Requirements: Biology

Natural Sciences Division

The Biology Curriculum

The biology curriculum structures learning based on the scientific process of discovery: observation, interpretation, experimentation, analysis and the formation of new hypotheses. Through exploration of recent developments in the broad range of biological fields, students examine details in the context of basic principles. Students experience the dynamic nature of biological science by participating in laboratory work and research projects that form the backbone of the program. The curricular design offers many choices to students, allowing non-majors to explore any one field of biology in depth or to examine biology in the context of human issues having sociological, economic and political importance, such as health care, biotechnology and the environment.

Introductory and foundation courses are offered at the 100-level. These consist of BIOL 109Y-110Y, the year long introductory lab sequence and BIOL 115 and 116, Energy and Information in Living Systems.

Upper-level courses are offered at the 200 and 300 levels. Courses at the 200 level are designed for sophomores and juniors who have completed at least part of the introductory-level curriculum. Reading assignments include textbooks, primary literature and other advanced sources. Courses at the 300 level are designed for juniors and seniors who have completed the entire introductory-level curriculum and at least one 200-level course. Primary literature and other advanced sources form a substantial portion of the reading, and extensive student-directed work is expected. In addition, senior Biology and Molecular Biology majors must take a 400-level senior seminar, as part of their Senior Capstone in Biology.

In addition to the biology major, major programs in biochemistry and in molecular biology are available. These programs combine work in biology and chemistry to prepare students for graduate work or employment entailing research on the molecular basis of biological systems. Information on course requirements for these major programs is detailed in the biochemistry and molecular biology section.

Non-majors can choose innovative topical courses that approach biological issues in a human context (BIOL 102, 103, 104, 105, 106, 107). These courses are designed for students with minimal backgrounds in biology. The foundation courses — BIOL 115 and 116 — allow more in-depth study. Several courses also serve the interdisciplinary concentration in environmental studies.

For students considering medical, dental, nursing or veterinary postgraduate programs, there is usually a requirement of a minimum of two semesters of biology with the corresponding laboratory work. BIOL 115 and 116 plus the laboratory sequence BIOL 109Y-110Y satisfy this requirement.

Students can involve themselves in the department through the Biology Student Advisory Group, which meets with the chair and faculty members, or as employees ranging from laboratory teaching assistants to research assistants.

Majors are encouraged to participate in the department through research with faculty members and by their active role in hiring faculty, suggesting curriculum changes, inviting and hosting seminar speakers and planning social events.

Requirements for the Major

- BIOL 109Y–110Y, to be completed by end of sophomore year
- BIOL 115 and 116 (or specific exemption by AP or IB), must be completed within the first four semesters
    - Advanced courses may be taken after completion of BIOL 115 and 116 so students can begin advanced lecture courses while completing BIOL 109Y–110Y
- Six upper-division lecture courses, including at least one 300-level course and one 400-level course. MATH 258 and CHEM 256 can each count as one of the six required upper-division courses
- Four upper-division laboratory courses (0.5 unit of credit in [BIOL 385, 386] or [BIOL 497, 498] can serve as one 0.25-unit laboratory course requirement)
- One year of Introductory Chemistry lecture (or equivalent)

In order to fulfill the diversification requirements for upper-level courses, biology majors will need to take at least one upper-level lecture course in each of the following three categories to graduate:

- Environmental biology: BIOL 228, 241, 251, 253, 261, 311, 328, 352 and 362
- Organismal biology/physiology: BIOL 211, 233, 238, 243, 245, 323, 336 and 358
- Cellular and molecular biology: BIOL 238, 255, 263, 266, 315, 321, 323, 333, 375 and CHEM 256

We strongly encourage majors to take at least one year of mathematics and physics. Students planning graduate studies in any area of biology should also include organic chemistry. We encourage majors to seek opportunities for independent research with faculty members, through Research in Biology (BIOL 385) honors research and the Summer Science Scholars Program.

Senior Capstone

The Senior Capstone for all biology majors consists of a detailed analysis of a research field, focusing on a critique of a particular research article. In addition, all majors must attend a specified number of guest lectures in the Biology Seminar Series and take a standardized assessment exam. Seniors must also enroll in BIOL 475 Senior Seminar in Biology.

Advanced Courses

Many courses and labs are offered in alternating years, so care should be taken in planning the major to suit individual goals. The following list indicates which courses are normally

taught on alternating-year schedules. Please note that the schedule can vary from these guidelines; students should consult the department chair or course instructor if particular courses are needed.

Courses that may be offered in alternating years (or less frequently) include: BIOL 211, 233, 234, 241, 245, 246, 251, 253, 255, 256, 266, 267, 311, 315, 321, 322, 323, 328, 333, 336, 346, 349, 352, 353, 358, 359, 362 and 375.

Honors

The Honors Program in biology is an exciting opportunity for students to perform research in collaboration with a faculty member of the Department of Biology. Prior to enrollment in senior honors, students are expected to complete at least one semester of Research in Biology (BIOL 385), although two semesters are recommended, and participate in the Summer Science Scholars Program. Students must have an overall GPA of at least 3.33 and a GPA of 3.33 in biology.

Requirements for the Minor

The biology minor requires a minimum of two and three quarter (2.75) units of credit earned in the major curriculum to include the following:

- BIOL 109Y–110Y
- BIOL 115 and 116
- At least one upper-level lab
    - Two semesters of BIOL 385 would satisfy the upper-level laboratory requirement, and one year of Individual Study (BIOL 393, 394) would satisfy one upper-level lecture course requirement in the minor.

Transfer Credit Policy

All transfer credit to be counted for the biology major must be approved in advance by the department chair.

Cross Listed Courses

The following courses are cross-listed in the biology department to satisfy natural-sciences diversification:

ENVS 112 Introduction to Environmental Studies
MATH 258 Mathematical Biology
MATH 258 Mathematical Biology and CHEM 256 Biochemistry can serve as upper-division lecture courses in the biology major.

Courses in Biology

BIOL 103 Biology in Science Fiction

Credit: 0.5

Science-fiction literature and film extend our awareness of the natural world in amazing ways, as in the film Avatar. Yet real biology is often more amazing than science fiction. This

course explores biology through science fiction, and through nonfiction biology more amazing than fiction. We meet human mutants in the X-Men, and we meet real human mutants in the medical literature. We explore human evolution through Vonnegut's Galapagos and discover bizarre living creatures through Herbert's Dune and Crichton's Jurassic Park. We model growth and explosion of populations in Star Trek, "The Trouble with Tribbles," and show how global climate change disrupts the marine ecosystem as in Slonczewski's A Door into Ocean. Students learn to blog science, an important form of online nonfiction writing. This course counts for science diversification, but does not count toward the major or minor, nor QR. Students may not take this course as pass/D/fail. No prerequisite. May be offered in alternating years.

BIOL 105 Biology of Exercise
Credit: 0.5

This introductory class examines the physiological response of the human body to exercise. Questions considered include: What limits human exercise performance? How does nutrition influence exercise? What are the mechanisms involved in increased performance during training? How does exercise influence health? Students directly evaluate the scientific basis of physiological knowledge through the analysis of experimental methods and data. Students write essays that explain recent scientific research to readers without technical training. Does not count toward the major or minor. No prerequisite. Generally offered in alternating years.

Instructor: C. Gillen

BIOL 106 Conservation Biology
Credit: 0.5

Conservation biology introduces students to subjects in biology that are central to questions about sustaining species and ecosystems. Students will use a series of case studies to learn the scientific methodology and fundamental principles that must be applied to issues of conserving biological diversity. Case studies will illustrate aquatic and terrestrial habitats; population and ecosystem levels of organization; and principles of evolution, population biology and ecosystem biology. BIOL 106 is appropriate for first-year students and is an alternative core course for the Environmental Studies Concentration. No prerequisite. Offered every other year.

Instructor: Bickford

BIOL 107 Scaling in Biology: Why Size Matters
Credit: 0.5 QR

While biologists seek general principles that explain the common characteristics of all organisms, we too often ignore that most obvious of traits: an organism's size. In this course, we will explore how size determines the form, function, pace and complexity of life. Our questions will span realms from the minuscule (how do bacteria swim?) to the gigantic (is Earth a super-organism?) to the fantastic (what would it cost to feed King Kong?) Living

things span an amazing range of sizes, and by using size as a lens for studying life, we will develop a quantitative framework for comparing not just apples and oranges, but bacteria and blue whales. Surreal perspectives on biology such as Swift's Gulliver's Travels and films like A Fantastic Voyage will further highlight the truly amazing nature of biological reality. This does not count towards the biology major or minor. No prerequisite.

Instructor: Kerkhoff

BIOL 109Y Introduction to Experimental Biology
Credit: 0.25 QR

This is the first laboratory course a student takes and is a prerequisite for all upper-division laboratory courses. Students are introduced to the processes of investigative biology and scientific writing. It is not designed to accompany any particular core lecture course. Laboratories cover topics presented in the core lecture courses, BIOL 115 and 116, and introduce a variety of techniques and topics, including field sampling, microscopy, PCR, gel electrophoresis, enzyme biochemistry, physiology, evolution and population biology. The course emphasizes the development of inquiry skills through active involvement in experimental design, data collection, statistical analysis, integration of results with information reported in the literature and writing in a format appropriate for publication. The year culminates in six-week student-designed investigations that reinforce the research skills developed during the year. Evaluation is based on short reports, quizzes, lab performance and scientific papers, as well as oral and written presentations based on the independent project. Enrollment is limited to 16 students in each section. Prerequisite or corequisite: BIOL 115 or equivalent.

BIOL 110Y Introduction to Experimental Biology
Credit: 0.25 QR

See course description for BIOL 109Y.

BIOL 115 Energy in Living Systems
Credit: 0.5

Energy flow is a unifying principle across a range of living systems, from cells to ecosystems. With energy flow as a major theme, this course covers macromolecules, cells, respiration and photosynthesis, physiology and homeostasis, population and community interactions, and ecosystems. Throughout the course, the diversity of life is explored. The course also introduces students to the process of scientific thinking through discussion of research methodology and approaches. Majors and nonmajors may enroll. Biology majors should take this class prior to the junior year. No prerequisite. Offered every year.

BIOL 116 Information in Living Systems
Credit: 0.5

How is information generated, transmitted, stored and maintained in biological systems? The endeavor to understand the flow of biological information represents a fundamental

undertaking of the life sciences. This introductory course examines the mechanisms of heredity, the replication and expression of genetic information and the function of genes in the process of evolution, with an emphasis on the tools of genetics and molecular biology to address research questions in these areas. Majors and nonmajors may enroll. Biology majors should take this class prior to the junior year. Prerequisite: BIOL 115 or equivalent, or permission of instructor. Offered every year.

BIOL 211 Health Service and Biomedical Analysis
Credit: 0.5

Students volunteer weekly at Knox Community Hospital, College Township Fire Department, or another designated health provider. We study health research topics including articles from biomedical journals, in the context of students' own community service in health-related fields. The academic portion of the class will meet as a three-hour seminar. Students read and critique articles on topics such as: diabetes in the community; pain-killers and drug addiction; AIDS and STIs; influenza transmission and socioeconomic status and health disparities. Students will relate these topics to their experiences from health service. Outside of class, students will have four hours/week reading, and a minimum of four hours/week service. Student assignments will include keeping a journal on their service, and class presentations related to the reading and their service. This counts as an upper-level lecture in organismal biology/physiology. Prerequisite: one year of biology or chemistry and permission of instructor.

BIOL 228 Ecology
Credit: 0.5

Ecology is the study of the distribution and abundance of organisms and the structure and dynamics of the biosphere. Topics will include physiological ecology, population ecology, competition, predator-prey systems, mutualism, succession, energy and nutrient dynamics, and the ecology of communities, ecosystems and the biosphere. We also will explore the influence of humans on natural systems. Students will use theoretical models and primary literature to supplement the text, lectures and discussions. Co-enrollment in BIOL 229 is highly recommended. This counts as an upper-level lecture in environmental biology. Prerequisite: BIOL 115 or equivalent or permission of instructor.

Instructor: Kerkhoff

BIOL 229 Ecology Laboratory
Credit: 0.25

This course examines techniques for studying ecological principles in the field and laboratory, with primary emphasis on terrestrial systems. Students will learn experimental design, sampling protocols and quantitative methods including spatial analysis with geographic information systems. Topics may include limits to distribution, interactions with the physical environment, population dynamics, species interactions, carbon sequestration and biodiversity. Studies will include physically demanding fieldwork in local

habitats in varying weather conditions. Prerequisite: BIOL 109Y-110Y and 115 or permission of instructor. Prerequisite or corequisite: BIOL 228.

Instructor: Kerkhoff

BIOL 233 Plant Biology
Credit: 0.5

This course is an introduction to plant life strategies and plant evolutionary principles that have produced present day plant biodiversity. The focus is reproductive but also includes the chemical foundation for survival interactions with other species. Student projects will examine the threats to plant biodiversity and the repercussions for humanity. Learning goals include understanding the underlying principles of plant evolution, plant reproduction, and plant survival strategies. For every biological scientist, you will gain experience in alternative life strategies to those found in animals that will benefit you in developing out-of-the-box thinking and analysis of biological questions. This counts as an upper-level lecture in organismal biology/physiology. Prerequisite: BIOL 109Y-110Y or permission of instructor.

BIOL 238 Microbiology
Credit: 0.5

Microbes inhabit the most extreme environments on earth, ranging from superheated sulfur vents on the ocean floor to alkaline soda lakes. In medicine, newly discovered bacteria and viruses cause a surprising range of diseases, including heart disease; they may even hold the key to human aging. Yet other species live symbiotically with us, keeping us healthy, and even regulate our brain. Still other microbes, such as nitrogen fixers, are essential to the entire biosphere. This course covers microbial cell structure and metabolism, genetics, nutrition, microbial communities in ecosystems, and the role of microbes in human health and disease. This counts as an upper-level lecture in organismal biology/physiology or in cellular/molecular Prerequisite: BIOL 116.

Instructor: Slonczewski

BIOL 239 Experimental Microbiology
Credit: 0.25

We learn the classic techniques of studying bacteria, protists and viruses in medical science and in ecology. We practice microbial culture and examine life cycles, cell structure and metabolism and genetics. High-throughput methods of analysis are performed, such as use of the microplate UV-VIS spectrophotometer and whole-genome sequencing. For the final project, each student surveys the microbial community of a particular habitat, using DNA analysis and biochemical methods to identify microbial isolates. Prerequisite: BIOL 109Y-110Y or a chemistry lab course. Prerequisite or corequisite: BIOL 238.

Instructor: Slonczewski

BIOL 241 Evolution
Credit: 0.5

Evolution is the major unifying theory of biology; the unity of fundamental processes, species diversity and adaptive characteristics of organisms are consequences of evolution and can be fully understood only in this light. Evolutionary processes also have major impacts on humans. This course introduces the processes of evolution, most of which can be examined in contemporary time through experiment, theory and simulation, and by examining pattern in nature. The class format will combine lecture and discussion. Topics will include basic Darwinian arguments, modern population genetics, adaptation, speciation, reconstructing phylogenetic history, macroevolution and the consequences of evolution for conservation and human health. Examples will be drawn from all levels of biology, from molecular to ecological studies. Students will read and discuss original literature, utilize computer simulations and prepare a final paper and presentation. This counts as an upper-level lecture in environmental biology. Prerequisite: BIOL 116 or permission of instructor.

Instructor: Wright, Mauck

BIOL 243 Animal Physiology
Credit: 0.5

Animal physiology examines the processes of animal cells, tissues and organ systems. In this class, we will seek to understand how physiological processes relate to the survival of an animal in its environment. We will use three primary approaches: (1) comparative, contrasting animals that live in different environments; (2) environmental, exploring how animals survive in challenging environments; and (3) structure-function, examining how the anatomy of a system relates to its function. Each of the primary animal organ systems (nerve, muscle, cardiovascular, respiratory, gastrointestinal, renal and excretory) will be covered in detail. Readings from the primary research literature will be assigned. This counts as an upper-level lecture in organismal biology/physiology. Prerequisite: BIOL 115 or equivalent or permission of instructor.

BIOL 244 Experimental Animal Physiology
Credit: 0.25

This laboratory class explores the techniques, equipment and experimental designs common to animal physiology. Topics may include muscle physiology, cardiac physiology, salt and water balance, metabolism, and exercise physiology. A variety of experimental techniques will be used. Students will participate in experimental design, perform experiments and present results in oral and written form. Students also will read and analyze relevant papers from the primary literature. Prerequisite: BIOL 109Y-110Y. Prerequisite or corequisite: BIOL 243.

Instructor: C. Gillen

BIOL 245 Environmental Plant Physiology
Credit: 0.5

Plants, like all life forms, survive in communities with a diversity of organisms and in a changing and demanding environment. Plant life benefits from and is challenged by relationships with other species and by the environment. Plants have evolved a fundamentally different pattern of living from organisms of other kingdoms; the physiological strategies that have evolved to meet the challenges of a predominantly stationary life that relies on resources of the immediate environment are marvelous, intriguing and enlightening. Our focus is on the structural and physiological processes that manage the intersections with the environment and with other organisms. The subject is presented through examination of fundamental concepts in plant physiology and current literature. This counts as an upper-level lecture in organismal biology/physiology. Prerequisite: BIOL 115 or equivalent. May be offered in alternating years.

Instructor: Bickford

BIOL 246 Environmental Plant Physiology Lab
Credit: 0.25

This course will examine techniques for investigating plant physiological responses to environmental stimuli in both laboratory and field settings. Students will learn to use instrumentation to measure processes related to CO2 acquisition and loss (photosynthetic CO2 assimilation, electron transport and respiration) and plant water status (water potential). Using these methods and an experimental approach, we will explore topics such as plant resource-use physiology, environmental impacts on leaf physiology and resource impacts on growth and allocation. These topics and processes will be examined in the context of natural and agroecosystem responses to climate change. During the semester, students will become familiar with the primary literature in the field, design and conduct experiments and communicate their results in written and oral form. Prerequisite: BIOL 109Y-110Y or permission of instructor. Prerequisite or corequisite: BIOL 245.

Instructor: Bickford

BIOL 253 Paleobiology
Credit: 0.5

This course examines the use of fossils as tools for interpreting Earth's ancient oceans and the life they once supported. Methods for inferring physical and chemical aspects of marine settings (e.g., oxygen levels, salinity variation) and the use of major marine fossil taxa as past analogues of modern organisms, will allow for the reconstruction of paleoenvironments. We will explore techniques used to infer how organisms functioned within their life environments and how they interacted with other life forms, and we will survey major events in the history of Earth's oceans and marine biota, including some significant fossil locations (i.e., Lagerstätten), as a means of introducing major ecological principles. Laboratories and exercises involving fossil specimens will constitute a significant portion of the final grade, and at least one field trip will be required. This counts

as an upper-level lecture in environmental biology. Prerequisite: BIOL 116 or permission of instructor.

BIOL 255 Genetic Analysis
Credit: 0.5

This course introduces both principles and experimental approaches related to heredity in a wide variety of organisms from bacteria to humans. Topics will include classical transmission genetics, chromosomal structure, extranuclear heredity, epigenetics, population and evolutionary genetics and molecular analysis of genes and chromosomes. As genetic analysis can be used to dissect many biological processes, we also will address how geneticists approach problems and advance scientific understanding, focusing our discussions around primary literature. This counts as an upper-level in cellular/molecular biology. Prerequisite: BIOL 116. May be offered in alternating years.

Instructor: Hicks

BIOL 256 Experimental Genetic Analysis
Credit: 0.25

This laboratory course introduces both genetic concepts and genetic approaches commonly used to understand biological processes, including both forward and reverse genetic approaches. We will primarily use the model plant Physcomitrella patens as our experimental organism, although the techniques used in this course can be applied to any organism amenable to genetic analysis. Prerequisite: BIOL 109Y-110Y and 116. Prerequisite or corequisite: BIOL 255.

BIOL 261 Animal Behavior
Credit: 0.5

The evolution and ecology of animal behavior is explored in detail. The diversity of behavior and the ecological consequences of behavior will be studied, with emphasis on how research programs are designed to answer questions. We investigate animal behavior from both proximate and ultimate perspectives across a broad range of behavioral phenomena. Outside of class, each student chooses an animal around which to build a semester-long investigation of animal behavior that emphasizes original observation and data collection. This counts as an upper-level lecture in environmental biology. Prerequisite: BIOL 115 or 116 or permission of instructor.

Instructor: Mauck

BIOL 262 Experimental Animal Behavior
Credit: 0.25

This laboratory applies the principles of experimental design and inference to the study of animal behavior. There will be both laboratory and field components. Students should be aware that animals do not always "behave" in discrete, three-hour time periods, and that

some work may have to be arranged outside of the regularly assigned class period. Prerequisite: BIOL 109Y-110Y. Prerequisite or corequisite: BIOL 261.

Instructor: Mauck

BIOL 263 Molecular Biology
Credit: 0.5

The molecular and genomic basis of life is at the heart of modern biology. In BIOL 263, we will learn techniques and explore research questions at the forefront of molecular research, focusing on the mechanisms by which the information of the genome is expressed to form the functional molecules of living cells and organisms. The processes of DNA replication, recombination and repair, transcription, and translation are discussed in the context of current research, frequently using primary literature. The function of genes and the regulation and measurement of gene expression are treated in depth. Students analyze and publish interactive tutorials on the structure and function of macromolecules. This intermediate course presumes a strong background in the basics of protein structure/function, central dogma processes, fundamental molecular techniques for manipulating nucleic acids and proteins and general chemistry. Note: For further study of the function of proteins, membranes and cellular processes, the complementary course BIOL 266 is recommended. This counts as an upper-level lecture in cellular/molecular biology. Prerequisite: BIOL 116 and CHEM 122 and 123 or CHEM 124 and 126. Recommended prerequisite or corequisite: CHEM 231 and 232.

Instructor: Powell, Smith

BIOL 264 Gene Manipulation
Credit: 0.25

This course teaches advanced methods of gene isolation, manipulation and characterization. An assortment of the following techniques will be covered: the isolation of DNA and RNA from tissues and cells; recombinant DNA technique; expression of genes in heterologous systems; the polymerase chain reaction (PCR); measurement of gene expression, and bioinformatics and sequence analysis. Prerequisite: BIOL 109Y-110Y and either CHEM 122 and 123 or CHEM 124 and 126. Corequisite: BIOL 263 or permission of instructor.

Instructor: Powell, Smith

BIOL 266 Cell Biology
Credit: 0.5

This course is designed to introduce the student to the wide variety of questions being asked by researchers in this exciting field and the approaches they are taking to answer these questions. This course complements BIOL 263 in content, concentrating on the nongenomic aspects of the cell. We will cover topics such as biological membranes and ion channels, cell organelles and their function, cell regulation, and intercellular and intracellular communication. This counts as an upper-level lecture in cellular/molecular

biology. Prerequisite: BIOL 116. Prerequisite or corequisite: CHEM 121 or 122. May be offered in alternating years.

Instructor: Itagaki

BIOL 267 Experimental Cell Biology
Credit: 0.25

This laboratory course is designed to complement BIOL 266. The topics covered in the laboratory will expose the student to some of the standard techniques used in modern cell biology. The laboratories also will illustrate some of the fundamental ideas of the field. Instead of covering a wide variety of techniques and preparations superficially, we will concentrate on a select few, covering them in greater depth. Some topics that will be covered are protein separation, cell permeability and cell motility. Prerequisite: BIOL 109Y-110Y. Prerequisite or corequisite: BIOL 266. May be offered in alternating years.

Instructor: Itagaki

BIOL 311 Seminar in Restoration Ecology
Credit: 0.5

This course will examine the ecological theory and practice of restoration ecology through lectures, class discussion, field trips and a class project on restoration design. The science of ecosystem restoration has grown dramatically over the past decades, emerging as an active subdiscipline of biology. The challenges of restoration are many, and include our incomplete understanding of the complexity of ecosystems and the limits this places on our ability to predict ecosystem response to restoration efforts. Restoration ecology spans a range of activities and scales, ranging from the systematic, long-term restoration of major ecosystems such as the Everglades or the Colorado River watershed, to small-scale restoration projects such as the prairie and wetland restoration projects at Kenyon's Brown Family Environmental Center. This class we will focus on the causes of ecosystem degradation, methods to quantify ecosystem response, the application of concepts such as ecological integrity, ecosystem resilience and alternative stable states. This counts as an upper-level lecture in environmental biology. Prerequisite: BIOL 115 and a 200-level Biology course or permission of instructor.

BIOL 315 Cell Signaling
Credit: 0.5

Cell signaling, a molecular choreography, allows cells to respond to changes in their internal and external environment. This vast and exciting field of study underpins one of the pillars of life, the ability of organisms to sense and respond to changing conditions. This class introduces students to the major players in signal transduction and how they coordinate to mount an effective cellular response, with a focus on techniques used to study pathways. Examples of particular pathways examined may include chemotaxis in bacteria, mating response in yeast, energy homeostasis in animals, and phototropism in plants. Students are expected to actively participate in class discussions of assigned

readings and critically evaluate primary literature. As a final project, students teach their peers about a pathway of interest to the student. BIOL 263 is helpful but not required. This counts as an upper-level lecture in cellular/molecular biology. Prerequisite: CHEM 121 or equivalent, BIOL 116, any 200-level biology course and junior or senior standing when enrolled.

Instructor: K. Gillen