D, 408K, 408L, 408M, 408N, 408S, Statistics and Scientific Computation 302; and an appropriate score on the ALEKS chemistry placement examination.                                                                                                                                                                      |
| CH 302: Principles of Chemistry II           | Development and application of concepts, theories, and laws underlying chemistry.  
**Prerequisites:** Credit with a grade of at least C- in Chem 301 or 301H; and credit with a grade of at least C- or registration for one of the following: M408C, 408D, 408K, 408L, 408M, 408N, 408S,SSC 302                                                                                                                                                                                   |
| CH 204: Introduction to Chemical Practices   | Introduction to the techniques of modern experimental chemistry. Designed to provide basic laboratory and analytical skills. May include organic, analytical, and physical chemistry, as well as materials science.  
**Prerequisites:** Credit or registration for CH 302.                                                                                                                                                                                                                                                                                                         |
| **CALCULUS COURSE – CHOOSE ONE**             |                                                                                                                                                                                                                                                                                                                                                                   |
| M408C: Differential and Integral Calculus    | Introduction to the theory and applications of differential and integral calculus of functions of one variable; topics include limits, continuity, differentiation, the mean value theorem and its applications, integration, the fundamental theorem of calculus, and transcendental functions.  
**Prerequisites:** A score of at least 80 on the ALEKS placement examination.                                                                                                                                                                                                                                                                           |
| M 408N: Differential Calculus for Science    | Introduction to the theory of differential calculus of functions of one variable, and its application to the natural sciences. Subjects may include limits and differentiation, with applications to rates of change, extremes, graphing, and exponential growth and decay.  
**Prerequisites:** A score of at least 70 on the ALEKS placement examination.                                                                                                                                                                                                                                                                                  |
| **INTRODUCTORY BIO LAB – CHOOSE ONE**        |                                                                                                                                                                                                                                                                                                                                                                   |
| BIO 206L: Intro Lab Experiments in Biology   | The organizing principles of biology (such as molecular and cellular functions, reproduction, development, homeostatic mechanisms, and organismal physiology and behavior) are used within a comparative and evolutionary framework to train students in modern laboratory techniques, bioinformatics, experimental design, and interpretation of results.                                                                                                                                                                                     |
**BIO 208L – W: Field Biology**

Field projects, laboratory exercises, field trips, and computer simulation exercises to acquaint students with the principles and applications of ecology and some of the experimental and descriptive methods of ecological investigations.  
**Prerequisites:** Credit or registration for BIO 311D. Taught in the spring and fall only.

---

**CHOOSE 8 HOURS OF ORGANIC CHEMISTRY, 6 HOURS OF COMPUTER SCIENCES, OR 8 HOURS OF PHYSICS**

### CHEMISTRY COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
</table>
| CH 320M: Organic Chemistry I | The development of organic chemical structure, nomenclature, and reactivity.  
**Prerequisites:** CH 302 with a grade of at least C-, and credit or registration for CH 204 or 317. |
| CH 320N: Organic Chemistry II | The development of organic chemical reactivity, with a focus on carbohydrates, proteins, and nucleic acids.  
**Prerequisites:** CH 204 or 317 and CH 310M with a grade of at least C- in each, and credit or registration for CH 210C. |

#### OR

### COMPUTER SCIENCE COURSES – CHOOSE 6 HOURS, AT LEAST 3 MUST BE UPPER-DIVISION

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
</table>
**Prerequisites:** None |
**Prerequisites:** Some knowledge of and experience in computer programming; and credit with a grade of at least C- or registration for M 305G, or equivalent score on the SAT M Level 1 or Level 2 test |
| CS 307: Foundations of Computer Science | Fundamental computer science concepts: data types, data structures, algorithms, and programming; functions and recursion; abstraction and encapsulation. Correctness: specification, testing, and proving. Simple sorting and searching algorithms. Introduction to analysis of algorithms.  
**Prerequisites:** One of the following: one year of programming in high school, C S 303E or 305J with a grade of at least C-, or consent of instructor; and credit or registration for M 408C or 408K, or a score of at least 520 on the SAT M Level 1 or Level 2 test |
| CS 313E: Elements of Software Design | Object-oriented design of software in a modern high-level language, using software library packages. Introduction to elementary data structures and complexity of algorithms.  
**Prerequisites:** C S 303E or 305J with a grade of at least C- |
| CS 323E: Elements of Scientific Computing | Fundamentals of software issues related to scientific computing. Topics include floating-point computations, numerical computation errors, |
interpolation, integration, solution of linear systems of equations, optimization, and initial value problems of ordinary differential equations. Implementations of algorithms are investigated using MATLAB for matrix and vector computations. Examples are drawn from a variety of science and mathematics areas.

**Prerequisite:** C S 303E or equivalent, M 408C, 408K, or 408N; M 408D, 408M, or 427L; and credit with a grade of at least C- or registration for M 341 or 340L.

---

**CS 324E: Elements of Graphics and Visualization**

Basics of two- and three-dimensional computer graphics systems, modeling and rendering, and selected graphics software APIs. Other topics may include interactive graphics, animation, graphical user interfaces, and the graphical presentation of information.

**Prerequisites:** C S 307 or 313E or EE 422C with a grade of at least C-.

---

**CS 326E: Elements of Networking**

Introduction to the principles and basic concepts of the Internet. Networking applications and protocols. Simple client/server applications. Other topics may include network technologies and topologies, packet and circuit switching, LANS and WANS, Internet security, and network management.

**Prerequisites:** C S 307 or 313E or EE 422C with a grade of at least C-.

---

**CS 327E: Elements of Databases**

A practical introduction to database management systems, with discussion of database administration and management. Survey of logical modeling, database design with a focus on relational databases, SQL query language, and current applications. Topics may include data integrity, performance, concurrency, transaction processing, recovery, security, and Web applications.

**Prerequisites:** C S 307 or 313E or EE 422C with a grade of at least C-.

---

**OR**

**PHYSICS COURSES – CHOOSE ONE 8 HOUR SEQUENCE**

**PHY 302 & 102M; and 302L & 102N:**

General Physics--Technical Course


**Prerequisites:** M 305G and credit or registration for PHY 102M; PHY 302K and 102M and credit or registration for PHY 102N.

**PHY 317K & 117M; and 317L & 112N:**

General Physics I and II

Introductory courses designed and recommended primarily for premedical students and others in the biomedical sciences whose professional or preprofessional training includes an introductory course in calculus. Mechanics, heat, and sound, with biomedical applications. Electricity and magnetism, light, atomic and molecular physics, nuclear physics, and their biomedical applications.

**Prerequisites:** M 408C, or 408K and coenrollment in 408L or M408N and coenrollment in M408S and credit or registration for PHY 117M; PHY 317K and 117M and credit or registration for PHY 117N.

**PHY 301 & 101L; and 316 &112L:**

Mechanics; Electricity and Magnetism

Designed for students who intend to major in science or mathematics.

**Prerequisites:** M 408C, or 408K and coenrollment in 408L or M408N and coenrollment in M408S and credit or registration for PHY 101L; PHY 301 and 101L, M 408D, or 408L and coenrollment in 408M and credit or registration for PHY 116L.

**PHY 303K and 103M; and 303L & 103N:**

Engineering Physics I and II

**Prerequisites:** M 408C, or 408K and coenrollment in 408L or M408N and coenrollment in M408S and credit or registration for PHY 103M; PHY 303K and 103M, M 408D, or 408L and coenrollment in 408M and credit or registration in PHY 103N.

### REQUIRED BIOLOGY COURSES

#### CELLULAR, DEVELOPMENTAL AND MOLECULAR - CHOOSE AT LEAST 3 HOURS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 320: Cell Biology</td>
<td>Principles of eukaryotic cell structure and function; macromolecules, energetics, membranes, organelles, cytoskeleton, gene expression, signaling, division, differentiation, motility, and experimental methodologies.</td>
<td></td>
</tr>
<tr>
<td>BIO 344: Molecular Biology</td>
<td>Molecular basis of cellular processes: gene structure and function; DNA replication; RNA and protein synthesis; viruses; molecular aspects of immunology and cancer, and recombinant DNA.</td>
<td></td>
</tr>
<tr>
<td>BIO 349: Developmental Biology</td>
<td>Principles of animal development, with emphasis on developmental mechanisms.</td>
<td></td>
</tr>
</tbody>
</table>

#### ECOLOGY AND EVOLUTION – CHOOSE AT LEAST 3 HOURS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 357: Evolutionary Ecology</td>
<td>Principles of modern ecology, particularly as they relate to natural selection and evolutionary theory.</td>
<td></td>
</tr>
<tr>
<td>BIO 370: Evolution</td>
<td>Introduction to modern evolutionary biology, focusing on the evolution of molecular, developmental, morphological, and behavioral traits. Genetic and ecological bases of evolutionary changes within populations and of evolutionary divergence in animals and plants.</td>
<td></td>
</tr>
<tr>
<td>BIO 373: Ecology</td>
<td>An introduction to ecology, the study of relationships among organisms and between organisms and their environment; adaptations, population, communities, and ecosystems. Includes both plants and animals and both terrestrial and aquatic ecosystems.</td>
<td></td>
</tr>
</tbody>
</table>

### ADDITIONAL BIOLOGY COURSES

Choose 18 hours – 3 hours in each of the following 6 areas, including at least 3 laboratory courses

#### 1. CELLULAR, DEVELOPMENTAL, AND MOLECULAR – CHOOSE AT LEAST 3 HOURS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 320: Cell Biology</td>
<td>Principles of eukaryotic cell structure and function; macromolecules, energetics, membranes, organelles, cytoskeleton, gene expression, signaling, division, differentiation, motility, and experimental methodologies.</td>
<td></td>
</tr>
<tr>
<td>BIO 320L: Cell biology Laboratory</td>
<td>Explores the complex structures and functions of cells through direct observation and experimentation. Subjects may include regulation of gene transcription and translation, protein sorting, organelles and membrane trafficking, cytoskeletal dynamics, and cell division. Students use a combination of modern molecular biology, biochemistry, and microscopy techniques, with a strong emphasis placed on hypothesis-driven approaches, proper experimental design, and clear scientific writing and presentation.</td>
<td></td>
</tr>
</tbody>
</table>
**BIO 323L – W: Laboratory Studies in Cell Biology**

Research exercises involving light/electron microscopy, image processing, auto-radiography, chromatography, fractionation, flow cytometry, spectroscopy, diffraction, antibody labeling, cell growth, and kinetics.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C- and credit with a grade of at least C- or registration for BIO 320.

**BIO 325L-W: Laboratory Experience in Genetics**

Experimentation and direct observation in fundamental aspects of transmission genetics.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

**BIO 325T: Human Genetics**

Genomics, cancer genetics, identification and analysis of human disease genes, and monogenic and multifactorial traits in humans.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

**BIO 326R: General Microbiology**

Overview of the major areas of micro-biological study, including cell structure and function, genetics, host-microbe interactions, physiology, ecology, diversity, and virology.  
**Prerequisites:** BIO 325 or 325H and CH 302 or 302H with grades of at least C-.

**BIO 226L: General Microbiology Laboratory**

Introduction to microbiology laboratory techniques and experimental demonstration of principles of microbiology.  
**Prerequisites:** Credit with a grade of at least C- or registration for BIO 326M or 326R.

**BIO 328D: Discovery Laboratory in Plant Biology**

Learning methods of experimental design, data gathering, data interpretation, and data presentation, including original experiments relating to questions of current interest in plant physiology.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

**BIO 330: Animal Virology**

Mechanisms by which viruses replicate and kill or transform cells.  
**Prerequisites:** BIO 325 or 325H and BIO 126L and 326R with grades of at least C- in each.

**Bio 230L: Virology Laboratory**

Basic experimental techniques applied to selected bacteriophages and animal viruses.  
**Prerequisites:** BIO 325 or 325H, and 126L with a grade of at least C- in each, and credit with a grade of at least C- or registration for BIO 330 or 333.

**BIO 331L – Laboratory Studies in Molecular Biology**

The methods and principles of molecular biology in a research laboratory context. Students conduct a research project directed by a faculty member.  
**Prerequisites:** BIO 205L, 206L, 208L, or 126L; BIO 325 or 325H with a grade of at least C-.

**BIO 332: Yeast Cell Biology**

Yeast is used as a model to teach some of the more actively researched areas of cell biology, such as chromosome structure, mating type, cell-cell interaction, DNA replication, mitosis, cytoskeletal motors, cell polarity, signal transduction, cell cycle, checkpoints, secretion, protein modification, yeast genetics, and yeast technology.  
**Prerequisites:** BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each.
BIO 335: Introduction to Biochemical Engineering

Microorganisms in chemical and biochemical synthesis; genetic manipulation of cells by classical and recombinant DNA techniques. Enzyme technology; design of bioreactors and microbial fermentations; separations of biological products.

Prerequisites: BIO 311C with a grade of at least C-, and either CH 339K and 339L, or 369

BIO 366: Tumor Biology

Natural history and causal mechanisms of cancer; viral and chemical carcinogens.

Prerequisites: BIO 325 or 325H, and BIO 330 or 360K with a grade of at least C- in each.

BIO 339: Metabolism and Biochemistry of Microorganisms

A study of the metabolic processes of microorganisms, using a biochemical approach.

Prerequisites: BIO 126L and 326R with a grade of at least C- in each, and CH 310M and 310N.

BIO 339M: Bacterial Behavior and Signaling Mechanisms

Advanced studies in how bacteria perceive their environment and communicate with each other. Subjects may include chemotaxis and motility, morphogenesis and development, and secretion and virulence. Taught entirely through reading and discussion of original articles.

Prerequisites: BIO 325 or 325H, and BIO 126L and 326R with a grade of at least C- in each.

BIO 344: Molecular Biology

Molecular basis of cellular processes: gene structure and function; DNA replication; RNA and protein synthesis; viruses; molecular aspects of immunology and cancer, and recombinant DNA.

Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 347: Biology and Genetics of Immune Disorders

Immune disorders in mammals, including humans, used as models for examining basic immunological and immunogenetic principles; emphasis on immune disorders of vertebrates.

Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 349: Developmental Biology

Principles of animal development, with emphasis on developmental mechanisms.

Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 349L: Experiments in Animal Developmental Biology

Methods and principles of developmental biology in a laboratory context, with emphasis on animal embryology using molecular techniques and microscopy.

Prerequisites: BIO 325 or 325H with a grade of at least C-, and credit with a grade of at least C- or registration for BIO 349.

BIO 350M: Plant Molecular Biology

Fundamentals of plant molecular biology, including structure and expression of the chloroplast and mitochondrial genomes.

Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 360K: Immunology

The basic concepts of humoral and cell-associated immune phenomena.

Prerequisites: BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each.

BIO 160L: Immunology Laboratory

Current techniques in experimental cellular and humoral immunology.

Prerequisites: Credit with a grade of at least C- or registration for BIO 360K.
BIO 366: Microbial Genetics  
Molecular biology of nucleic acids; biosynthesis of macromolecules, transfer of genetic material from cell to cell, recombination, mutagenesis, and regulatory mechanisms.  
**Prerequisites:** BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each.

BIO 366R: Molecular Genetics  
Techniques used for studying molecular biology and transgenic organisms. Includes advanced genetics and the molecular genetics used in clinical applications.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

CH 369: Fundamentals of Biochemistry  
A survey course covering the basics of protein structure and function, carbon and nitrogen metabolism, and molecular biology of macromolecules.  
**Prerequisites:** CH 320M or 318M with a grade of at least C-.

### 2. PHYSIOLOGY AND NEUROBIOLOGY – CHOOSE AT LEAST 3 HOURS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
</table>
| Bio 322: Structure, Physiology, and Reproduction of Seed Plants | The principles of structure and functioning of higher plants; special attention to the dynamics of growth and development and reproduction.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-, CH 302 or 302H, and coenrollment in BIO 122L. |
| BIO 122L: Structure, Physiology, and Reproduction of Seed Plants Laboratory | Observation of structure and reproduction in seed plants and employment of experimental techniques that demonstrate physiological processes, especially processes of growth and development.  
**Prerequisites:** Concurrent enrollment in BIO 322. |
| BIO 328: Introductory Plant Physiology | General principles of the mineral nutrition, water relations, metabolic activities, growth and development of green plants  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-, and CH 302 or 302H. |
| BIO 329: Medical Mycology | A basic introduction to medical mycology and an overview of research involving both the fungal zoopathogen and its host.  
**Prerequisites:** BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each. |
| BIO 129L: Medical Mycology Laboratory | Basic techniques for the identification and manipulation of fungi of medical importance.  
**Prerequisites:** BIO 126L with a grade of at least C-, and credit with a grade of at least C- or registration for BIO 329. |
| BIO 336: Tumor Biology | Natural history and causal mechanisms of cancer; viral and chemical carcinogens.  
**Prerequisites:** BIO 325 or 325H and BIO 330 or 360K with a grade of at least C- in each. |
| BIO 339: Metabolism and Biochemistry of Microorganisms | A study of the metabolic processes of microorganisms, using a biochemical approach.  
**Prerequisites:** BIO 126L and 326R with a grade of at least C- in each, and CH 310M and 310N. |
| BIO 345: Cell Physiology | An integrated approach to basic processes in physiology: metabolism, transport, energetics, molecular and cellular control mechanisms.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-, and CH 310M. |
BIO 345E: Endocrinology
Vertebrate endocrinology (primarily mammalian), with a focus on human pathophysiology.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 359K: Principles of Animal Behavior
An introduction to the study of animal behavior: descriptive analysis of behavior; physiological basis of behavior; development of behavior; adaptive significance and evolution of behavior; communication and social behavior.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 359R: Animal Sexuality
The biology of sexuality, including genetics, morphology, physiology, and psychology of sex.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 360K: Immunology
The basic concepts of humoral and cell-associated immune phenomena.
Prerequisites: BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each.

BIO 160L: Immunology Laboratory
Current techniques in experimental cellular and humoral immunology.
Prerequisites: Credit with a grade of at least C- or registration for BIO 360K.

BIO 361: Human Infectious Diseases
Etiology, pathogenesis, diagnosis, and immunobiology of the major microbial diseases, with emphasis on their prevention.
Prerequisites: BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each.

BIO 361L: Public Health Bacteriology Laboratory
Training in techniques required for independent work in diagnostic and epidemiological bacteriology.
Prerequisites: BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each.

BIO 361T: Comparative Animal Physiology
Physiology of organ systems in animal phyla, with special emphasis on physiological adaptations of organisms to their environment.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 365D: Principles of Drug Action
Introduction to the basic principles of pharmacology, including how drugs get into the body, exert their actions, and are metabolized and excreted.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 365L: Neurobiology Laboratory
An introduction to physiological, morphological, and molecular techniques used for analysis of the nervous system. Experiments and computer simulations illustrate basics of information processing by the nervous system.
Prerequisites: BIO 205L, 206L, or 126L and BIO 325 or 325H and BIO 365R or 371M with a grade of at least C- in each.

BIO 365 N: Development and Plasticity of the Nervous System
An introduction to the principles by which the neural tube (brain and spinal cord) develops during embryogenesis, including regionalization of the brain into forebrain, midbrain, hindbrain, and spinal cord. Particular emphasis will be given to the mechanisms that govern how neurons acquire their identity and form neuronal circuits and synapses. Developmental and congenital diseases and possible therapies, including stem cell based therapy or gene therapy.
Prerequisites: BIO 349 and 365R or 371M with a grade of at least C- in each.

BIO 365P: Laboratory in Integrative
Study of human physiology using an inquiry-based approach. Students read
### Physiology

Primary scientific literature; collect, analyze, and present data; write detailed explanations of laboratory activities; and work in groups to design, execute, and present an experiment.

**Prerequisites:** BIO 325 or 325H with a grade of at least C-, and credit with a grade of at least C- or registration for BIO 361T or 365S.

### BIO 365R: Vertebrate Physiology

Introduction to the nervous system and other excitable tissues. Subjects may include membrane potentials, ion channels, synaptic transmission, learning and memory, skeletal and cardiac muscle, and how systems of neurons lead to sensation and motor output. Human diseases are used to illustrate perturbation of normal function.

**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

### BIO 365S: Vertebrate Systems Physiology

Overview of body fluids, the cardiovascular system, respiration, digestion, metabolism, and endocrinology.

**Prerequisites:** BIO 311C; 325 or 325H; Chem 301 and one of the following: M408C, 408K, 408N, 408R, SSC 302 with a grade of at least C- in each.

### BIO 365T: Neurobiology of Disease

The neurobiological basis of disorders of the brain, with the main focus on mental illness. Emphasizes the neural circuitries and biochemical events that underlie specific mental processes and behaviors.

**Prerequisites:** BIO 325 or 325H and BIO 365R or 371M with a grade of at least C- in each.

### BIO 365W: Neurobiology of Addiction

Study of the neurobiology of neurotransmitters, and the influence of alcohol and drugs of abuse on neurotransmitters.

**Prerequisites:** BIO 365R or 371M with a grade of at least C-.

### BIO 366C: Ion Channels and the Molecular Physiology of Neuronal Signaling

Explores the role of molecular conformational changes in higher-level neuronal function and sensory transduction, including the generation and regulation of diverse types of neuronal signaling characteristics. Emphasizes a quantitative approach and the use of models to study function.

**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

### BIO 371L: Experimental Physiology

Experimental approach to physiological mechanisms by which animals adapt to their environment.

**Prerequisites:** BIO 205L, 206L, 208L or 126L and BIO 325 or 325H with a grade of at least C- in each.

### BIO 371M: Neuronal Basis of Brain and Behavior

The nervous system, with emphasis on vertebrate neurobiology.

**Prerequisites:** BIO 325 or 325H with a grade of at least C-

---

### 3. ECOLOGY AND EVOLUTION – CHOOSE AT LEAST 3 HOURS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSC 328M</td>
<td>Biostatistics</td>
<td>Introduction to methods of statistical analysis of biological data. <strong>Prerequisites:</strong> Four hours of coursework in BIO and either M 408D or 408L.</td>
</tr>
<tr>
<td>BIO 321L</td>
<td>Aquatic Entomology</td>
<td>The taxonomy of aquatic insects; the use of aquatic insects in biomonitoring. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-.</td>
</tr>
<tr>
<td>BIO 340L</td>
<td>Biology of Birds</td>
<td>Anatomy, physiology, classification, and ecology of birds. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-.</td>
</tr>
<tr>
<td>BIO 448L</td>
<td>Invertebrate Biology</td>
<td>A study of the diversity and evolution of multicellular invertebrate animals, with emphasis on common themes in animal body construction and function. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-.</td>
</tr>
</tbody>
</table>
BIO 351: Economic Botany
An in-depth analysis of the origin of domesticated plant species, the role in nature of plant products, and the ways natural products have been altered through artificial selection.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 352: Reproductive Biology of Flowering Plants
Pollination biology, breeding systems, reproductive strategies, and fruit and seed dispersal from evolutionary and ecological vantage points.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 453L: Entomology
Characteristics, importance, and biology of the major groups of insects.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 354L: Ichthyology
Overview of the evolution, biology, and ecology of fishes, emphasizing freshwater fishes.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 455L: Vertebrate Natural History
Phylogeny, taxonomy, life histories, habits, and distribution. Field trips to be arranged.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 456L: Limnology and Oceanography
Introduction to the study of the interactions between aquatic organisms and their environments.
Prerequisites: BIO 325 or 325H with a grade of at least C- and CH 302 or 302H.

BIO 357: Evolutionary Ecology
Principles of modern ecology, particularly as they relate to natural selection and evolutionary theory.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 358L: Systematics
Comparative study of biological variation of living and fossil organisms, including speciation, biogeography, taxonomy, and phylogeny of genes, populations, species, and higher taxa.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 359J: Behavioral Ecology
Advanced topics in behavioral ecology, with detailed consideration of animal communication, altruism, sexual selection, plant-animal interactions.
Prerequisites: BIO 325 or 325H and BIO 359K or 370 with a grade of at least C- in each.

BIO 262: Plant Systematics
Elementary principles of plant taxonomy as exemplified by families of flowering plants found seasonally around Austin.
Prerequisites: BIO 325 or 325H with a grade of at least C-, and coenrollment in BIO 262L.

BIO 262L: Angiosperm Diversity Laboratory
Practical experience in recognizing, identifying, and classifying families of flowering plants.
Prerequisites: BIO 325 or 325H with a grade of at least C-, and coenrollment in BIO 262L.

BIO 363: Plant Speciation
Nature of species in higher plants, speciation phenomena in plants, natural hybridization, polyploidy, agamospermy, evolutionary mechanisms.
Prerequisites: BIO 325 or 325H with a grade of at least C-.

BIO 364: Microbial Ecology
The ability of microbes to adapt to and change their environment.
### BIO 369L: Herpetology

Biology of amphibians and reptiles, including evolution, ecology, behavior, physiology, life history, and field identification.  
**Prerequisites:** BIO 325 or 325H and BIO 126L and 326R with a grade of at least C- in each.

### BIO 370: Evolution

Introduction to modern evolutionary biology, focusing on the evolution of molecular, developmental, morphological, and behavioral traits. Genetic and ecological bases of evolutionary changes within populations and of evolutionary divergence in animals and plants.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

### BIO 471G: Natural History Museum Science

An introduction to curatorial practices in natural history museums; students complete a twenty- to thirty-hour curatorial project.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

### BIO 373: Ecology

An introduction to ecology, the study of relationships among organisms and between organisms and their environment; adaptations, population, communities, and ecosystems. Includes both plants and animals and both terrestrial and aquatic ecosystems.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

### BIO 373L: Ecology Laboratory

Intensive field ecology. Includes group field experiment and observation, independent projects, and field trips to other vegetation zones. Students complete weekly write-ups of observation and data analysis, reports of independent projects, and an oral presentation on an independent project.  
**Prerequisites:** Credit or registration for BIO 373.

### BIO 375: Conservation Biology

Application of principles of ecology to the preservation of wild plant and animal species and to the preservation, management, and restoration of natural and seminatural ecosystems. Emphasis on scientific, biological aspects of issues such as endangered species protection, preserve design, and forest management.  
**Prerequisites:** BIO 325 or 325H and BIO 357, 359J, or 373 with a grade of at least C- in each.

### MNS 352C: Estuarine Ecology

General ecological principles of estuarine environments in Texas, including physiography, hydrography, and plant and animal community structure and productivity. Requires several field trips in addition to lecture hours, including one weekend trip.  
**Prerequisites:** Upper-division standing and 6 hours in BIO, CH, GEO or PHY.

### MNS 354Q: Marine Environmental Science

Application of the principles of marine science to the study of environmental issues: toxicology, biogeochemical cycles, and biological and ecological impacts of xenobiotic materials in the coastal zone.  
**Prerequisites:** BIO 311D, and CH 302 or 302H.

### 4. ANIMAL BIOLOGY – CHOOSE AT LEAST 3 HOURS

#### BIO 321L: Aquatic Entomology

The taxonomy of aquatic insects; the use of aquatic insects in biomonitoring.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

#### BIO 438L: Animal Communication

Animal communication from a multidisciplinary perspective, with emphasis on quantitative analysis, sensory processing, and evolution of signals.
BIO 340L: Biology of Birds
Anatomy, physiology, classification, and ecology of birds.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 346: Human Biology
Introduction to human evolution, genetics, sexuality, senescence, and population growth.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 448L: Invertebrate Biology
A study of the diversity and evolution of multicellular invertebrate animals, with emphasis on common themes in animal body construction and function.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 453L: Entomology
Characteristics, importance, and biology of the major groups of insects.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 340L: Biology of Birds
Anatomy, physiology, classification, and ecology of birds.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 359J: Behavioral Ecology
Advanced topics in behavioral ecology, with detailed consideration of animal communication, altruism, sexual selection, plant-animal interactions.  
**Prerequisites:** BIO 325 or 325H and BIO 359K or 370 with a grade of at least C-.

BIO 359K: Principles of Animal Behavior
An introduction to the study of animal behavior: descriptive analysis of behavior; physiological basis of behavior; development of behavior; adaptive significance and evolution of behavior; communication and social behavior.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 359R: Animal Sexuality
The biology of sexuality, including genetics, morphology, physiology, and psychology of sex.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 361T: Comparative Animal Physiology
Physiology of organ systems in animal phyla, with special emphasis on physiological adaptations of organisms to their environment.  
**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

BIO 365S: Vertebrate Systems Physiology
Overview of body fluids, the cardiovascular system, respiration, digestion, metabolism, and endocrinology.  
**Prerequisites:** BIO 311C; 325 or 325H; Chem 301 and one of the following: M408C, 408K, 408N, 408R, SSC 302 with a grade of at least C- in each.

BIO 369L: Herpetology
Biology of amphibians and reptiles, including evolution, ecology, behavior, physiology, life history, and field identification.  
**Prerequisites:** BIO 325 or 325H; and BIO 455L, 357, 359K, or 478L with a grade of at least C- in each.

BIO 371L: Experimental Physiology
Experimental approach to physiological mechanisms by which animals adapt to their environment.  
**Prerequisites:** BIO 205L, 206L, 208L, or 126L; and BIO 325 or 325H with a grade of at least C- in each.

BIO 478L: Comparative Vertebrate
Study of vertebrate morphology from developmental anatomy to the
### Anatomy
function, biomechanics, and phylogenetic relationships of living and fossil taxa.

**Prerequisites:** BIO 325 or 325H with a grade of at least C-.

### MNS 354: Marine Invertebrates
Study of invertebrate taxonomy, structure, behavior, and ecology, with emphasis on field sampling and laboratory studies of invertebrate habitats of the Texas coast.

**Prerequisites:** Six hours of BIO or consent of instructor.

### MNS 354C: Biology of Fishes
Anatomy, physiology, behavior, life history, taxonomy, and distribution of fishes, with emphasis on field sampling and laboratory studies of the coastal biota. Requires several field trips, including one weekend trip.

**Prerequisites:** Upper-division standing, six hours of BIO, or consent of instructor.

### 5. PLANT BIOLOGY - CHOOSE AT LEAST 3 HOURS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio 322: Structure, Physiology, and Reproduction of Seed Plants</td>
<td>The principles of structure and functioning of higher plants; special attention to the dynamics of growth and development and reproduction. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-, CH 302 or 302H, and coenrollment in BIO 122L.</td>
<td></td>
</tr>
<tr>
<td>BIO 122L: Structure, Physiology, and Reproduction of Seed Plants Laboratory</td>
<td>Observation of structure and reproduction in seed plants and employment of experimental techniques that demonstrate physiological processes, especially processes of growth and development. <strong>Prerequisites:</strong> Concurrent enrollment in BIO 322.</td>
<td></td>
</tr>
<tr>
<td>BIO 324: Survey of the Plant Kingdom</td>
<td>Review of the groups of living and fossil plants, emphasizing their organization, reproduction, and evolution. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-, and coenrollment in BIO 124L.</td>
<td></td>
</tr>
<tr>
<td>BIO 124L: Survey of the Plant Kingdom Laboratory</td>
<td>Demonstration of members of various plant groups, using cultures and prepared materials, to emphasize organization, reproduction, and evolution. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-, and coenrollment in BIO 324.</td>
<td></td>
</tr>
<tr>
<td>BIO 327: General Phycology</td>
<td>A general survey of the algae and of their biology. <strong>Prerequisites:</strong> Biology 325 or 325H; 324 and 124L with a grade of at least C-in each, and coenrollment in BIO 127L.</td>
<td></td>
</tr>
<tr>
<td>BIO 127L: Laboratory in General Phycology</td>
<td>Survey of various algal groups, including direct observations of their biology, exposure to research techniques, and instruction in culture procedures. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-, and credit with a grade of at least C- or registration for BIO 327.</td>
<td></td>
</tr>
<tr>
<td>BIO 328: Introductory Plant Physiology</td>
<td>General principles of the mineral nutrition, water relations, metabolic activities, growth and development of green plants <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-, and CH 302 or 302H.</td>
<td></td>
</tr>
<tr>
<td>BIO 328D: Discovery Laboratory in Plant Biology</td>
<td>Learning methods of experimental design, data gathering, data interpretation, and data presentation, including original experiments relating to questions of current interest in plant physiology. <strong>Prerequisites:</strong> BIO 325 or 325H with a grade of at least C-.</td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>BIO 350M</td>
<td>Plant Molecular Biology</td>
<td>Fundamentals of plant molecular biology, including structure and expression of the chloroplast and mitochondrial genomes.</td>
</tr>
<tr>
<td>BIO 351:</td>
<td>Economic Botany</td>
<td>An in-depth analysis of the origin of domesticated plant species, the role in nature of plant products, and the ways natural products have been altered through artificial selection.</td>
</tr>
<tr>
<td>BIO 352:</td>
<td>Reproductive Biology of Flowering Plants</td>
<td>Pollination biology, breeding systems, reproductive strategies, and fruit and seed dispersal from evolutionary and ecological vantage points.</td>
</tr>
<tr>
<td>BIO 262:</td>
<td>Plant Systematics</td>
<td>Elementary principles of plant taxonomy as exemplified by families of flowering plants found seasonally around Austin.</td>
</tr>
<tr>
<td>BIO 262L:</td>
<td>Angiosperm Diversity Laboratory</td>
<td>Practical experience in recognizing, identifying, and classifying families of flowering plants.</td>
</tr>
<tr>
<td>BIO 363:</td>
<td>Plant Speciation</td>
<td>Nature of species in higher plants, speciation phenomena in plants, natural hybridization, polyploidy, agamospermy, evolutionary mechanisms.</td>
</tr>
<tr>
<td>BIO 374:</td>
<td>Plant Anatomy with Histological Techniques</td>
<td>Tissue organization and cellular details of stems, roots, and leaves of seed plants, with emphasis on development and function.</td>
</tr>
<tr>
<td>BIO 174L:</td>
<td>Laboratory in Plant Anatomy with Histological</td>
<td>Demonstration of cellular details and tissue systems of plant organs; instruction in the preparation of plant materials for histological examination.</td>
</tr>
<tr>
<td></td>
<td>Techniques</td>
<td></td>
</tr>
<tr>
<td>MNS 352D:</td>
<td>Marine Botany</td>
<td>Exploration of the marine algae and seagrasses of the south Texas coast, with emphasis on their taxonomy, physiology, and ecology; field trips to representative coastal habitats. Requires several field trips, including one weekend trip.</td>
</tr>
</tbody>
</table>

**6. MICROBIOLOGY – CHOOSE AT LEAST 3 HOURS**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 326R:</td>
<td>General Microbiology</td>
<td>Overview of the major areas of microbiological study, including cell structure and function, genetics, host-microbe interactions, physiology, ecology, diversity, and virology.</td>
<td>BIO 325 or 325H ; and CH 302 or 302H with a grade of at least C- in each.</td>
</tr>
<tr>
<td>BIO 226L:</td>
<td>General Microbiology Laboratory</td>
<td>Introduction to microbiology laboratory techniques and experimental demonstration of principles of microbiology.</td>
<td>Credit with a grade of at least C- or registration for BIO 326M</td>
</tr>
</tbody>
</table>
or 326R (or 226R).

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 329: Medical Mycology</td>
<td>A basic introduction to medical mycology and an overview of research involving both the fungal zoopathogen and its host. <strong>Prerequisites:</strong> BIO 325 or 325H; and BIO 126L and 326R (or 226R) with a grade of at least C- in each.</td>
<td></td>
</tr>
<tr>
<td>BIO 129L: Medical Mycology Laboratory</td>
<td>Basic techniques for the identification and manipulation of fungi of medical importance. <strong>Prerequisites:</strong> BIO 126L (or 341) with a grade of at least C-, and credit with a grade of at least C- or registration for BIO 329.</td>
<td></td>
</tr>
<tr>
<td>BIO 330: Animal Virology</td>
<td>Mechanisms by which viruses replicate and kill or transform cells. <strong>Prerequisites:</strong> BIO 325 or 325H; and BIO 126L and 326R (or 226R) with a grade of at least C- in each.</td>
<td></td>
</tr>
<tr>
<td>BIO 230L: Virology Laboratory</td>
<td>Basic experimental techniques applied to selected bacteriophages and animal viruses. <strong>Prerequisites:</strong> BIO 325 or 325H, and 126L with a grade of at least C- in each, and credit with a grade of at least C- or registration for BIO 330 or 333.</td>
<td></td>
</tr>
<tr>
<td>BIO 339: Metabolism and Biochemistry of Microorganisms</td>
<td>A study of the metabolic processes of microorganisms, using a biochemical approach. <strong>Prerequisites:</strong> BIO 126L and 326R (or 226R) with a grade of at least C- in each, and CH 310M and 310N.</td>
<td></td>
</tr>
<tr>
<td>BIO 364: Microbial Ecology</td>
<td>The ability of microbes to adapt to and change their environment. <strong>Prerequisites:</strong> BIO 325 or 325H; and BIO 126L and 326R (or 226R) with a grade of at least C- in each.</td>
<td></td>
</tr>
<tr>
<td>MNS 354E: Aquatic Microbiology</td>
<td>Ecology, physiology, distribution, and growth of heterotrophic and autotrophic bacteria and fungi in waters and sediments. <strong>Prerequisites:</strong> BIO 311D, CH 302 or 302H, and consent of instructor.</td>
<td></td>
</tr>
</tbody>
</table>