

## COURSE DESCRIPTIONS

### **BIOL 400E Experimental Evolution & Lab 2 CREDITS**

The theory of evolution provides the conceptual foundation for all of modern biology. Quantitative evolution provides formal theoretical frameworks for quantitatively linking natural selection, genetic variation, and the rate and direction of adaptive evolution. Biology 400 will explore patterns, processes, and consequences of evolutionary change in the context of modern research. We will emphasize problems of practical importance in biomedical science, agriculture, and conservation. Above all we will use contemporary literature to frame and guide our experimental approaches. Among the questions we will consider are these: What are the mechanisms that drive evolution, and what do they tell us about the persistence of genetic diseases and the challenges of saving endangered species? What are the genetic mechanisms that underlie adaptation and speciation? What experimental designs can be employed to study evolutionary change? We will answer these questions through scholarly article discussions, expert presentations, and laboratory experiments.

### **BIOL 400F Epigenetics & Gene Expression 4 CREDITS**

The Human Genome project was expected to lead to major breakthroughs in predicting and treating human disease, but an additional level of genetics has complicated the understanding of our genetic destiny. It is not only DNA sequence that matters, but the regulation of that gene as well. The changes in gene expression patterns that do not impact the DNA sequence itself is called epigenetics, a rapidly expanding field of research. This course will provide a foundation in epigenetics, covering the mechanisms underlying DNA methylation, histone modification, chromatin organization, and noncoding RNA. Important applications such as early development, stem cells, cancer, environmental health, and transgenerational inheritance will be a focus, in addition to laboratory techniques.

### **BIOL PLAN2 Upper Division Placeholder 2 CREDITS**

Use this placeholder course in student planning for a 2 credit upper-division requirement.

### **BIOL PLAN4 Upper Division Placeholder 4 CREDITS**

Use this placeholder course in student planning for a four-credit upper-division requirement.

### **BIOL 103 Human Anatomy and Lab 4 CREDITS**

This course focuses on the study of the structures of the human body in an integrated lecture/lab setting. The course approaches anatomy from both the microscopic and macroscopic perspectives and includes developmental and comparative aspects of each organ system. A human cadaver is used in the lab. BIOL 103 does not fulfill biology major requirements and registration priority is given to declared Nursing and Health Science majors.

### **BIOL 104 Human Physiology and Lab 4 CREDITS**

The mechanisms of human biological function are the basis of this course in an integrated lecture/lab class. Normal processes within cells, organs, and systems form the foundation for understanding disease and subsequent medical treatment. The study of physiology requires some familiarity with the basic concepts of chemistry. BIOL 104 does not fulfill biology major requirements. Prerequisite: BIOL 103 or instructors' permission. Offered Spring semester.

### **BIOL 111 Clinical Microbiology and Lab 4 CREDITS**

This course is designed for pre-nursing and allied health majors and does not count toward the biology major or minor. The techniques and principles of microbiology, especially as they relate to human disease, are examined in this course.

### **BIOL 202 Organisms and Evolution 4 CREDITS**

In this course, students will be exposed to the process and pattern of evolution, as it applies to animal and plant communities. An evolutionary perspective will be taken throughout, as the course underscores how the environment and biological laws shape the adaptations in diverse animal and plant groups. Classification and phylogenetics will highlight the functional and structural relationships among living organisms. Students will also explore the relationships between humans and biological diversity. Students will apply the scientific method through experimental design as well as data analysis and interpretation as it relates to the diversity of life on Earth.

### **BIOL 203 Introduction to Ecology 4 CREDITS**

This course covers evolutionary biology and ecology, with the goal of exposing you to a broad range of topics and ideas in both disciplines

and as an integrated whole. We will examine how organisms interact with their environment at the individual, population, and community levels, while also looking at the current state of many important ecosystems on Earth. Additionally, we will explore the mechanisms of evolution that have resulted in the diversity of life on Earth. This course is designed to help you develop skills of science, including observation, written and oral communication, critical thinking, and problem-solving, in a collaborative environment. Pre- or co-requisite: MATH 240 or DATA 220.

### **BIOL 204 Principles of Genetics 4 CREDITS**

Genetics, the study of inheritance, relates to all aspects of Biology since all living organisms must possess, maintain, and pass on their genetic material. Traditionally this discipline is separated into classical concepts (e.g. Mendelian) and modern concepts (e.g. Molecular). However, this division is historical and unnecessary. Our course will intentionally meld these components to build an authentic understanding of the current field. Also, since genetics is the basis of variation in biology and a source of modern technology, social issues involving diversity and bioethics are interwoven to enhance the understanding of the application of this science. Prerequisites: CHEM 112. (4)

### **BIOL 205 Introduction to Cell Biology 4 CREDITS**

This course is an introduction to molecular and cellular biology in an integrated lecture, discussion, and lab format. Course topics include the basic synthesis, structure and processing of biological molecules, enzyme function, cellular structure, signaling, as well as cell types and differentiation. In lab, you will also learn to perform basic cell and molecular biology lab techniques, such as micro-scale measurement, microscopy, and sterile technique and learn to design experiments to test hypotheses, and collect and analyze data to test their hypotheses. Prerequisites: CHEM 112. (4)

### **BIOL 300 Special Topics in Biology 1 to 4 CREDITS**

Covers special topics normally not offered in the regular biology curriculum. A maximum of four hours of BIOL 300 may be used toward the biology major or minor.

### **BIOL 301 Comparative Anatomy and Lab 4 CREDITS**

An integrated lecture/lab covering the anatomic relationships of all chordates. It includes aspects of embryology and evolution as they pertain to chordates. Lamprey, shark, cat, and human anatomy are emphasized. Offered Fall semester. Prerequisites: BIOL 202, 203, 205 (pre-2011: BIOL 105, 106); CHEM 111, 112. (4)

### **BIOL 303 Microbiology and Lab 4 CREDITS**

An introduction to general and medical microbiology. Topics will include the fields of bacteriology, virology, and mycology. Special attention will be given to human pathogens and their host-parasite relationships. Immunological and other host defense systems will also be introduced in the course. Historical developments and investigators will be discussed. The laboratory portion of the course will include a research project. Prerequisites: BIOL 204, 205; CHEM 111, 112. (4)

### **BIOL 304 Stem Cells and Development Lab 4 CREDITS**

Interested in stem cell therapy, regeneration, or growing organs in the lab for transplant? In this course we will dig deeper into recent developments in research on stem cell maintenance and differentiation as well as how stem cells are involved in tissue organization and organ development. We will investigate how signal transduction pathways, gene regulation, and epigenetic mechanisms influence stem cells and differentiation in detail by examining model systems as well as medical applications. We will read and present the primary literature throughout the class and the laboratory will include research projects that are designed and carried out by the students.

### **BIOL 306 Aquatic Ecology and Lab 4 CREDITS**

This field course will introduce students to the freshwater aquatic ecosystems of the western U.S., including lakes, streams, rivers, and wetlands. We will explore the ecological processes that dominate these systems, the organisms that inhabit them, and the ecological techniques central to their study. Field exercises will include trips to many aquatic ecosystems in the region; experience with sampling techniques for measurement of physical, chemical, and biological features; and experimental design for answering questions about the relationships among species and between species and their environment.

**BIOL 307 Comparative Physiology and Lab 4 CREDITS**

The general physiological processes in major groups of animals will be addressed. From the most primitive to the most complex, the physiology of animals will be studied through evolutionary and embryological approaches.

**BIOL 309 Global Change Biology 4 CREDITS**

Global climate change has altered the natural environment processes and their functionality in unprecedented ways. This leave biological systems to cope with the consequences. From molecular to ecosystem level, the responses of biological systems to these changes are the subject of active scientific research. Students in this course will become familiar with general concepts and mechanisms of Global Change as well as advanced biological research topics in the area of Global Change Biology.

**BIOL 310 Plant Biology and Lab 4 CREDITS**

This course will take a cellular, molecular and genetic approach to unravel the complex biology of plants from the microscopic cell level to the structure and function of higher plant systems. Topics will include evolutionary developmental biology (evo/devo), plant anatomy, plant-microbe and plant-environment interactions, abiotic stress physiology, soil-water relations, and molecular genetics. Weekly lab experiences will deal with the microscopic organization of plant bodies, local field trips, plant cell and tissue culture, and plant biotechnology. A functional knowledge of basic cell biology and genetics as well as lab and microscope skills will be needed. Prerequisites: BIOL 202, 204, 205; CHEM 111,112.

**BIOL 313 Astrobiology and Lab 4 CREDITS**

Astrobiology is the interdisciplinary study of the origin of life on Earth and the search for life beyond our planet. Drawing on current research in disparate fields, such as planetary science and biochemistry, students will use Utah's unique environmental features as a backdrop for engaging in discussions about conditions that push the limits of life. Students will explore topics such as life in extreme environments, life in space, and the molecular origin of life. They will participate in field trips and lab work, as well as read current primary literature in the field. Prerequisite: BIOL 203, 204 (pre-2011: BIOL 105). (4)

**BIOL 315 Principles of Paleontology 4 CREDITS**

This course introduces the organisms that compose the fossil record as well as the methods that paleontologists use to reconstruct the life of the past. Topics include modes of preservation, classification and the species problem, biases of the fossil record, phylogenetic reconstructions, functional morphology, paleoecology, morphometric analyses, evolutionary developmental biology, evolutionary trends, and critical intervals in the history of life.

**BIOL 350 Biochemistry 3 CREDITS**

A study of the chemistry of living organisms. Begins with a review of basic biology and organic chemistry as it applies to the biological systems, the structure and function of the cell, water and its importance in the biological system and energy considerations. Detailed discussions of protein chemistry, enzymology, carbohydrate structure, cellular metabolism, and lipid chemistry.

**BIOL 370 Scientific Computing 4 CREDITS**

An introduction to programming techniques that apply to a wide range of scientific disciplines. Topics include basic programming principles, equation solving, and model simulation. Students who have completed CMPT 201 may not take this course without instructor's approval. Same as CHEM/PHYS 370.

**BIOL 387 Undergraduate Teaching 1 to 2 CREDITS**

For teaching assistants in the biology classes. Practical experience in teaching and grading undergraduate biology courses. A maximum of two credit hours of BIOL 387 may be applied toward the major or minor. This course is repeatable for credit.

**BIOL 400 Advanced Topics in Biology 2 to 4 CREDITS**

Topical courses that are not currently a part of the regular curriculum. For junior and senior biology majors only.

**BIOL 401 Directed Studies 1 to 4 CREDITS**

A student-initiated in-house study of some biological topic or project. A maximum of four credit hours of BIOL 401 can be credited toward the Biology major or minor. Prerequisite: consent of instructor and school dean.

**BIOL 402 Immunology and Lab 4 CREDITS**

An introduction to the complex interaction of cellular signals and events that constitute the human immune response. Humoral and cellular mechanisms of immunity, histocompatibility, hypersensitivities, cytokine signaling, and the complement system will be examined in some detail. The laboratory will introduce the elemental methods of immunology and the immunological diagnosis of diseases.

**BIOL 403 Cellular Neuroscience and Lab 4 CREDITS**

The focus of this course is molecular and cellular neurobiology, including neuronal differentiation, cell structure, function, and connectivity. We will focus on how neurons are made, communicate, and are connected into circuits. Model systems used to study neuroscience will be introduced and we will use primary literature throughout. The laboratory will include research projects that are designed and carried out by the students.

**BIOL 404 Advanced Ecology and Lab 4 CREDITS**

A discussion of the basic principals of plant and animal ecology and the processes that maintain the structure and function of ecosystems. The course examines connections between ecology and some pressing environmental problems, and includes ecological phenomena that require background understanding of chemical and physical processes. Class and lab projects involve reading of primary literature, experimental design, data analysis, and independent research. This is a senior level course that builds on other course information and skills. Prerequisites: BIOL 202, 203 (pre-2011: BIOL 105, 106); CHEM 112; MATH 240.

**BIOL 405 Cell Biology of Cancer and Lab 4 CREDITS**

Nearly every structure and process in healthy cells is affected in cancer cells. This course is an exploration of cell structure and function with a molecular focus, including in-depth discussions of cell polarity, migration, division, and death, and how these processes are affected in cancer. We will read and present the primary literature throughout the class. The laboratory emphasizes current techniques in cellular biology and includes research projects that are designed and carried out by the students. Offered even Spring semesters.

**BIOL 420 Senior Seminar 2 CREDITS**

This course is designed as a senior level capstone in the Biology curriculum. Students will develop a sense of significance of communication of data in fields of science. They will learn how to use the current databases, journals, and internet to access scientific literature. They will also build a proficiency in writing and communication skills with regards to sharing scientific information. (WCore: SC)

**BIOL 430 Undergraduate Research 1 to 4 CREDITS**

Students undertake a portion of a research project and learn all aspects of scientific inquiry. One credit hour equates to three hours per week in the laboratory. This course may be taken one credit at a time. This course is repeatable for credit.

**BIOL 440 Internship 1 to 4 CREDITS**

Offers students the opportunity to integrate classroom knowledge with practical experience. Prerequisites: junior or senior standing (for transfer students, at least 15 hours completed at Westminster), minimum 2.5 GPA, and consent of program director and Career Center internship coordinator. A maximum of 4 hours of BIOL 440 may be applied toward the major or minor. This course is repeatable for credit. REGISTRATION NOTE: Registration for internships is initiated through the Career Center website and is finalized upon completion of required paperwork and approvals. More info: 801-832-2590 <a><https://westminstercollege.edu/internships></a>