

Biology (BIOL)

BIOL 1010 BB General Biology

3:3:0 **Fall, Spring, Summer**
* Prerequisite(s): ACT (or equivalent) composite score of 21+, or completion of ENGL1010 (or higher) with a minimum grade of C-

Introduces major themes and concepts of biology including cell and molecular biology, genetics, diversity, evolution, and ecology. Provides students with necessary information and skills to critically evaluate what they hear, read, and see in the living world; communicate clearly; and apply methods to interpret data for making informed decisions concerning the role of biology in a world of which they are a part. May be delivered online.

BIOL 1015 BB General Biology Laboratory

1:0:2 **Fall, Spring, Summer**
* Prerequisite(s) or Corequisite(s): BIOL 1010

A general laboratory experience covering introductory topics in general biology. Designed to complement the student's experience in the General Biology 1010 course with emphasis on the application of the scientific method. Includes actual student experiences with living organisms, use of the microscope, field excursions and an introduction to techniques used in the study of life. Course lab fee of \$13 for supplies applies.

BIOL 101H BB General Biology

3:3:0 **On Sufficient Demand**
* Prerequisite(s): ACT (or equivalent) composite score of 21+, or completion of ENGL1010 (or higher) with a minimum grade of C-
* Corequisite(s): BIOL 1015

Encourages students to understand and link concepts related to metabolism, photosynthesis, evolution, ecology, patterns of inheritance and genetics, human disease, physiology and organ systems, biological diversity, and environmental issues. Writing is emphasized in the course, including a term paper on a relevant and timely biological topic, as well as essay examinations.

BIOL 1070 BB Hereditiy

3:3:0 **On Sufficient Demand**
* Prerequisite(s): BIOL 1010 is strongly recommended

Introduces genetics for non-majors. Addresses patterns of inheritance from generation to generation (with an emphasis on human heredity), DNA structure and function as well as other aspects of molecular genetics and reproductive technologies.

BIOL 1200 (Cross-listed with: GEO 1020) BB Prehistoric Life

3:3:0 **Spring**
* Prerequisite(s): BIOL 1010 or GEO 1010 recommended

Studies prehistoric life. Uses the concepts of biology and physical science. Studies major groups of ancient animals and plants as found in the rock record. Includes aspects and fundamental concepts of biology, ecology, and geology.

BIOL 1500 (Cross-listed with: ANTH 1020) BB Biological Anthropology

3:3:0 **Fall**
* Prerequisite(s): ENGL 1010 and (ANTH 101G or BIOL 1010)

For students with special interests in Anthropology or the Life Sciences. Studies fossils and living primates, primate biology and behavior. Surveys humanoid fossils. Investigates human evolution and variations of basic biology as it pertains to human development. Stresses the importance of the distribution and diversity of humankind.

BIOL 1610 BB College Biology I

4:4:0 **Fall, Spring, Summer**
* Prerequisite(s): ACT (or equivalent) composite score of 21+, or completion of ENGL1010 (or higher) with a minimum grade of C-

Gives a broad exposure to many aspects of the life sciences. Covers topics of biochemistry, energetics, cell structure and function, genetics, and evolution. BIOL 1615 must be taken concurrently by Biology Department majors. BIOL 1615 is not required for pre-allied health majors.

BIOL 1615 BB College Biology I Laboratory

1:0:3 **Fall, Spring, Summer**
* Corequisite(s): BIOL 1610

Laboratory course to accompany BIOL 1610. Topics covered include scientific method, biomolecules, cell structure and function, cellular reproduction, Mendelian and molecular genetics, DNA technology, and evolution. Course Lab fee of \$30 applies.

BIOL 1620 BB College Biology II

3:3:0 **Fall, Spring, Summer**
* Prerequisite(s): BIOL 1610 and BIOL 1615 with a C- or higher in each.
* Corequisite(s): BIOL 1625

Provides the second semester material in the two semester introductory course designed for biology majors. Covers origin and early evolution of life, plant structure and function, plant diversity, animal structure and function, animal diversity, and animal behavior.

BIOL 1625 BB College Biology II Laboratory

1:0:2 **Fall, Spring, Summer**
* Corequisite(s): BIOL 1620

Laboratory course to accompany BIOL 1620. Topics covered include animal biology and diversity and plant biology and diversity. Course Lab fee of \$24 for lab, transportation applies.

BIOL 202R (Cross-listed with: GEO 202R) BB Science Excursion

1:0:2 **Fall, Spring, Summer**

For students interested in the natural world. Explores a wide variety of topics in science, including geology, botany, astronomy, zoology, ecology, and archeology. Consists of a minimum of a four-day field trip. Participants should gain an increased understanding of several fields of scientific study. May be repeated as many times as desired for interest, however a maximum of 3 credits may count toward graduation.

BIOL 204R (Cross-listed with: GEO 204R) BB Natural History Excursion

3:1:6 **On Sufficient Demand**

For students interested in the natural world. Promotes an in-depth look at a wide variety of topics in science, including geology, botany, astronomy, zoology, ecology, and archeology. Consists of 15 hours of lecture plus an appropriate field trip. Participants should gain an interdisciplinary understanding of science and nature. May be repeated for up to six credits toward graduation.

BIOL 2070 BB Natural History of the Colorado Plateau

3:1:4 **On Sufficient Demand**
* Corequisite(s): GEO 2070

Addresses the biological component of the Natural History Course taught in conjunction with GEO 2070 at the Capitol Reef Field Station during the summer months. Requires students to sign up for BIOL 2070 and GEO 2070 in order to participate. Teaches students about the ecology of this unique ecosystem, the plants and animals that occupy the landscapes and the interactions of the organisms with man and the environment. Provides an intense, hands on field course where faculty and students participate together in a natural setting. Requires students to live and learn at the field station for most of the course.

BIOL 2500 BB Environmental Biology

3:3:0 **On Sufficient Demand**
* Prerequisite(s): BIOL 1010 or BIOL 1610 is recommended

Designed to acquaint students with the principles of ecology emphasizing population dynamics, energetics, structural components, and concepts of niche and succession. Discusses the interactions of ecological principles and humanity's technology relative to the world today and factors that influence the quality of life.

Biology

BIOL 290R

Special Topics In Biology

1 to 4:0 to 4:0 to 12 On Sufficient Demand

* Prerequisite(s): BIOL 1010 or higher or Instructor Approval

Explores and examines special topics relating to the field of Biology. Emphasizes areas of rapid growth in Biology or current importance to society. May be repeated for a total of six credits toward graduation.

BIOL 295R

Independent Studies in Life Sciences

1 to 4:0:3 to 12 Fall, Spring, Summer

* Prerequisite(s): At least 3 credit hours of college level biology, approval of a faculty mentor, and approval of the department chair

Provides individual studies in biology under the direction of a faculty mentor. May include literature reviews, original research, and participation in ongoing departmental projects. Introduces students to the methodology of life science research. Students will prepare oral and written reports of their projects. May be repeated for up to 4 credits toward graduation.

BIOL 3300

Developmental Biology

3:3:0 Fall

* Prerequisite(s): BIOL 1610 with a minimum grade of C- and University Advanced Standing

Examines the principles of Developmental Biology with emphasis on the specialization of cells and their organization into body plans. Recommended for Biology Majors interested in developmental processes. May be delivered online.

BIOL 3400

Cell Biology

3:3:0 Fall, Spring

* Prerequisite(s): BIOL 1610 and CHEM 1220 with a C- or higher in each and University Advanced Standing

For Biology majors or those desiring more knowledge of this subject. Studies the cell as an organism emphasizing molecular basis of cell structure and functions.

BIOL 3405

Cell Biology Laboratory

1:0:3 On Sufficient Demand

* Prerequisite(s): BIOL 1610 and CHEM 1220 or higher with minimum grade of C- in each and University Advanced Standing
* Corequisite(s): BIOL 3400

Uses laboratory exercises to demonstrate topics covered in BIOL 3400. Includes experimental methods for studying cell processes, enzymes, tissue specific proteins, organelles, and experimental design. Course Lab fee of \$100 applies.

BIOL 3500

Genetics

3:3:0 Fall, Spring, Summer

* Prerequisite(s): BIOL 1610 with minimum grade of C- and University Advanced Standing

For Biology majors. Studies the genetic basis of life and the mechanisms by which information to make life is stored in the DNA. Presents classical, molecular, and population genetics in the background of current techniques and understanding of genetic processes. Provides an understanding of the basic principles of genetics and preparation for more advanced courses in other aspects of biology.

BIOL 3515

Advanced Genetics Laboratory

1:0:4 Fall, Spring

* Prerequisite(s): University Advanced Standing
* Prerequisite(s) or Corequisite(s): BIOL 3500

Examines advanced aspects of classical and molecular genetic transmission and analysis. Provides hands-on experience with the methods of classical and molecular genetics. Course Lab fee of \$60 applies.

BIOL 3550

Molecular Biology

3:3:0 Fall, Spring

* Prerequisite(s): BIOL 1610, CHEM 1215, and University Advanced Standing

Examines structure, organization, replication, and expression of the genome, and methods for study of genome structure and function.

BIOL 3555

Experiments in Molecular Biology

1:0:3 Fall, Spring

* Prerequisite(s): University Advanced Standing
* Prerequisite(s) or Corequisite(s): BIOL 3550

Performs experiments in molecular biology including cDNA synthesis, gene cloning, DNA sequencing, polymerase chain reaction (PCR), computer analysis of nucleic acid and protein sequences, protein expression-screening and protein separation and characterization. Course Lab fee of \$150 applies.

BIOL 3600 (Cross-listed with: CHEM 3600)

Biological Chemistry

3:3:0 Fall, Spring

* Prerequisite(s): CHEM 2320 and University Advanced Standing

Introduces principles of the chemical processes that define living organisms. Covers structure and function of proteins, carbohydrates, lipids, and nucleic acids. Explores metabolic pathways, biosynthesis, enzymatics, thermodynamics, membrane dynamics and related processes within a living cell. Emphasizes molecular mechanisms of reactions and their outcomes.

BIOL 3605 (Cross-listed with: CHEM 3605)

Biochemistry Laboratory

1:0:4 On Sufficient Demand

* Prerequisite(s): University Advanced Standing
* Corequisite(s): BIOL 3600

Introduces laboratory techniques in biochemistry. Studies methods and theory behind purification of proteins and nucleic acids including chromatography and electrophoresis. Uses methods in assessing enzyme activity and kinetics and protein structure analysis. Includes analysis and manipulation of DNA and RNA. Course Lab fee of \$151 applies.

BIOL 3700

General Ecology

3:3:0 Fall, Spring

* Prerequisite(s): BIOL 1620 (or equivalent with instructor consent) with a C- or higher, and University Advanced Standing

Introduces the relationships between organisms and their environment, including population, community and ecosystem processes. Specific topics include adaptation to abiotic factors and the influence of these factors on distribution and abundance; survivorship, age structure, and growth of populations; life history patterns, species interactions, community structure and diversity, biome structure and distribution, and energy flow and nutrient cycles in ecosystems. Also presents the impact of humans on ecological processes.

BIOL 3705

General Ecology Laboratory

1:0:2 On Sufficient Demand

* Prerequisite(s): University Advanced Standing
* Corequisite(s): BIOL 3700

Laboratory component to General Ecology in which students may acquire skills in the collection, analysis, and presentation of ecological data. Activities include field sampling of plant and animal populations, laboratory experiments and observations, and computer simulations. Emphasizes techniques in data storage and statistical analysis, graphical representation of data, and scientific writing. Course Lab fee of \$18 for lab, transportation applies.

BIOL 3800

Conservation Biology

3:3:0 Spring

* Prerequisite(s): (BIOL 1010 or BIOL 1620 with a minimum of C-) and University Advanced Standing; BIOL 3700 strongly recommended

Presents scientific principles of conservation biology and associated cultural and ethical issues. Explores the diversity of life on this planet and how that diversity is organized and distributed. Investigates the challenges facing management of our natural resources in order to maintain healthy and productive populations and ecosystems. Course fee of \$13 for materials, transportation applies

BIOL 4000**Freshwater Ecology****4:3:2 On Sufficient Demand**

* Prerequisite(s): BIOL 1620 and (BIOL 2500 or BIOL 3700) with a C- or higher in each, and University Advanced Standing

Explores physical, chemical, and biological characteristics of freshwater systems, including lakes, rivers, and streams. Emphasizes freshwater habitats as ecosystems. Studies human impacts on freshwater, with particular reference to Utah and the West. Emphasizes field experience in collecting and measuring the physiochemical characteristics and different groups of organisms found in freshwater habitats. Includes weekly laboratory. Course Lab fee of \$17 for lab, transportation applies.

BIOL 4200 (Cross-listed with: CHEM 4200, GEO 4200, PHYS 4200)**Teaching Methods in Science****3:2:2 Fall, Spring**

* Prerequisite(s): Acceptance into secondary education program, senior-level standing, instructor approval, and University Advanced Standing

Examines objectives, instructional methods and curriculum for teaching science in the secondary school. Includes developing, adapting, evaluating, and using strategies and materials for teaching biological and physical sciences, appropriate both to the special needs of the learners and the special characteristics of science discipline.

BIOL 4260**Ethical Issues in Biology****2:1:2 On Sufficient Demand**

* Prerequisite(s): (BIOL 1610, BIOL 1620, and PHIL 2050 with a C- or higher in each) and University Advanced Standing

Offer an in-depth analysis of current ethical issues in biology. Requires extensive reading and an analytical term paper. Presents subjects in lecture, and in lab sessions, concentrates on readings and on analyses of issues and their effects on people. Explores and discusses individual participant paradigms.

BIOL 4300**Bioinformatics and Genome Analysis****4:3:2 On Sufficient Demand**

* Prerequisite(s): BIOL 3500 with a minimum grade C- and University Advanced Standing

Studies analysis of genomic sequences, comparison of genomes of different species to gather information about protein function. Includes hands on learning in bioinformatics and genomics. Uses a combination of computer work and discussions that will allow the student to perform basic gene and protein analysis using web tools.

BIOL 4450**Immunology****3:3:0 On Sufficient Demand**

* Prerequisite(s): (MICR 2060 or MICR 3450 or ZOOL 2420) and University Advanced Standing

* Corequisite(s): BIOL 4455

Explores the macromolecules, cells and organs involved in innate and adaptive immunity. Examines the development of lymphocyte repertoire, positive and negative selection of lymphocytes and the production of effector lymphocytes. Studies properties of antigens, vaccines, antigen presenting cells and the mechanisms of antigen presentation. Reviews major immunological methods for medical diagnostics and other applications. Examines causes and consequences of autoimmune and lymphoproliferative diseases and immunodeficiencies. Probes how immune response could be manipulated for cancer therapy and transplantation medicine.

BIOL 4455**Immunology Laboratory****1:0:2 On Sufficient Demand**

* Prerequisite(s): University Advanced Standing

* Corequisite(s): BIOL 4450

Addresses federal, local and institutional regulations on using vertebrate animals for biomedical research. Teaches and regularly practices aseptic techniques required in handling biohazardous materials including vertebrate tissues. Studies how to collect tissues and blood from vertebrate animals and process the samples for harvesting various types of cells and macromolecules. Presents common immunological techniques such as western blot analysis and ELISA. Covers how to immunize animals using appropriate adjuvant and harvest plasma from immunized animals to isolate immunoglobulin. Examines tissue typing methodologies including PCR techniques. Course Lab fee of \$150 applies.

BIOL 4500**Principles of Evolution****3:3:0 Fall, Spring**

* Prerequisite(s): BIOL 1620 and BIOL 3500 with a C- or higher in each, senior status, and University Advanced Standing

* Prerequisite(s) or Corequisite(s): BIOL 3700

Focuses on the concepts of evolution as a fundamental principle of biology. Emphasizes the mechanisms and explanations of the tremendous diversity of life. Studies classical, molecular and current explanations of evolution in the background of current techniques and understanding of the genetic processes. Successful completers of this course will possess an understanding of the principles of evolution and be able to explain the various aspects of natural selection and speciation.

BIOL 4550**Molecular Evolution and Bioinformatics****3:3:0 On Sufficient Demand**

* Prerequisite(s): BIOL 3500 with minimum grade of C-, and minimum of 6 additional credits upper division biology (BIOL, BOT, MICR, ZOOL, BTEC) courses, and University Advanced Standing

Focuses on the concepts of evolution as a fundamental principle of biology with emphasis on change at the molecular level. Teaches how natural selection shapes the evolution of genes, gene systems, macromolecules, and organisms. Explores the roles of mutation, natural selection, population size and subdivision, and genetic recombination. Introduces different approaches for testing hypotheses about how molecules evolve by using phylogenetic analysis.

BIOL 481R**Biology Internship****1 to 5:1 to 5:0 Fall, Spring, Summer**

* Prerequisite(s): BIOL 1620 with a C- or higher and Instructor Approval

Allows biology majors to earn credit while obtaining practical and research experience as an intern in a government, nonprofit, private agency, or with an approved employer. Must be supervised by agency representative and faculty advisor. Department chairperson approval required and written contracts must be completed and signed. May be repeated with a maximum of 5 credits counting toward graduation. May be graded credit/no credit.

BIOL 489R**Student Research****1 to 4:0:3 to 12 Fall, Spring, Summer**

* Prerequisite(s): BIOL 1620, CHEM 1210, Junior or Senior Standing, instructor permission, and University Advanced Standing

Provides guided research studies in biology under the direction of a Biology Department faculty mentor. Includes any combination of literature reviews, original research, and/or participation in ongoing departmental projects. Involves students in the methodology of original biology research. Requires preparation and presentation of oral and/or written reports. Results may form the basis of the senior thesis in the major, if thesis option is chosen. May be repeated for 4 credits toward graduation.

BIOL 490R**Special Topics in Biology****1 to 4:0 to 4:0 to 8 On Sufficient Demand**

* Prerequisite(s): BIOL 1620 and University Advanced Standing

Explores and examines special topics relating to the field of biology. Emphasizes areas of rapid growth in biology or current importance to society. May be repeated for a total of 9 credits toward graduation.

Biology

BIOL 494R

Student Seminar

1:1:0

Fall, Spring

* Prerequisite(s): BIOL 1620 with a C- or higher, junior or senior standing, and University Advanced Standing

Requires students to research scientific literature, give oral presentations, and lead discussions on assigned biology topics in specific areas of current research in biology. May be repeated for up to two credits toward graduation.

BIOL 497R

Biology Colloquium

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On Sufficient Demand

* Prerequisite(s): University Advanced Standing

Requires students to attend lectures presented every other week by department faculty and/or invited speakers. Feature lectures that are usually a summary of the speaker's recent research results, presented at a level appropriate for junior and senior biological science majors. May be repeated for a maximum of 2 credits toward graduation.

BIOL 499R

Senior Thesis

1 to 2:0:3 to 6

Fall, Spring, Summer

* Prerequisite(s): ENGL 2010 or ENGL 2020, junior standing, instructor permission, and University Advanced Standing

For students who are nearing completion of a baccalaureate degree in Biology with the thesis option. Assists students who are writing a thesis based only on library research, or those who have performed laboratory/field research under BIOL 489R. Provides experience in critically analyzing published literature and, if laboratory/field research was performed, comparing research results with the scientific literature. Supervised by an appointed faculty member of the Department of Biology. Requires a technically accurate report on one's findings. Includes the opportunity to present the research results to students, faculty and the community at a Department of Biology seminar. May be repeated once for a total of 2 credits toward graduation.

BIOL 5000

Regulatory Affairs for Life Sciences

4:4:0

* Prerequisite(s): Acceptance into the Certificate of Proficiency in Regulatory Affairs for Life Sciences or Instructor Approval

Introduces regulatory affairs as practiced by medical device and biopharma companies in the US. Focuses on United States Federal Drug Administration and International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use guidances and best practices.

BIOL 5010

Quality Management Systems for the Life Sciences

2:2:0

* Prerequisite(s): BIOL 5000

Introduces FDA and International Conference on Harmonisation (ICH) requirements for the QSR (Quality System Regulation). Focuses on ISO 13485 and related guidances. Specifically covers the regulations and standards which are the basis of the regulated life science industry.

BIOL 5020

Design Control and Risk Management for the Life Sciences

3:3:0

* Prerequisite(s): BIOL 5000

Introduces design control and risk management requirements for medical device and BioPharma companies.

BIOL 525R

Advanced Topics for Biology Teachers

1 to 5:1 to 5:0 to 10 On Sufficient Demand

* Prerequisite(s): Departmental Approval

For licensed teachers or teachers seeking to re-certify their biology endorsement from the Utah State Office of Education. Teaches principles of biology and pedagogy of teaching biology for teachers in public or private schools. Emphasizes correlation with the Utah Core Curriculum, the National Science Education Standards, and the Benchmarks of Project 2061. Topics will vary.

BIOL 579R

Special Topics

2:2:0

Spring

Focuses on issues that are current and often changing in regulatory affairs, such as international regulations. Engages students in discussion and lectures with industry experts on cutting-edge issues that impact how medical devices and pharmaceuticals are regulated for compliance and safety. May be repeated for a maximum of 8 credits toward graduation. May be delivered online.

BIOL 580R

Capstone Project

1:1:0

* Prerequisite(s): BIOL 5020

Applies knowledge learned in the Regulatory Affairs sequence of courses to the real world. Allows students to work with faculty members and industry experts to design and complete a project that incorporates various concepts that have been presented in previous Regulatory Affairs courses. May be repeated for a maximum of 3 credits toward graduation.

BIOL 581R

Biology Internship

1 to 5:1 to 5:0

* Prerequisite(s): Instructor Approval and Internship Orientation

Allows students to earn credit while obtaining practical and research experience as an intern in a government, nonprofit, private agency, or with an approved employer. Must be supervised by agency representative and faculty advisor. Department chairperson approval required and written contracts must be completed and signed. May be repeated with a maximum of 5 credits counting toward graduation. May be graded credit/no credit.

BIOL 6000

Regulatory Affairs for Life Sciences

4:4:0

Fall

* Prerequisite(s): Acceptance into the Graduate Certificate in Regulatory Affairs for Life Sciences or Instructor Approval

Introduces regulatory affairs as practiced by medical device and biopharma companies in the US. Focuses on United States Federal Drug Administration and International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use guidances and best practices.

BIOL 6010

Quality Management Systems for the Life Sciences

2:2:0

Spring

* Prerequisite(s): BIOL 6000

Introduces FDA and International Conference on Harmonisation (ICH) requirements for the QSR (Quality System Regulation). Focuses on ISO 13485 and related guidances. Specifically covers the regulations and standards which are the basis of the regulated life science industry.

BIOL 6020

Design Control and Risk Management for the Life Sciences

3:3:0

Spring

* Prerequisite(s): BIOL 6000

Introduces design control and risk management requirements for medical device and BioPharma companies.

BIOL 680R

Capstone Project

1:1:0

Spring

* Prerequisite(s): BIOL 6020

Applies knowledge learned in the Regulatory Affairs sequence of courses to the real world. Allows students to work with faculty members and industry experts to design and complete a project that incorporates various concepts that have been presented in previous Regulatory Affairs courses. May be repeated for a maximum of 3 credits toward graduation.

BIOL 681R**Biology Internship****1 to 5:1 to 5:0****Spring**

* Prerequisite(s): Instructor Approval

Allows students to earn credit while obtaining practical and research experience as an intern in a government, nonprofit, private agency, or with an approved employer. Must be supervised by agency representative and faculty advisor. Department chairperson approval required and written contracts must be completed and signed. May be repeated with a maximum of 5 credits counting toward graduation. May be graded credit/no credit.