

# BIOLOGY (BIOL-UA)

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## BIOL-UA 3 Human Reproduction & Development (4 Credits)

*Typically offered Summer term*

Introduction to human reproductive anatomy, physiology and endocrinology, conception, pregnancy and development of the human embryo, childbirth, and principles of human heredity. Related topics are contraception and sexually transmitted diseases.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

## BIOL-UA 4 Human Physiology (4 Credits)

*Typically offered Summer term*

Investigation into how the human body functions. Overview of cellular structure and function is followed by an in-depth study of the nervous, endocrine, cardiovascular, and other organ systems.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

## BIOL-UA 7 Practical Human Physiology (4 Credits)

*Typically offered Spring*

The course is geared toward the beginning health professional students. This physiology course will focus on how the human body works. Anatomy will also be discussed as the various physiological mechanisms are only possible due to its close interrelationship. Students will be introduced to both clinical and research methodologies and will be able to apply this knowledge in a laboratory setting.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

## BIOL-UA 10 Essential Molecular Biology: Dissecting The Cellular Machinery, (4 Credits)

This course is for those who have ever wondered how the “molecules of life” (e.g. DNA, RNA, and proteins) work together to make complex organisms. Through a series of interactive lectures and discussions, we will look at what the molecules of life are, how they interact with each other, and what happens when things go wrong. Additionally, we will explore how we know what we know in molecular biology, including a discussion of the experiments that led us to these discoveries, the questions that remain unanswered, and the cutting-edge technologies that are key to bridging gaps in our understanding of the molecular components of life. By the end of the course, we hope students will be able to approach science news articles and molecular biology in popular culture with a new appreciation.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

## BIOL-UA 11 Principles of Biology I (4 Credits)

*Typically offered Fall and Summer terms*

Introductory course mainly for science majors, designed to acquaint the student with the fundamental principles and processes of biological systems. Subjects include the basics of chemistry pertinent to biology, biochemistry and cell biology, genetics and molecular biology, anatomy and physiology, neurobiology, ecology, population genetics, and history and classification of life forms and evolution. Laboratory exercises illustrate the basics of experimental biology, molecular biology, biochemistry, and genetics, as well as the diversity of life forms and organ systems.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

## BIOL-UA 16 Ecological Field Methods (4 Credits)

*Typically offered Fall*

Prerequisite: Fundamentals of Ecology (BIOL UA-63) (may be taken concurrently). Students learn the skills needed to design and implement field experiments, interpret data and present ecological research. While investigating real habitats (forests, salt marshes, urban landscapes), students perform biological surveys and measure abiotic parameters. Ecological techniques are nested within questions in biodiversity and community structure, invasion biology, urban ecology, habitat alteration and climate change. During approximately half of the lectures, class meets at off-campus field sites. Students should not schedule meetings or classes either directly before or after class time.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** (BIOL-UA 63 OR Corequisite: BIOL-UA 63) AND Prerequisite: (BIOL-UA 11 OR BIOL-UA 9011 OR SCIEN-UH 1601) AND (BIOL-UA 12 OR BIOL-UA 9012 OR ENVST-UA 100 OR SCIEN-UH 1602).

## BIOL-UA 21 Molecular and Cell Biology I (4 Credits)

*Typically offered Fall*

In-depth study of cell biology, with an emphasis on the molecular aspects of cell function. Topics include protein structure and synthesis, gene expression and its regulation, cell replication, and specialized cell structure and function. The course provides an introduction to genomics and bioinformatics and examines developmental biology, evolution, and systems biology.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** (BIOL-UA 12 with a Minimum Grade of C OR BIOL-UA 14 OR BIOL-UA 9012 with a Minimum Grade of C) AND (CHEM-UA 110 OR CHEM-UA 102 OR CHEM-UA 126 OR CHEM-UA 129).

## BIOL-UA 23 Vertebrate Anatomy (4 Credits)

*Typically offered occasionally*

Study of the evolutionary development of backboned animals, with emphasis on the mammals. Treats the major organ systems of vertebrate groups, with stress on structural-functional interpretations. Laboratory work includes detailed dissection of representative vertebrates. Field trips to the American Museum of Natural History help illustrate some of the topics.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** (BIOL-UA 11 OR BIOL-UH 2010 OR BIOL-UA 9011 with a Minimum Grade of C OR BIOL-UA 13) AND (BIOL-UA 12 with a Minimum Grade of C OR BIOL-UA 9012 with a Minimum Grade of C OR BIOL-UA 14 OR BIOL-UA 21 with a Minimum Grade of C OR BIOL-SHU 21).

**BIOL-UA 25 Physiology (4 Credits)***Typically offered Fall*

A comparative course that encompasses vertebrate and invertebrate physiology. Extensive discussion of the anatomy and physiology of the human cardiovascular system, the human lung, the human kidney, and the human brain. There is a focus on the physiological integration of organ systems, underlying cellular/molecular mechanisms, and adaptation. Ventilation, organism scale and environment, blood, the cardiovascular system, acid-base regulation, osmoregulation, feeding, digestion and absorption, the nervous system and behavior, muscle, endocrine function, and reproduction are studied. Special topics include human physiology in extreme environments (high-altitude and diving), a detailed analysis of mammalian vision, animal sleep and hibernation, and the comparative physiology of animals that live at deep-sea hydrothermal vents. The laboratory includes traditional physiology experiments, as well as an introduction to bioinformatics.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 21 with a Minimum Grade of C AND BIOL-UA 22) OR (BIOL-SHU 21 AND BIOL-SHU 22).**BIOL-UA 26 Developmental Biology (4 Credits)***Typically offered Spring*

Introduction to the principles and experimental strategies of developmental biology. Covers the cellular and molecular basis for pattern in the embryo; the determination of cell fate; cell differentiation; the genes controlling these events; how they are identified and studied; and the cellular proteins that affect shape, movement, and signaling between cells. Special emphasis on the experimental basis for our knowledge of these subjects from studies in fruit flies, nematodes, frogs, plants, and mice.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** BIOL-UA 21 with a Minimum Grade of C OR BIOL-UH 2010 OR (BIOL-SHU 21 AND BIOL-SHU 22).**BIOL-UA 30 Genetics (4 Credits)***Typically offered Fall and Summer terms*

An introductory course in genetics covering classical genetics, chromosome structure and mutation, gene function and regulation, and aspects of molecular and developmental genetics. Recent studies in human genetics and their applications are also discussed.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** BIOL-UA 21 with a Minimum Grade of C OR (BIOL-SHU 21 AND BIOL-SHU 22) OR SCIEN-UH 1601 with a Minimum Grade of C OR SCIEN-UH 1602 with a Minimum Grade of C.**BIOL-UA 31 ATB: Genetics & Genomics (4 Credits)***Typically offered Fall*

Covers genetic principles by means of a project-based laboratory. Students characterize mutants genetically and phenotypically. Analyses of dominance, linkage, recombination, dosage effects, and complementation are performed in the first part of the course. The second part of the course addresses genetic approaches made possible by the availability of complete genome sequences (genomics). Special note: Although the class is held at the listed hours (as described in the course registration bulletin), and attendance at the start of each class session is mandatory, the biological nature of the work may require some laboratory time outside the scheduled laboratory session.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 21 OR BIOL-UA 30).**BIOL-UA 32 Gene Structure and Function (4 Credits)***Typically offered Spring*

Intermediate course in the molecular basis of gene action in viruses, prokaryotes, and eukaryotes. Covers topics drawn from the following areas or other current work: structure and organization of the genetic material, replication, repair, transcription, translation, recombination, oncogenesis, and regulation of gene expression.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** BIOL-UA 21 with a Minimum Grade of C AND BIOL-UA 22 with a Minimum Grade of C.**BIOL-UA 37 ATB: Cell Biology (4 Credits)***Typically offered Spring*

Introduction to the methodology used to study cell structure and function. In the laboratory, students study the fundamentals of cell biology and the experimental approaches used to examine the cell. Experimental topics cover cellular, subcellular, and macromolecule localization; biochemical analysis of the cell; and cell culture techniques.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 21 AND BIOL-UA 22) OR BIOL-UH 2010 OR (BIOL-SHU 22 AND BIOL-SHU 21).**BIOL-UA 42 Biostatistics (4 Credits)***Typically offered Fall and Spring*

Provides an introduction to the use of statistical methods for analyzing biological data. Introduces methods for describing and displaying data, the role and use of probability in describing and understanding living systems, hypothesis testing, and how to design experiments. Biological data and R—a free, open-source statistical software package—are used to gain proficiency with these tools.

**Grading:** CAS Graded**Repeatable for additional credit:** No**BIOL-UA 44 Microbiology and Microbial Genomics (4 Credits)***Typically offered Fall*

Intended for majors and minors in biology as a comprehensive description of microbes, the most abundant and diverse organisms on the planet. Organized into four modules: the microbial cell, microbial genomics, microbial development and adaptation, and microbial interactions with the host and the environment. Through lectures and critical analysis of primary literature, students are led to realize how the advent of genomics has revolutionized microbiology, a scientific discipline that is more than a century old.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** BIOL-UA 21 with a Minimum Grade of C OR SCIEN-UH 1601 OR SCIEN-UH 1602 OR (BIOL-SHU 21 AND BIOL-SHU 22).**BIOL-UA 50 Immunology (4 Credits)***Typically offered Fall and Summer terms*

Introduction to immunology, with attention to the genetics, molecular, and cell biology of antibody production; T-cell mediated immune responses; and innate immunity. Topics include the nature of antigens, hypersensitivities, transplantation, cytokines, autoimmunity, cancer, response to infection, and vaccines.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** BIOL-UA 22 with a Minimum Grade of C OR BIOL-UH 2010 with a Minimum Grade of C OR BIOL-SHU 22.

**BIOL-UA 58 Evolution (4 Credits)***Typically offered Spring term of odd numbered years*

Introductory course covering a broad range of topics in modern evolutionary thought and practice, including ecological context of evolutionary change, interpretation of the fossil record, patterns of extinctions, speciations and biogeographic distributions, genetic variation and population structure, natural selection and adaptations, reconstruction of evolutionary history and phylogeny, molecular evolution, evolutionary novelties and the evolution of developmental systems, and human evolution and social issues.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** BIOL-UA 21 with a Minimum Grade of C OR BIOL-SHU 21 OR (SCIEN-UH 1601 AND SCIEN-UH 1602).**BIOL-UA 63 Fundamentals of Ecology (4 Credits)***Typically offered Fall*

Students investigate the relationship between abiotic and biotic components of an ecosystem. Building upon an introduction to environmental factors, students examine the interplay between these components at the organismal, population, community and ecosystem levels. Throughout the course, we discuss current ecological applications and issues, such as habitat destruction, sustainability, disease, invasive species, and global climate change. Intended for students majoring in biology (ecology track) and environmental studies.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (ENVST-UA 100 OR BIOL-UA 11 OR BIOL-UA 13 OR BIOL-UA 9011) AND (BIOL-UA 12 OR BIOL-UA 14 OR BIOL-UA 9012).**BIOL-UA 64 Geographic Information Systems for Ecology (4 Credits)***Typically offered Spring*

Geographic information systems (GIS) are computerized systems for the capture, storage, management, analysis, and display of geographically referenced data and their attributes. Emphasizes mastery of the basic principles and applications of GIS, including coordinate systems, data transformations, spatial analysis, and accuracy assessment. Laboratory exercises analyze ecological data and examples and provide extensive hands-on experience with ArcGIS, a professional GIS software package.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 11 OR BIOL-UA 13 OR BIOL-UA 9011 OR BIOL-UA 12 OR BIOL-UA 9012 OR BIOL-UA 14 OR ENVST-UA 100 OR BIOL-SHU 21 OR BIOL-SHU 22).**BIOL-UA 100 Intro to Neural Science (4 Credits)***Typically offered Fall*

Introductory lecture course covering the fundamental principles of neuroscience. Topics include principles of brain organization, structure and ultrastructure of neurons, neurophysiology and biophysics of excitable cells, synaptic transmission, neurotransmitter systems and neurochemistry, neuropharmacology, neuroendocrine relations, molecular biology of neurons, development and plasticity of the brain, aging and diseases of the nervous system, organization of sensory and motor systems, structure and function of cerebral cortex, and modeling of neural systems.

**Grading:** CAS Graded**Repeatable for additional credit:** No**BIOL-UA 103 Bioinformatics in Medicine and Biology (4 Credits)***Typically offered Fall*

Due to recent advancements in High Throughput Genomics technology we are able to study the function of many genes. We have the ability to compare genes in normal vs. diseased cells, to help us better understand the molecular mechanisms of the different diseases. In this course students will learn how to program in R, a powerful statistical programming language, use statistical methods to analyze real biomedical data, and learn how to interpret the results.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 11 AND BIOL-UA 12) OR (BIOL-SHU 21 AND BIOL-SHU 22).**BIOL-UA 150 ATB:Immunology (4 Credits)**

In this course students will learn the principles of immunology and neuroendocrinology. The course will cover immune cells and their role in innate and adaptive immune responses; the function, structure, types and development of antibodies and the mechanisms behind their effects; the mechanism of response to stress and the role of cortisol and the nervous system in this response. The laboratory experiments will focus on immunological methods employing antibodies, such as agglutination, immunodiffusion, immunocytochemistry, Western blotting and ELISA. Through designing and carrying out a research project to test a relationship between stress and the immune system, students will be introduced to the process of scientific research, will develop an understanding of how to collect and analyze the significance of data, and will gain the skills for reading, presenting and writing a scientific paper.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 21 AND BIOL-UA 22) OR BIOL-UA 44 OR BIOL-UA 50.**BIOL-UA 190 Mass Culture: China (4 Credits)**

This course examines the important role of mass culture in modern China. Our interest in "mass culture" will be twofold. First, we will consider the development and cultural impact of media technologies and media objects geared towards a mass audience. Second, we will explore the notion of "the masses" as a conceptual framework through which Chinese cultural producers and intellectuals, both before and after the 1949 revolution, made sense of the world and their place in it. Materials to be discussed include literature, film, visual art, and music from the late imperial period to the present day.

**Grading:** Graded**Repeatable for additional credit:** No**BIOL-UA 202 Behavioral & Integrative Neuroscience (4 Credits)***Typically offered Spring*

Lecture and laboratory course that focuses on how the brain uses both sensory and stored information to generate behavior. Lectures and laboratories cover four main areas: sensory process, learning and memory, motivational and attentional mechanisms, and the motor system. Laboratories employ a range of electrophysiological techniques, lesions and pharmacological manipulations, and various behavioral techniques to examine the integrative processes by which the brain governs behavior.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** NEURL-UA 100.

**BIOL-UA 223 Molecular and Cell Biology Laboratory (1 Credit)***Typically offered Fall*

This laboratory course applies concepts learned in the Molecular and Cell Biology course (BIOL-UA 21) to a molecular biology research project. The research project will introduce students to standard genetic and biochemical techniques common in a molecular biology lab, such as DNA isolation, agarose-gel electrophoresis, and transformation. The project also will provide students with a hands-on understanding of how modern DNA-sequencing technology, along with bioinformatic tools, can be used to discover genetic differences and understand cellular function.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 11 AND BIOL-UA 12) OR (BIOL-UA 13 AND BIOL-UA 14) OR (BIOL-SHU 21 AND BIOL-SHU 22).**BIOL-UA 327 NY Underground (4 Credits)**

Prerequisite: Principles of Biology II (BIOL-UA 12) or Environmental Systems Science (ENVST-UA 100). Investigates the life and resources underneath New York, with a focus on energy, transportation, and water (potable and waste). Concludes with the biotic components of New York's fascinating dendritic underground environment. Features hands-on data collection and field trips (including one all-day field trip).

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 12 OR ENVST-UA 100).**BIOL-UA 390 Urban Ecology (4 Credits)**

We are currently living in a time where city residents outnumber rural residents. In addition, the projected expansion of human population growth is largely predicted to occur in urban areas. Urban Ecology is an interdisciplinary and emerging field of research focused on the consequences of urbanization on ecological processes. In addition to a physically transformed natural landscape, cities are unique from other systems in terms of hydrology, temperature, noise, air quality and many other abiotic factors. In this course we will investigate the consequences of urban constructs on ecological systems. We will discuss factors such as nutrient cycling, organismal behavior and phenology, disease, and the drivers and patterns of biodiversity in urban systems. We will also talk about green spaces, urban planning, and the future of these expanding manmade landscapes. A significant component of this course will involve discussion of current literature. This is an upper-level reasoning course designed primarily for students majoring in biology (ecology track) and environmental studies.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 63 OR ENVST-UA 325).**BIOL-UA 500 At the Bench: Disease Ecology (4 Credits)***Typically offered Fall*

This is an upper-level undergraduate course that will teach students about the environmental determinants of disease vectors, and the molecular techniques used to measure prevalence of a pathogen in these vectors. Students will partake in a semester-long research project on Lyme disease, the most prevalent vector-borne disease in the United States. The aim of the project is to determine the prevalence of *Borrelia burgdorferi*, the Lyme disease causative agent, in tick populations from selected New Jersey or New York forests. Students will collect ticks, bring them back to the lab and analyze them for the presence of the *Borrelia burgdorferi* bacteria. Then collected and analyzed data will be fed into epidemiological models to assess human risk of Lyme disease in the studied areas.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 63 OR ENVST-UA 325 OR BIOL-UA 21).**BIOL-UA 530 Cancer Biology (4 Credits)**

This course covers the fundamental mechanisms of cancer emergence and evolution. Cancer is a devastating disease with huge medical and economical implications. Since the US declared the "War on Cancer" in 1971, the government has spent billions of dollars in research while patients all around the world spend similar sums in medical bills. These investments have led to significant discoveries and therapeutic improvements, but a definitive cure for cancer remains elusive. The course will cover some of the most important advances in cancer research, with a special emphasis on why basic research is critical to address the challenges posed by this disease. Students will gain a solid foundation on the fundamental molecular and cellular mechanisms behind tumor initiation, progression, and spreading. Students will also learn how tumors evolve and how this evolutionary process is largely responsible for the difficulties in eradicating cancer. The course finishes with discussion of how basic research has enabled novel therapeutic approaches that are bringing us a step closer to cure cancer.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** BIOL-UA 22.**BIOL-UA 545 Genome Engineering (4 Credits)**

A discussion-based course on principles underlying current and future genetic engineering approaches, ranging from unicellular organisms to whole animals. Focuses on the development and invention of technologies for engineering biological systems at the genomic level, including high-throughput functional genomic screens, gene editing therapies and the ethical and social implications of new technologies.

**Grading:** CAS Graded**Repeatable for additional credit:** No

**BIOL-UA 560 Plant Science and Biotechnology (4 Credits)**

Plant biology is relevant to any scientist whose work requires an understanding of food security, climate change, genetic engineering, and drug discovery. This course focuses on the organismal and molecular biology of plants with an emphasis on subjects that have a direct impact on imminent societal challenges. For example, the extension of plant-microbe symbioses is the subject of a multi-million dollar Gates Foundation project to address climate change by lowering energy intensive nitrogen inputs. Other efforts seek the introduction of C4 photosynthesis to new crops in order to stabilize food production in the hot, dry climates that lie ahead. Plant secondary compounds and now plant-based antibody production are important tools in modern medicine. The course does not aim to debate these often-controversial approaches but rather to provide a scientific basis to understand them. The material will incorporate and reinforce concepts in genetics and molecular biology. The course will also emphasize development of rigorous scientific communication skills needed for careers in research and medicine rather than in-class testing. Writing assignments will include a personal essay of scientific interests and a scientific summary of primary research that will be developed into a short research proposal and final presentation.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** BIOL-UA 21.

**BIOL-UA 700 Evolutionary Zoology (4 Credits)**

*Typically offered Fall*

Animals are one of life's most successful lineages, occupying nearly every environment. This course provides an introduction to the diversity of animal form and function in the context of phylogeny and evolution, with a focus on the invertebrates, the majority of animals. Lectures will be devoted alternately to individual branches of the tree of animals and to common themes in the ways animals have evolved to fit and shape their environments. We will discuss morphology, physiology, reproduction, development, and ecology. We will discuss the unique genomic and molecular characteristics of each branch of animal life, with attention to the ways that nonmodel organisms can provide insights into core cellular and molecular processes, including cell-cell communication and biomineralization. We will also discuss the intersection of these animals with human interests, including economic zoology, ecosystem services, and medicine. In laboratory and field exercises, students will learn to collect and identify invertebrate animals and to form and test hypotheses about their attributes.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** BIOL-UA 21 AND (BIOL-UA 22 OR BIOL-UA 63 OR BIOL-UA 100).

**BIOL-UA 902 Topics (4 Credits)**

Topics vary by semester and do not fit into the Special Topics category. -

**Grading:** CAS Graded

**Repeatable for additional credit:** Yes

**BIOL-UA 920 Spring Special Topics Course (4 Credits)**

Special topics may vary from semester to semester, and can be broad in scope or focused on some aspect of biology. A detailed course description will be made available when topics are announced. This course satisfies the foundational upper-level elective requirement.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** (BIOL-UA 9012 OR BIOL-UA 22).

**BIOL-UA 922 Spring Special Topics Course (4 Credits)**

Topics:

**Grading:** CAS Graded

**Repeatable for additional credit:** Yes

**Prerequisites:** BIOL-UA 22.

**BIOL-UA 924 Spring Special Topics Course (4 Credits)**

Special topics may vary from semester to semester, and can be broad in scope or focused on some aspect of biology. A detailed course description will be made available when topics are announced. This course satisfies the quantitative upper-level elective requirement.

**Grading:** CAS Graded

**Repeatable for additional credit:** Yes

**BIOL-UA 954 Advanced Research in Microbiology (4 Credits)**

In this course, students will investigate the functional and structural properties of bacterial spores, which are among the most resistant organisms on Earth. The spore-forming bacterium *Bacillus subtilis* is readily amenable to genetic manipulation and is a well-established model system for molecular and cellular biology. Students will get the opportunity to conduct hands-on experiments in the Eichenberger laboratory, thus learning classic molecular microbiology techniques and familiarize themselves with fluorescence microscopy. In the first half of the semester, students will learn classic microbiology procedures, and in the second part of the semester they will conduct an independent project characterizing mutant bacteria.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** BIOL-UA 21 AND BIOL-UA 22.

**BIOL-UA 957 Advanced Research in Synthetic Biology (4 Credits)**

Students will contribute to the collaborative and international research project Sc2.0, specifically working with members of the Boeke laboratory from NYU Langone. The goal of the Sc2.0 project is to build the first synthetic eukaryotic organism using a "bottom up" approach, marking a groundbreaking achievement in the field of synthetic biology. *Saccharomyces cerevisiae*, also known as the budding yeast, is the well-established model organism used in this project. Students will gain hands-on research experience in microbiology, cellular biology, and genetics while working with the budding yeast in this course.

**Grading:** CAS Graded

**Repeatable for additional credit:** No

**Prerequisites:** BIOL-UA 21.

**BIOL-UA 980 Independent Laboratory Research (External Institution) (4 Credits)***Typically offered Fall*

Intended only for biology majors. The details of individual internships are established by the director of undergraduate studies. Field or laboratory research with a sponsor at an organization or institution in the metropolitan area other than the Department of Biology. Students with the necessary background in course work and who, in the opinion of the sponsor, possess intellectual independence and ability may register for an internship in some field of biology. The student must approach an individual at the organization or institution to obtain sponsorship and agreement to provide counsel and any necessary space and facilities for the research project. The director of undergraduate studies maintains a file of suitable opportunities and is available to help students identify organizations of interest. The student must submit a lab or research notebook and a final paper.

**Grading:** CAS Graded**Repeatable for additional credit:** Yes

**Prerequisites:** BIOL-UA 22 with a Minimum Grade of C AND Restriction: Academic Program Visiting/Special StudentNYU PrecollegeWriters in NYHyperlocal JournalismCultural CapitalTisch High School Program.

**BIOL-UA 995 Becoming a Scientist (Honors) (2-4 Credits)***Typically offered Fall*

Succeeding in a scientific career requires intelligence and expertise in the laboratory, but also skills in scientific writing, oral communication, and ethics. Undergraduate biology majors conducting independent laboratory-based research projects read scientific papers and communicate scientific results in both oral and written reports. Topics: inspiring science and scientists, choosing a good scientific problem, defining your scientific strategy (grant writing), giving scientific presentations, scientific ethics, and career paths.

**Grading:** CAS Graded**Repeatable for additional credit:** No**BIOL-UA 997 Independent Laboratory Research (NYU Bio) (2-4 Credits)***Typically offered Fall*

Intended primarily for biology majors. Field or laboratory research with a faculty sponsor in the Department of Biology. Students with the necessary background in course work and who, in the opinion of a faculty sponsor, possess intellectual independence and ability may register for independent study in some field of biology. The student must approach a faculty member in his or her field of interest to obtain sponsorship and agreement to provide counsel and any necessary space and facilities for the research project. Requires a written report on the research.

**Grading:** CAS Graded**Repeatable for additional credit:** Yes

**Prerequisites:** BIOL-UA 22 with a Minimum Grade of C AND Restriction: Academic Program Visiting/Special StudentNYU PrecollegeWriters in NYHyperlocal JournalismCultural CapitalTisch High School Program.

**BIOL-UA 999 Undergraduate Research Thesis (2 Credits)***Typically offered Fall and Spring*

Requires a full literature search of the subject and a formal written report on the research in publication form.

**Grading:** CAS Graded**Repeatable for additional credit:** Yes**BIOL-UA 9011 Prin of Biology I (4 Credits)**

Introductory course for Science majors designed to acquaint the student with the fundamental principles and processes of biological systems. Subjects include the basics of chemistry pertinent to biology, biochemistry and cell biology, genetics and molecular biology, anatomy and physiology, neurobiology, ecology, population genetics and history and classification of life forms and evolution. Laboratory exercises illustrate the basics of experimental biology, molecular biology and biochemistry as well as the diversity of life forms and organ systems.

**Grading:** CAS Graded**Repeatable for additional credit:** No**BIOL-UA 9012 Principles of Biology II (4 Credits)**

Introductory course for science majors designed to acquaint the student with the fundamental principles and processes of biological systems. Subjects include the basics of chemistry pertinent to biology, biochemistry and cell biology, genetics and molecular biology, anatomy and physiology, neurobiology, ecology, population genetics and history and classification of life forms and evolution. Laboratory exercises illustrate the basics of experimental biology, molecular biology and biochemistry as well as the diversity of life forms and organ systems.

**Grading:** CAS Graded**Repeatable for additional credit:** No**Prerequisites:** (BIOL-UA 11 OR BIOL-UA 9011).**BIOL-UA 9022 Molecular and Cell Biology II (4 Credits)**

The objective of this course sequence is to provide students with a firm and rigorous foundation in the principles of modern molecular and cellular biology. These concepts form almost all the basis for the great advances now being made in biology and the medical sciences. In this second part of the course, we will discuss the fundamental processes that enable cells to grow, move, and communicate. The processes underlying tissue formation and cell death will also be introduced.

**Grading:** CAS Graded**Repeatable for additional credit:** No**BIOL-UA 9123 Principles of Biology Laboratory (1 Credit)**

Laboratory exercises illustrate the basics of experimental biology, molecular biology, and biochemistry as well as the diversity of life forms and organ systems.

**Grading:** CAS Graded**Repeatable for additional credit:** No