GE-D, Life Sciences

Courses that meet this requirement provide a scientific understanding of a full range of living systems from molecules to ecosystems by teaching students to understand how data is generated, presented and interpreted and how scientific discovery spurs technological growth and impacts society. A separate lab is required for all transfer courses.

BISC 102Lxg, Humans and Their Environment

We believe that the future of life on earth both humans and other species will largely depend upon decisions made by humans within the context of their scientific knowledge and of course upon the prevailing socio-economic system. Thus, we have for many years in our course referred to earth as the “Anthropogenic Planet”. A major premise of the class is that many of the most important and complex issues concerning the future of the environment require assessment from the perspective of sound biological principles. In order to make intelligent decisions regarding the use of natural resources and the quality of life, the public and its leaders must have a basic understanding of biology. In BISC 102 we provide students with understanding of 3 general fields in biological science: ecology, genetic inheritance, and evolution. These concepts from these fields are then applied to real-world problems. With regard to ecology, we largely draw upon simple thermodynamic laws of energy and material transfer in ecosystems as well as population dynamics and basic physiology. With regard to inheritance we draw upon Mendelian genetics and simple population genetics. With regard to evolution, we draw upon Darwin’s theory and neo-Darwinian interpretations by such writers as Richard Dawkins. These 3 fields provide “the big ideas” that can drive development of a scientific philosophy that non-science students can take with them as they pursue their careers after graduation.

This course description has been provided by Professor Dale Kiefer, James Moffett, Cornelius Sullivan.

BISC 103Lxg, General Biology for the Environment and Life

BISC 103Lg is designed to enable students who are not biology majors to understand the fundamental concepts, principles and processes upon which all life is based, the relationship between biology and their day-to-day world; how scientists acquire scientific knowledge; and how this methodology is used to address questions important to health and environmental issues around the world. This information provides students with the tools to enable them to become responsible, scientifically literate global citizens and voters. Students who successfully complete BISC 103 have the ability to critically evaluate popular press articles and other media reporting on technological, health-related and environmental issues. This ability empowers students to make better, scientifically-informed life decisions.

Environmental Studies is an interdisciplinary field in which students are required to have mastered elements of several traditional disciplines in addition to content and methods specific to their own fields. Students of the environment require a common set of skills in biology, including basics of evolution, systematics, ecology, genetics, biochemistry and molecular biology, physiology and anatomy. They must be firmly grounded in the chemistry of proteins, nucleic acids and other biological molecules. In our biology curriculum leading to a BS degree in that subject these topics would be presented over the course of five or more semesters of study. In order to provide a rigorous one-semester survey, BISC 103L will not address all specialized concepts in many of the areas traditionally covered in biology.

This is a one semester, rigorous introductory biology lecture and laboratory course that covers important aspects of general and molecular biology. This course is tailored more specifically to Environmental Studies and other life science studies at USC. This course is not appropriate for medical school preparation and will not serve as a prerequisite for upper division courses in biology. Students majoring in biology, chemistry, other natural sciences, or engineering will normally register in
the BISC 120L sequence. Consult your advisor and the instructor immediately if you have questions about BISC-103L vs. BISC 120L. Students majoring in neuroscience should take BISC 220, for which this course is not a substitute.

Fundamental concepts in chemistry are required for an understanding of biology. Students should have a working knowledge of high school chemistry, and are urged to take the companion chemistry course, CHEM 103L: General Chemistry for the Environment and Life. The chemical concepts that we shall use regularly throughout the course will reinforce those of CHEM 103L.

This course description has been provided by Professor Eric Webb, Ian Ehrenreich.

BISC 104Lxg, How the Body Works: Topics in Human Physiology
This course is designed to give undergraduates an introduction to human physiology. BISC 104 is designed to provide a working knowledge of the human body and many of the associated considerations, such as diseases, genetics, lifestyle, and the effect of both legitimate and illegal drugs. We shall also explore social aspects of many of areas presented. Although there is no prerequisite, general knowledge of introductory biology and chemistry at the high school level is helpful.

Please note that this course is not designed for those majoring in biology or the related health sciences. BISC 104 does not satisfy the requirements for accreditation in any pre-health area of which we are aware, and should not be used in an attempt to satisfy admission requirements into one of the health professions. We do not support, and will not provide help, in using this course for such a purpose. Those who are majoring in biology or any of the health sciences should consider BISC 307, which is designed specifically for pre-health majors.

This course description has been provided by Professor Chien-Ping Ko.

BISC 120Lg, General Biology: Organismal Biology and Evolution
This course is only for a specified cohort of students. BISC 120Lg duplicates credit in BISC 112L, BISC 113L, and BISC 121L.
In-depth survey of key topics related to advances in our knowledge of the diversity of life and evolution; origin of life; eukaryotes/prokaryotes; ecology.

This course description has been provided by Professor Suzanne Edmands, Wiebke Ziebis, Andrew Gracey, Oliver Rizk.

BISC 121Lg, Advanced General Biology
This course is only for a specified cohort of students. BISC 121Lg duplicates credit in BISC 112L, BISC 113L, and BISC 120L. Corequisite: CHEM 115aL.
Equivalent to BISC 120L, but taught at a higher level for exceptionally well-prepared students. Admission to the course by departmental approval only.

This course description has been provided by Professor David Hutchins, Jed Fuhrman.

BISC 150Lxg, The Nature of Human Health and Disease
The Nature of Human Health and Disease course is designed to bring students to a level of understanding of basic human biology, health and disease as well as modern biomedical science that will enable them to make rational decisions on personal, ethical, and political issues in their health. This level will be reached through lectures, reading of texts, papers and news media, and laboratory experiments.

This course description has been provided by Professor Christina Bancroft, Oliver Rizk.
BISC 230Lxg, The Biology of the Brain: Current Topics in Neuroscience

The brain is unique compared to other organs in the human body. Neurons, the cells that make up the brain, have most of the same fundamental characteristics of other cells in the body, yet the activation of brain cells results in events as complex as sensory perception, movement, learning and memory, and emotion. This class will cover a range of topics, including: organization and overview of course; standing on shoulders of giants (history of neuroscience); from worms to people, electrodes to brain scanners (methods for studying the brain); everything we are, do, and imagine in 3 pounds (organization of the nervous system); how brain cells talk to each other (neural signals and synaptic transmission); our most complicated computer builds itself! Wait. What? (neural development); seeing, hearing, tasting, smelling, and touching (mechanisms of sensory perception); What was that again? (learning and memory); hunger and thirst (basis of appetitive behaviors); getting what you want and retaliating (neural mechanisms of aggression); left brain / right brain (lateralization and other brain specializations); from sharing a cave to Facebook (biological substrates of social behavior); when brains don’t work (Parkinson’s, schizophrenia, depression, other disorders); delicate yet resilient (trauma and recovery of the brain and spinal cord); can’t live with ‘em, can’t evolve without ‘em (sex); messing with your mind (drugs); appreciating art, music, and beauty (Rock n’ Roll); and the whole enchilada (personality and consciousness).

CHEM 203Lxg, AIDS Drug Discovery and Development

CHEM 203: Chemistry in Life: AIDS Drug Discovery and Development (http://c203.usc.edu/203/) is designed for non-science majors. This Chemistry course will provide students with a solid understanding of HIV/AIDS and the discovery and development of drugs used to treat HIV/AIDS. As such, you will be trained in the basic science concepts and the scientific method and learn how science and technology can impact society and health. The course will be taught in a “bottom-up” fashion, starting with basic chemical and biological principals. This component of the course will start with understanding the structure and bonding of organic molecules, including drugs. We will then move on to learn basic molecular and cellular biology, giving us to the tools to then explore our immune systems and how we fight disease. The next component of the course will focus on the effects of HIV, ranging in scale from our bodies to the global pandemic. Specifically, we will look at the history and epidemiology of HIV and AIDS, followed by an investigation of the molecular mechanisms of HIV infection. We will then move on to discuss how from the moment of infection our immune system is in constant losing battle with HIV and how drugs have both entered and exited the fray. In the next component, we will continue with a discussion of HIV drug development, which covers topics such as how your body processes drugs and how we can statistically analyze the efficacy of drugs. Lastly, we will finish the course by looking at the future of AIDS pandemic and ethical questions raised by treatment and prevention.

CHEM 203 will give you an understanding of why chemistry and biochemistry are important in the context of drug development and treating disease. You will gain an understanding of how pharmaceutical companies develop drugs and what factors go into whether they make it to market or not. You will gain an understanding of what HIV/AIDS is, how it is treated, and what its socioeconomic effects are. Upon completing this course, you will have substantive knowledge in science and technology. You will also understand how scientists investigate scientific questions and solve important challenges in human health. Additionally, you will be able to articulate basic principals in chemistry, biology and human disease a well-informed, cogent manner.

This course description has been provided by Professor Matthew Pratt.

CHEM 350g, Molecular Principles of Biochemistry

This course is only for a specified cohort of students.

This course is designed to help students master the fundamental knowledge they need in order to understand the key molecular processes in biology. Instead of learning a large number of facts and observations, students are challenged to develop a deeper insight into the primary molecular principles operating behind biochemistry. The course will train students
to use these concepts to understand how cells leverage fundamental chemical forces to perform important biological functions, emphasizing the interpretation of facts and the synthesis of knowledge by deduction, over memorizing details and specifics. Main topics include: biomolecular structures, protein and nucleic acid chemistry and functions, carbohydrates, lipid membranes, enzyme catalysis and kinetics, and biochemical signaling. In addition, a concise overview of molecular biology will be given, highlighting the key molecular processes central to metabolism and to gene expression and replication.

*This course description has been provided by Professor Chi H. Mak.*

**CORE 103g, The Process of Change in Science: Thematic Option**

*This course is only for a specified cohort of students.*

**HBIO 200Lg, The Human Animal**

The Human Animal introduces the student to an evolutionary and biological view of the human species, and the use of scientific inquiry to understand ourselves. We begin by surveying the history of evolutionary thought and examining the structure of evolutionary theory. We then survey the Primate order, followed by an examination of the fossil evidence for human evolution. We conclude with a consideration of how evolution may influence the modern human species. Theoretical questions confronting the field in the 21st century are discussed, to familiarize you with the major issues. We will give particular emphasis to evolutionary explanations for the origins of modern humans, to ecological influences on behavior, and to evolutionary implications for the origins of human behavior.

*This course description has been provided by Professor Craig Stanford.*

**HBIO 205Lxg, The Science of Sport**

This course will deal with the physiological and nutritional basis of human performance. It will be a combination of lecture and laboratory exercises to better help students understand the factors that facilitate and limit optimal performance. Laboratory experiences will allow students to obtain a “hands-on” approach to measures and techniques that are discussed in lecture. It is not a course aimed solely at elite students, but also the typical individual who has the desire to exercise and wishes to better understand that factors that are involved in exercise tolerance.

*This course description has been provided by Professor Robert Girandola.*

**HBIO 250g, The Pharmacology of Performance Enhancing Drugs**

This course will deal with the physiological and nutritional basis of human performance. It will be a combination of lecture and laboratory exercises to better help students understand the factors that facilitate and limit optimal performance. Laboratory experiences will allow students to obtain a “hands-on” approach to measures and techniques that are discussed in lecture. It is not a course aimed solely at elite students, but also the typical individual who has the desire to exercise and wishes to better understand that factors that are involved in exercise tolerance.

*This course description has been provided by Professor Casey Donovan.*

**LING 110Lg, In a Word**

"Biolinguistic inquiry investigates the human language faculty as an internal biological property." This course presents fundamental aspects of biolinguistics, launched by Noam Chomsky in the 1950s. The course discusses the biolinguistic thesis that the language faculty is shared by the member of the human species and is internal to an individual member of the human species and how specific hypotheses can be formulated under this thesis so that predictions that they give rise to can
be put to rigorous empirical test. It will be emphasized that since each student is a member of the human species, predictions in biolinguistics (which we sometimes call language faculty science) should be about each of them. The students will be required to participate in on-line Experiments; they will study the universal and language-particular hypotheses that give rise to the definite and categorical predictions tested in those Experiments and how to interpret the Experimental results, following the most widely accepted method of hypothesis-testing in natural sciences such as physics, drawing from works by Richard Feynman's "Seeking New Laws" in his 1964 Cornell Messenger Lectures.

It is an indubitable fact that the members of the human species are able to produce and comprehend the language to which they are exposed once they have reached a certain maturational stage, barring any serious impairment. One of the most fundamental working hypotheses adopted in the research program initiated by Noam Chomsky is that underlying this ability of ours is what is called the language faculty. Chomsky has maintained that we should approach the language faculty just as natural scientists approach their subject matters.

The goal of this course is two-fold. On the one hand, it aims to introduce to the students systematic aspects of language, with regard to how words are analyzed and formed, how sounds are put together to form a word, how words are combined to form a larger expression, such as a sentence, and how some aspects of the "meanings" are computed, among other issues. The other aim of the course is to introduce to the students, building on the discussion and activities pertaining to the first goal, how language faculty can be studied scientifically.

The latter aim is directly related to how we understand the term "scientifically." We can understand the term as more or less equivalent to "systematically," in the sense of making observations, coming up with a generalization based on the observations, testing the validity of the generalization against additional observations, and stating the generalization in terms of certain concepts and relations. The activities centering on the first goal are in fact intended to be scientific in this sense.

One can also understand the sense of scientifically by focusing more on how predictions are made under what hypotheses, and how the validity of the hypotheses is tested experimentally. As noted above, it is hypothesized by Chomsky and others that all members of the human species, barring any serious impairment, share the core properties of the language faculty. Every adult speaker of English then must share crucial properties of the language faculty, with the qualification given above. One can thus ask: What kind of hypotheses can we put forth about properties of the language faculty? What kind of predictions do we make based on such hypotheses? What kind of experiments can we conduct to test our predictions? During the course of the semester, students will be asked to participate in on-line experiments to get first-hand experience on how they are run. Students will learn exactly what is predicted about their own linguistic reactions, how experimental results are analyzed, and whether the experimental results support or disconfirm predictions that have been made.

This course description has been provided by Professor Hajime Hoji.

LING 275Lg, Language and Mind

This course introduces students to the study of Language as a cognitive science, focusing on the mental representations of the sounds of speech and of words. Some questions that will be addressed throughout the course are: How do we define language and are humans the only species that have spoken language? What are the sounds of the world’s languages? How can they best be classified and understood? How are sounds represented in the mind? How do social, cultural, and regional factors influence language? How are sounds produced by the human vocal apparatus? How are sounds transmitted through the air and captured by the ear? How good are we at producing machines that generate speech? How do children learn to understand and produce speech? Do speakers of different languages perceive speech differently? How is speech related to reading? How is language normally processed in the brain? What goes wrong when language is impaired in an individual?

Throughout the course we will emphasize the scientific methods used by researchers to investigate these and other questions. Because this course is multidisciplinary in nature, drawing primarily from the fields of Linguistics and Psychology, students will be introduced to the different methods, techniques, and technologies used by researchers in both fields.

An exciting aspect of this domain of inquiry is its newness. Unlike the more traditional sciences, the study of Language as a cognitive science has been developed primarily in the latter half of the 20th century, and much of the research described in
this course is under 30 years old. As a result, some of the questions that we will explore, even in this introductory course, have not yet been answered, or have only recently been understood. This gives students the unique opportunity to witness how theories develop and change through scientific experimentation and argumentation.

*This course description has been provided by Professor Elsi Kaiser.*

**PSYC 100g, Introduction to Psychology**

This course is a comprehensive introduction to the subject areas, theoretical perspectives, methods and controversies in the field of psychology. Topics covered include research methods, brain structure and function, sensation, perception, principles of learning, memory, development, intelligence, personality, stress, social behavior, consciousness, psychological disorders and therapy.

*This course description has been provided by Professor Ann Renken.*

**PSYC 339Lg, Origins of the Mind**

Humans have uniquely powerful minds. Unlike other animals, we can reason about a wide range of topics and knowledge domains. How do we develop such powerful and flexible minds? Which types of knowledge are endowed by natural selection and shared with other animals, and which are the product of uniquely human abilities like language and culture? This course will explore the origins of the mind, by examining how knowledge emerged in our evolutionary history and emerges during development. We will study the evolutionary and developmental origins of ten types of human knowledge: visual perception; navigation; object representation; mathematics; social cognition; language; culture and pedagogy; evolution; religion; and morality.

*This course description has been provided by Professor Justin Wood.*