Fall 2020 Course Descriptions as of 03/30/2020 08:12 PM

Information in Browse Course Catalog is subject to change. Information is term specific. Please refer to the appropriate term when searching for course content. Key to Course Descriptions may be found at: **http://rcs.registrar.arizona.edu/course_descriptions_key**.

Molecular & Cellular Biology (MCB)

MCB 101: Biotechnology Techniques (3 units)
Description: MCB 101 is a three-unit course for students with an emphasize in biotechnology including career in biotechnology, history and applications of recombinant DNA technology and the human genome project, and laboratory safety practices. Students are introduced to a variety of techniques used in biotechnology and molecular biology using the equipment necessary in a research or industrial setting. Students are expected to develop skills in DNA and Protein Gel Electrophoresis, Microbiology, PCR, Pipetting, Solution Preparation, Serial Dilutions, Standard Curve, and Spectrophotometry.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Spring
Community Campus: Spring
Recommendations and additional information: Prerequisites: High school biology and/or chemistry or teacher approval. An understanding of basic biology and chemistry as well as scientific practices in student background is preferred.

MCB 102: Biotechnology Research (3 units)
Description: MCB 102 is a three-unit course for students with an emphasize in human genetics and biotechnology including career exploration, history and applications of recombinant DNA technology, the human genome project, and laboratory safety practices. This course will allow students to perfect biotechnology techniques, learn to read research papers, and hear about cutting edge research at the University of Arizona. It includes advanced biotechnological techniques, fundamentals of cell biology and genetics, applications of biotechnology, bioethics, and careers in biotechnology. This course offers a unique opportunity to motivated high school students who possess a strong interest in pursuing advanced education in bioscience and biomedical science. Through laboratory activities and field-based research, students will conduct independent research in an active laboratory, and learn to communicate. The novel scientific research will be presented at the Southern Arizona Region Science Fair (SARSEF). This course is a continuation of Biotechnology Techniques.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Spring
Community Campus: Spring
Recommendations and additional information: Prerequisites: MCB 101. An understanding of general biotechnology techniques as well as scientific practices related to these techniques.

MCB 103: KEYS Research (3 units)
Description: This is a three-unit course for students with an interest in biotechnology, toxicology, genetics, and bioengineering. The course offers a unique summer opportunity to motivated high school students who possess a strong interest in pursuing advanced education in bioscience, biomedical science, or engineering. Through research opportunities, students attend a weeklong, hands-on institute, perform independent research in an active laboratory, and learn science communication through weekly workshops with the other KEYS students and personnel.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Summer
Community Campus: Summer
Recommendations and additional information: High school biology and/or chemistry. Course entrance is based on competitive selection process and up to instructor discretion.

MCB 170C1: Evolution of Modern Biology (3 units)
Description: This course is designed to introduce students to concepts in modern biology, with an emphasis on the processes that created the current status of life on earth. Students should leave the course with the understanding of the relationship between DNA, RNA, proteins, genes the phenotypes. They will be introduced to basic metabolism, and the kinds of regulatory networks that control our cells. Students also will look at the ways that different types of reproductive strategies are utilized by populations of organisms. Finally, we will talk about the ways that humans are changing the rules-the impact of recombinant DNA technology on present and future human life.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Discussion May Be Offered
Lecture Required
Equivalent to: ANTH 170C1, ENTO 170C1, GEOS 170C1
Course typically offered:
Main Campus: Fall, Spring

Enrollment requirement: Enrollment not allowed if you have previously taken NATS 104 "Animal Sexual Behavior" (Top 1), "Human Var In Mod World" (Top 4), "Life on Earth' (Top 5) or 'Views of Life" (Top 8) or ANTH 170C1, ENTO 170C1, or GEOS 170C1.
General Education: NATS 104

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 175: Cancer Basics (3 units)
Description: This is a course designed to introduce students to the biology of cancer. The course will provide an introduction to molecular and cellular biology, cover the basic models of cancer and the clinical aspects of cancer diagnosis and treatment, including a brief description of current therapies.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Summer

MCB 181L: Introductory Biology Laboratory I (1 unit)
Description: Laboratory exercises presenting techniques and fundamental principles of modern biology. Designed to complement the information concurrently presented in 181R.
Grading basis: Regular Grades
Career: Undergraduate
Flat Fee: $47
Course Components: Laboratory Required
Lecture May Be Offered
Equivalent to: BIOC 181L, ECOL 181L, MCB 181M, MIC 181L
Course typically offered:
Main Campus: Fall
Online Campus: Fall

Recommendations and additional information: Prerequisite or concurrent registration, MCB 181R.
Shared Unique Number: SUN# BIO 1181

MCB 181M: Advanced Introductory Biology Laboratory I (2 units)
Description: Laboratory exercises exploring principles of biology and scientific thinking. Designed to complement the information concurrently presented in 181R. Greater depth and individual challenge than MCB181L.
Grading basis: Regular Grades
Career: Undergraduate
Flat Fee: $35
Course Components: Laboratory Required
Equivalent to: BIOC 181L, ECOL 181L, MCB 181L, MIC 181L
Recommendations and additional information: Prerequisite or concurrent registration, MCB 181R. Credit for only one MCB 181M, MCB 184 or MCB 181L.

MCB 181R: Introductory Biology I (3 units)
Description: Introduction to biology covers fundamental principles in molecular and cellular biology and basic genetics. Emphasis is placed on biological function at the molecular level, with a focus on the structure and regulation of genes, the structure and synthesis of proteins, how these molecules are integrated into cells, and how these cells are integrated into multicellular systems. Examples stem from current research in bacteria, plants, and animals (including humans) in the areas of cell biology, genetics, molecular medicine and immunology.
Grading basis: Regular Grades
Career: Undergraduate

Course Components:	Discussion	May Be Offered
	Lecture	Required

Equivalent to: BIOC 181R, ECOL 181R, MCB 184, MIC 181R
Course typically offered:
Main Campus: Fall, Spring, Summer
Online Campus: Fall, Spring, Summer

Enrollment requirement: PPL 40+ or SAT I MSS 550+ or ACT MATH 23+ or one course from Math 108, 112, 113, 119A, 120R, or higher(If higher Math taken contact department for assistance with registration). Test scores expire after 2 years.
Shared Unique Number: SUN# BIO 1181

MCB 184: Introductory Biology I: The Secrets of Life (4 - 5 units)
Description: Integrated lecture and laboratory course. Focus is on how cellular machines & components work and why they work that way. Specific topics include the scientific approach, the nature of the molecular world and the structure and function of key players (DNA, hemoglobin, the translation machinery, enzymes), control and operation of genes and proteins, copying, `reading' and distribution of the genetic material, communication within the cell and with the cell's environment, molecules, diseases and medicine, capture, storage and release of energy. Course features a required 4th weekly meeting time for discussion/problem solving/exam prep.
Grading basis: Regular Grades
Career: Undergraduate
Flat Fee: $35

Course Components:	Discussion	Required
	Laboratory	Required
	Lecture	Required

Equivalent to: BIOC 181R, ECOL 181R, MCB 181R, MIC 181R
Enrollment requirement: PPL 40+ or SAT I MSS 550+ or ACT MATH 23+ or one course from Math 108, 112, 113, 119A, 120R, or higher(If higher Math taken contact department for assistance with registration). Test scores expire after 2 years.

MCB 195A: Molecular and Evolutionary Biology of Star Trek (1 unit)
Description: Science, engineering and science fiction intertwine in our society in many unique and surprising ways. As just one example, the science fiction stories of Jules Verne from the latter half of the 19th century inspired active (though at the time, underfunded and sometimes amateur) scientific research into aeronautics and astronautics. These technological developments nevertheless led to the advent of human air- and spaceflight many decades later. The various series of Star Trek have played a similarly pivotal role in articulating popular concepts of `life in the universe¿; some of these basic ideas continue to frame the way in which biology, chemistry, planetary geology and astronomy research is conducted today. In this course we will use plots and ideas about life in the universe, as explored in episodes of Star Trek series, as starting points for discussing contemporary topics in biology, evolution and genetics. For each seminar, participants will view a selected episode and conduct assigned reading on a scientific topic described in that episode. Seminar participation is gauged by the assimilation, dissection and critical discussion of the valid scientific concepts covered by each seminar topic, not by knowledge of Star Trek series character or production minutiae. Seminar attendees need not be previously familiar with Star Trek to productively participate in this course.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall, Spring

Field trip: None
Enrollment requirement: MCB Freshman in the MCB major only.
Freshman Colloquia: Freshman Colloquia

MCB 195B: Genomic Medicine Colloquium (1 unit)
Description: Students will explore the impacts of genomics on medicine, learn how to succeed in university-level biology courses, and explore career opportunities related to molecular biology and genomics. This is a first-year colloquium course. Topics will include big data biology, precision cancer treatment, personalized genomics, and ethics.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Molecular & Cellular Biology Major
Enrollment requirement: Must be an MCB Major Freshman
Freshman Colloquia: Freshman Colloquia

MCB 195C: Introduction to Research in Molecular and Cellular Biology (1 unit)
Description: This is a 1-unit course designed for freshmanMolecular and Cellular Biology (MCB) majors to introduce students to MCB and preparethem for engaging in biological research.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall, Spring

Field trip: None
Enrollment requirement: MCB freshman majors ONLY.
Freshman Colloquia: Freshman Colloquia

MCB 195D: Teaching and Learning in MCB (1 unit)
Description: Students will investigate the process of learning, drawing from examples of learning topics in molecular and cellular biology. This introduction will provide student with tools they will need to succeed in university-level biology courses. In addition, students will explore career opportunities for teaching and communicating science that are available to people with degrees in molecular and cellular biology. This is a first-year colloquium course.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Molecular & Cellular Biology Major
Enrollment requirement: MCB Major freshman only
Freshman Colloquia: Freshman Colloquia

MCB 195G: The Molecular Biology of Food (1 unit)
Description: his course is intended to teach students about how food is produced, how we obtain the nutrients we need, and how technology via molecular biology underlies studies of nutrition and can transform how we will grow food in the future. Students will also explore the basics of cell and molecular biology, learn how to succeed in university-level biology courses, and explore career opportunities available to people with degrees in molecular and cellular biology. This is a first-year colloquium course.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Spring

Recommendations and additional information: Molecular & Cellular Biology Major
Enrollment requirement: MCB Major freshman only
Freshman Colloquia: Freshman Colloquia

MCB 195I: What is MCB? (1 unit)
Description: What is Molecular and Cellular Biology is a one-unit colloquium course where students will explore the basics of cell and molecular biology, learn how to succeed in university-level biology courses, and explore career opportunities available to people with degrees in molecular and cellular biology.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Molecular & Cellular Biology Major
Enrollment requirement: MCB Major freshman only
Freshman Colloquia: Freshman Colloquia

MCB 195J: Biological Scientist's Approaches to Identify and Solve Big Problems (1 unit)
Description: In this freshman colloquium, molecular and cellular biology students will have the opportunity to think about Big Problems with biological connections facing society then work in groups to use imagination and scientific thinking to propose solutions. Students will learn to identify problems, research information on the topic, propose solutions, and communicate their ideas to their peers.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Spring

Field trip: None
Enrollment requirement: MCB Major freshman only
Freshman Colloquia: Freshman Colloquia

MCB 195K: Unusual Brains Colloquium (1 unit)
Description: In this colloquim, we will explore some of the cellular and molecular mechanisms behind the differences in how our brains work. At the same time, we will listen to the voices of people whose brains work differently. These readings and discussions will be interspersed with tips on how to succeed in university-level biology courses, and explore career opportunities available to people with degrees in molecular and cellular biology. This is a first-year colloquium course.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall, Spring

Field trip: None
Enrollment requirement: Must be an MCB Major Freshman.
Freshman Colloquia: Freshman Colloquia

MCB 199: Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 11 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 199H: Honors Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Enrollment requirement: Student must be active in the Honors College.
Honors Course: Honors Course
Honors Course: Honors Course

MCB 239: Introduction to Precision Medicine (3 units)
Description: This course will outline examples of new precision-medicine practices that provide diagnosis of health disorders and targeted therapies for the treatment of these disorders. The topics covered will include "-omics" approaches to predict health and diagnose disorders; developing targeted therapies to cure disease; uses and limitations of gene therapy for treatment of disease; and the potential uses of stem-cell therapies.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Two courses from Tier One-Natural Sciences. Students should have completed a Tier One biology course (MCB 170C or 170C in another department) OR MCB 181R.
General Education: Tier 2 Natural Sciences
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 261: Cell Connection - Exploring the Mysteries of Life (3 units)
Description: This is a non-majors course designed to foster an understanding of the biology that shows up each day in newspapers, magazines and the internet for students not seeking a science degree. We will cover the science behind life-altering subjects such as cancer, heart disease, and infectious diseases. We will discuss developing trends and their ethical impact in biotechnology, gene therapy and genomics that impact our daily lives. This course will build on NATS 104.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Summer

General Education: Tier 2 Natural Sciences
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 285L: Principles of Microbiology Laboratory (1 unit)
Description: The course is the laboratory course to accompany MIC 285R.
Grading basis: Regular Grades
Career: Undergraduate
Flat Fee: $40
Course Components: Laboratory Required
Equivalent to: MCB 285L, PLP 285L, SWES 285L, VSC 285L
Also offered as: ACBS 285L, ENVS 285L, MIC 285L, PLP 285L
Course typically offered:
Main Campus: Spring

Recommendations and additional information: MCB 181R, MCB 181L, ECOL 182R, ECOL 182L, CHEM 103A, CHEM 103B, CHEM 104A, CHEM 104B. Concurrent registration, MIC 285R for MIC and V SC majors. Strongly recommended: MIC 285L, MIC 285R be taken together by all others.
Home department: Veterinary Science & Microbiology

MCB 285R: Principles of Microbiology (4 units)
Description: The course is an introductory microbiology class for majors, emphasizing cellular, biochemical and molecular aspects of metabolism, genetics, cell structure, and host-parasite interactions
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: MCB 285R, PLP 285R, SWES 285R, VSC 285R
Also offered as: ACBS 285R, ENVS 285R, MIC 285R, PLP 285R
Course typically offered:
Main Campus: Spring

Recommendations and additional information: MCB 181R, MCB 181L, ECOL 182R, ECOL 182L, CHEM 103A, CHEM 103B, CHEM 104A, CHEM 104B. Concurrent registration, MIC 285R for MIC and V SC majors. Strongly recommended MIC 285L, MIC 285R be taken together by all others.
Home department: Veterinary Science & Microbiology

MCB 295A: Immunotherapy Colloquium (1 unit)
Description: Students will explore the current state of the art in immuno-oncology: the therapeutic approach designed to activate a patient's own immune system against cancer. This approach has recently garnered significant excitement as previously incurable cancers are seeing remarkable remissions. The course will provide a brief overview of cancer and the immune system, with a focus on the novel treatments of checkpoint inhibitors, and chimeric antigen receptor transgenic therapies.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Molecular & Cellular Biology Major. This is a second-year colloquium course and requires the students to have either completed or to be concurrently enrolled in introductory biology.
Enrollment requirement: MCB majors only

MCB 295B: Seeing Is Believing: Imaging Modalities in Molecular and Cellular Biology Colloquium (1 unit)
Description: Students will explore current research and career opportunities in molecular and cellular biology. The focus of this colloquium is on key and recent discoveries as well as scientific insights into cell and molecular biology that were made using imaging approaches such as microscopy. This course is appropriate for students who have recently added or are interested in adding a molecular and cellular biology major. This is a second-year colloquium course that will highlight the interdisciplinarity and applicability of cell and molecular biology concepts in a wide range of careers.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Spring

Enrollment requirement: MCB majors only

MCB 295C: Cell Signaling in Cancer, Aging, and Depression (1 unit)
Description: 25 years ago, Mike Hall and colleagues discovered a novel kinase they named the Target of Rapamycin (TOR or mTOR). This kinase is now known to act as the master regulator of cell growth and metabolism in eukaryotes. Accordingly, defects in TOR function underlie many diseases including cancer, clinical depression, and diabetes. In this class students will learn about modern research in molecular and systems biology by walking through the major discoveries in the TOR signaling field--starting with basic research in yeast and moving to the study of disease and aging in humans. Each class period will focus on a new discovery and the experimental method(s) that were used to make that discovery. Students will practice interpreting real experimental data during class sessions and read and summarize a new paper in the TOR field for their final project.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Spring

Enrollment requirement: MCB Majors Only

MCB 295D: Stem Cells and Human Health (1 unit)
Description: The course will guide students to explore the current state of the art in stem cell biology and medicine. It will provide a brief overview of stem cells, with a focus on their clinical potentials in revolutionary treatments of cancer, aging, Alzheimer's, amyotrophic lateral sclerosis, autism, and other human health issues, as well as risks and ethical challenges. This course is a second-year colloquium and requires the students to either have completed or be concurrently enrolled in introductory biology.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Spring

Field trip: None.
Enrollment requirement: MCB majors only
Freshman Colloquia: Freshman Colloquia

MCB 295G: Life in the Universe (1 unit)
Description: Students will explore the study of life in the Universe: also known as Astrobiology. The course will provide a brief overview of the ways the physiological limits of life on Earth have been considered to predict the potential for life to exist elsewhere in the Universe. We will explore key research from Astrobiologists investigating extant or extinct life and biosignatures from extreme environments. By conducting planetary field analogue studies, or by subjecting terrestrial samples to simulated space or planetary environments Astrobiologists are exploring the limits of life as we know it.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Colloquium Required
Course typically offered:
Main Campus: Fall, Spring

Field trip: None.
Enrollment requirement: MCB Major Only, MCB 181R concurrent or completed.
Freshman Colloquia: Freshman Colloquia

MCB 296B: Seminar in Bioinformatics (1 unit)
Description: This seminar course provides an overview of and introduction to the field of bioinformatics. Talks by faculty who do research in bioinformatics and computational biology, as well as by scientists from the biotechnology industry, give a sense of the current directions in the field.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 2 times.
Also offered as: CSC 296B, ECOL 296B
Course typically offered:
Main Campus: Fall

Home department: Ecology & Evolutionary Biology

MCB 297A: Undergraduate Lab Preceptor (3 units)
Description: Undergraduate preceptors will work as a team with graduate assistants and course staff to teach students in Biology 181 labs. They will learn learner-centered teaching techniques, web page design, effective communication skills, and how to organize and execute a lesson plan.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Workshop Required
Repeatable: Course can be repeated a maximum of 3 times.
Equivalent to: ECOL 297A
Course typically offered:
Main Campus: Fall

MCB 299: Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 299H: Honors Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Enrollment requirement: Student must be active in the Honors College.
Honors Course: Honors Course
Honors Course: Honors Course

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 301: Molecular Basis of Life (4 - 5 units)
Description: The course encompasses foundational material for the study of Molecular and Cellular Biology. It will be one of three core courses required for the MCB major. The focus will be on the fundamental concepts governing the interaction of biological macromolecules required for the central dogma of molecular biology: DNA > RNA > protein. Topics to be covered: DNA structure, replication, RNA transcription, structure, modification, processing and turnover, protein translation and modification. Protein-protein and protein-nucleic acid interactions required for these processes will be explored in-depth.In addition to lectures, small group in-class activities will: 1) introduce concepts that are the basis of interaction in large molecular assemblies, 2) introduce molecular and cell biology concepts that put macromolecular assemblies in a biological context.
Grading basis: Regular Grades
Career: Undergraduate

Course Components:	Discussion	Required
	Lecture	Required
	Workshop	May Be Offered

Course typically offered:
Main Campus: Spring

Enrollment requirement: MCB majors only. One year General Chemistry (CHEM 151/152 or equivalent); one semester Organic Chemistry (CHEM 241A and 243A or equivalent); MCB 181R and 181L (or equivalent).

MCB 303: Explorations in Integrated Science (4 units)
Description: Students will learn to integrate knowledge and research approaches from multiple scientific disciplines through five laboratory- and lecture- based modules, including plant ecophysiology, gas exchange, soil and water chemistry, soil microbiology, and multi-scale modeling.
Grading basis: Regular Grades
Career: Undergraduate
Flat Fee: $150

Course Components:	Laboratory	May Be Offered
	Lecture	Required

Equivalent to: MATH 303, PHYS 303
Recommendations and additional information: MATH 122A & 122B, or MATH 125.
Writing Emphasis: Writing Emphasis Course

MCB 304: Molecular Genetics (4 - 5 units)
Description: This course will cover the foundations of genetics and genomics: 1) how cells and organisms transmit information to the next generation, 2) how the phenotypes of cells and organisms are connected to the information encoded within a DNA template, and 3) how DNA sequencing and recombinant DNA technology can be used to sequence and analyze the entire set of DNA in cells. In the first half of the course, the topics will include the mechanisms of genetic transmission, basis of traits, genome replication, and gene expression. The focus of the second half of the course will be to synthesize our understanding of these fundamental processes and to explore their application to the analysis of a wide range of biological phenomena.
Grading basis: Regular Grades
Career: Undergraduate

Course Components:	Discussion	May Be Offered
	Lecture	Required

Course typically offered:
Main Campus: Fall

Recommendations and additional information: MCB 181R, MCB 181L; CHEM 103A and CHEM 104A or CHEM 151; concurrent registration, CHEM 241A and CHEM 241B recommended. Credit for MCB 304 or MCB 411 or ECOL 320 only. Preference given to MCB majors.
Enrollment requirement: MCB 181R and MCB 181L; (CHEM 105A and CHEM 106A) or CHEM 151; (CHEM 105B and CHEM 106B) or CHEM 152. Major: MCB, SCED, or BIOIN, or minor: MCB.

MCB 305: Cell and Developmental Biology (4 - 5 units)
Description: The structure and function of eukaryotic cells with a focus on relationships to developmental biology and experimental analysis. Concepts will be illustrated by demonstrating links to processes important for the development of multi-cellular organisms and disease progression.
Grading basis: Regular Grades
Career: Undergraduate

Course Components:	Discussion	May Be Offered
	Lecture	Required

Course typically offered:
Main Campus: Spring

Recommendations and additional information: MCB 181R, MCB 181L, ECOL 182R, ECOL 182L, CHEM 241B, CHEM 243B, MCB 304; MATH 124 or MATH 125. Credit for MCB 305 or MCB 410 but not both. Preference given to MCB majors.
Enrollment requirement: Major: MCB, BIOIN or SCED . Minor: MCB.

MCB 310: Improving Learning in Science Classrooms - How to Make it Stick (3 units)
Description: The field of learning sciences has revealed fascinating, and often unexpected, information about the process of learning. This course aims to guide students to investigate theories of learning and to help them begin to apply these concepts to their own learning. In the second half of the semester, we will investigate learning in social settings and discuss important factors to consider when supporting others' learning. Students will critically evaluate issues within educational systems that may positively or negatively influence learning. This course will be most applicable to students with a STEM major, as most of the discussion will focus on examples of learning topics in science and math. Many topics will focus on issues specific to learning in the sciences, including "math anxiety", "science identity", and "integrating scientific practices and concepts".
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Two courses from Tier One, Individuals & Societies.
General Education: Tier 2 Individuals & Societies
Honors Course: Honors Contract
Honors Course: Honors Contract
Writing Emphasis: Writing Emphasis Course

MCB 315: Quantitative Biology (3 units)
Description: This one-semester introductory course covers key principles of molecular and cellular biology, with an emphasis on contemporary quantitative approaches such as systems biology and genomic analysis. Topics to be covered include cellular growth control and cancer, the role of viruses in human disease, developmental biology, and stem cell research. It is intended both for students in the life sciences interested in quantitative methods and for students outside the life sciences with an intellectual curiosity about biological systems. The course will provide an integrated conceptual foundation in biology and develop critical thinking skills and quantitative problem-solving abilities. Students will be expected to work on group projects, on-line assignments, presentations, problem sets, and essay exams, and to participate in class discussions and group problem solving. Discussions will explore readings in current scientific literature.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Discussion Required
Lecture Required
Course typically offered:
Main Campus: Fall

Enrollment requirement: Appropriate Math Placement Level or Proctored/Prep for Calculus 75+, or MATH 120R, (MATH 110 TC OK and 111), (MATH 112 TC OK and 111), or (MATH 111 TC OK and MATH 112) or MATH 125.

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 325: The Biology of Cancer (3 - 4 units)
Description: This course is designed to help intermediate students understand the biology of cancer. The course will cover the disease of cancer from the aspects of molecular and cellular biology, as well as experimental models of cancer and drug development. Clinical aspects will be highlighted, including diagnosis, pathology and treatments, as well as ethics. Honors section available.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Discussion — May Be Offered
Lecture — Required
Equivalent to: MCB 195D
Course typically offered:
Main Campus: Fall

Enrollment requirement: MCB Majors Only. Must have completed MCB 181R.

MCB 330: Critical Reasoning and Problem Solving in Biomedicine (1 unit)
Description: Students will read and analyze primary scientific literature on a variety of topics in molecular and cellular biology that apply to biomedicine. Students will practice solving problems based on authentic experimental data.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Workshop — Required
Course typically offered:
Main Campus: Fall, Spring

Field trip: None
Enrollment requirement: MCB Major Only. MCB 181R.
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 340: Introduction to Biotechnology (3 units)
Description: Survey of both the basic concepts and techniques used in the analysis and improvement of biological organisms by genetic engineering and cell culture as well as examples of biotechnology improvements that have been made in various organisms. The course covers topics ranging from bioremediation to Cancer Stem Cells.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: MCB 340, MIC 340
Also offered as: MIC 340, PLS 340
Course typically offered:
Main Campus: Fall

Recommendations and additional information: PLS 240 or MCB 181R or MIC 205 or an introductory course in biology.
Home department: School of Plant Science

MCB 360: Plant Growth and Physiology (3 units)
Description: Survey of the fundamental concepts of plant physiology and how those concepts are supported by evidence from physiological, biochemical, biophysical, molecular and genomic experiments. The emphasis is on "whole plant" physiology and how plants work in the real world.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: MCB 360
Also offered as: PLS 360
Course typically offered:
Main Campus: Spring
Distance Campus: Spring

Recommendations and additional information: PLS 130 or PLS 240; MCB 181R and MCB 181L; CHEM 103A and CHEM 103B. CHEM 241A and CHEM 241B recommended.
Home department: School of Plant Science

MCB 361: Principles of Plant Physiology Laboratory (1 unit)
Description: Laboratory exercises in plant physiology.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Laboratory Required
Repeatable: Course can be repeated a maximum of 2 times.
Equivalent to: MCB 361
Also offered as: PLS 361
Course typically offered:
Main Campus: Spring

Recommendations and additional information: Prerequisite or concurrent registration, PLS 360.
Home department: School of Plant Science

MCB 391: Preceptorship (1 - 3 units)
Description: Specialized work on an individual basis, consisting of instruction and practice in actual service in a department, program, or discipline. Teaching formats may include seminars, in-depth studies, laboratory work and patient study.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated for a maximum of 9 units.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 391A: 181 Laboratory Preceptor (3 units)
Description: Undergraduate preceptors will work as a team with a graduate or undergraduate teaching assistant and course staff to teach students in Biology 181 labs. You will learn student-centered teaching techniques, effective communication skills, and how to organize and execute a lesson plan in order to work in the classroom assisting your peers.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 3 times.
Enrollment requirement: MCB 181R.

MCB 392: Directed Research (1 - 6 units)
Description: Individual of small group research under the guidance of faculty.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated for a maximum of 12 units.
Course typically offered:
Main Campus: Fall, Spring, Summer

Student Engagement Activity: Discovery
Student Engagement Competency: Innovation and Creativity

MCB 392A: Directed Research in Genetics and Human Health (1 - 6 units)
Description: Individual or small group research under the guidance of faculty in the field of genetics or human health. Qualified students working on an individual basis with professors who have agreed to supervise such work. Work will be in the area of genetics and human health.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 12 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 392B: Directed Research in MCB Education and Communication (1 - 6 units)
Description: Individual or small group research under the guidance of faculty in the field of molecular and cellular biology education and outreach. Qualified students working on an individual basis with professors who have agreed to supervise such work. Work will be in the area of MCB education or communication.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 12 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 392C: Directed Research in Systems and Big Data Biology (1 - 6 units)
Description: Individual or small group research under the guidance of faculty in the field of systems and big data biology. Qualified students working on an individual basis with professors who have agreed to supervise such work. Work will be in the area of systems and big data biology.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 12 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 396: Special Topics in Molecular and Cellular Biology (1 unit)
Description: Special topics seminar course for Juniors and Seniors. Course includes small group discussion, research, and presentations on a variety of molecular and cellular biology related special topics of interest. Current research, relevant issues, historical perspectives and guest speakers may be included. Sophomores may enroll with consent of the department.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 2 times.
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Junior or Senior status.

MCB 396A: Laboratory Practices in Cancer Research (1 unit)
Description: A seminar for students performing research in laboratories with Arizona Cancer Center faculty. Students meet as a class bi-weekly with a faculty member in 1.5-hour sessions to discuss their research projects, including detailed descriptions of associated techniques, and read and discuss scientific literature pertaining to their research. Students will make a formal presentation of their research project to the class at the end of the semester.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Seminar Required
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Concurrent registration, MCB 392 or MCB 492 or MCB 399H or MCB 499H. Students must be performing research in labs with Arizona Cancer Center.

MCB 396H: Molecular and Cellular Biology Honors Special Topics Seminar (1 unit)
Description: An Honors special topics seminar course for Honors Active Juniors and Seniors. Course includes small group discussion, research, and presentations on a variety of molecular and cellular biology related special topics of interest. Current research, relevant issues, historical perspectives and guest speakers may be included. Honors sophomores may enroll with consent of the department.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 2 times.
Course typically offered:
Main Campus: Fall, Spring

Enrollment requirement: Honors active Junior or Senior status.
Honors Course: Honors Course
Honors Course: Honors Course

MCB 396I: Career Exploration and Professional Development (1 unit)
Description: This course was developed to encourage students to study science, to prepare to enter the scientific workforce, and to take advantage of mentoring opportunities that will assist them to advance to positions of scientific leadership. The premise is that through developing a broad understanding of issues related to science and through professional development, students will gain access to information and to the formal and informal networks needed to progress to successful careers in science. Part of the course is devoted to interactions with those in science related fields who can share experiences and provide guidance.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Seminar Required
Equivalent to: GWS 396I
Course typically offered:
Main Campus: Fall

Student Engagement Activity: Professional Development
Student Engagement Competency: Professionalism
Success Course: Success Course

MCB 396J: Preparation for Prozkoumat!: International Research (2 units)
Description: This course will prepare students culturally and scientifically for a 10 week research experience at the Czech Academy of Sciences, Institute of Parasitology, in Ceske Budejovice, Czech during the summer. Students will learn about Czech history, explore current events in Czech, and prepare a science demonstration to do for precollege Czech students. Students will engage in activities designed to help them integrate into a different culture and appreciate different perspectives of people they encounter in the Czech Republic. They will contemplate how science is conducted in a democracy vs under communist rule (as a means of appreciating what the Czech's have accomplished since the fall of communism in 1989). They will also read relevant scientific literature and prepare a proposal for the research to be done abroad.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Discussion Required
Course typically offered:
Main Campus: Spring

Recommendations and additional information: Acceptance to Prozkoumat Summer Research Program

MCB 396K: Individual Development Planning for a Biomedical Career (1 unit)
Description: Through this course, students will develop a plan for reaching their educational goal in a biomedical sciences/health-related field. The process for developing the plan will be to define a career goal; assess individual strengths and weaknesses towards achieving that goal; make a record of the progress to date; and create the plan for moving forward. The expected learning outcomes are to: 1) practice the iterative process of writing a personal statement and revising it after getting feedback; 2) be able to research admission requirements for post-baccalaureate degree programs; 3) conduct a self-assessment with regards meeting admission requirements; 4) develop strategies for addressing challenges to meeting any requirements; and 5) know how to prepare a resume.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 3 times.
Course typically offered:
Main Campus: Fall

Success Course: Success Course

MCB 397A: Biology Outreach Development (1 unit)
Description: Students meet once a week for 2 hours to develop new "hands-on" biology themed demonstrations. These demonstrations will then be taken to local schools for presentation to classrooms, when requested. They will also be used in the spring semester SORT course by outreach groups visiting local schools.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Workshop Required
Repeatable: Course can be repeated a maximum of 4 times.
Course typically offered:
Main Campus: Fall, Spring

Field trip: None.

MCB 397C: STEM Outreach and Recruitment (1 unit)
Description: The purpose of the STEM Recruitment & Outreach (SORT) Team is to engage undergraduate students majoring in the life sciences in educational outreach by generating an interest in and promoting an understanding of the biological science topics among elementary school students, middle school students, high school students, fellow undergraduates, and the general public. In the area of recruitment (primarily the role of MCB Ambassadors) is to serve as representatives of the MCB department, and to assist current and potential future MCB students through related recruitment and outreach activities. This course will provide training in public speaking, outreach, and recruitment for participants.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Workshop Required
Repeatable: Course can be repeated a maximum of 4 times.
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Interested students must apply and be accepted.
Student Engagement Activity: Community Partnership
Student Engagement Competency: Civic and Community

MCB 399: Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Student Engagement Activity: Discovery
Student Engagement Competency: Innovation and Creativity

MCB 399H: Honors Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Enrollment requirement: Student must be active in the Honors College.
Honors Course: Honors Course
Honors Course: Honors Course

MCB 400: Computer Concepts and Perl Programming (3 units)
Description: Basic Perl programming with applications to biology and fundamental computer concepts that are necessary to efficiently utilize computers in biological research.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: BIOC 400, ECOL 400, GENE 400, PLS 400
Co-convened with: MCB 500
Course typically offered:
Main Campus: Fall

MCB 404: Bioethics (3 - 4 units)
Description: Advances in biomedical research will be reviewed and their ethical, social and legal implications discussed. Honors section available (Fall and Spring only).
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Discussion — May Be Offered
Lecture — Required
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: One year of college-level introductory biology; botany not acceptable.
Writing Emphasis: Writing Emphasis Course

MCB 407: Neurobiology (4 units)
Description: Cellular, molecular and developmental biology of nerve cells, synapses and neural systems.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Discussion — May Be Offered
Lecture — Required
Equivalent to: BIOC 407, NROS 307, NRSC 407, PSYC 407
Recommendations and additional information: MCB 410 or equivalent; MCB 181R, MCB 181L, MCB 182R and MCB 182L.

MCB 410: Cell Biology (3 - 4 units)
Description: The molecular basis of the structure and function of animal, plant and prokaryotic cells with emphasis on experimental analysis. Honors section available. Student with a prior failed attempt may only retake the course once.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Discussion — May Be Offered
Lecture — Required
Equivalent to: BIOC 410, MIC 410, MICR 410, NROS 310, PLS 410
Course typically offered:
Main Campus: Spring

Recommendations and additional information: MCB 181R, MCB 181L, MCB 182R, MCB 182L, MCB 462A or MCB 460; recommend MCB 320 and concurrent registration, MCB 411.
Enrollment requirement: Not an MCBBS or MCBBS2 major.

MCB 411: Molecular Biology (3 - 4 units)
Description: Mechanisms of genome replication, genetic recombination, DNA repair, gene expression and regulation. Honors section available. Student with a prior failed attempt may only retake the course once.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: BIOC 461
Course typically offered:
Main Campus: Fall

Recommendations and additional information: MCB 181R, MCB 181L, MCB 182; MCB 462A or BIOC 384 or BIOC 385. Students can obtain credit for only one of these courses: MCB 411, BIOC 461, or BIOC 466.
Enrollment requirement: Not an MCBBS or MCBBS2 major.

MCB 413: Why is Grass Green? Communicating Science to the Public (3 units)
Description: Learning to communicate to the public is challenging for scientists, as they try - and often fail - to frame scientific research and translate jargon into a narrative that catches the imagination of the general public. In this course, students will to learn to consider audience, format, and intent when accurately communicating complex biology concepts to non-specialists. Students will apply these skills to projects featuring hands-on experience communicating science to a variety of audiences. This class is appropriate for students who are considering communication- oriented scientific careers as well as those interested in improving the public's understanding of science through policy, writing, and/or social media.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Fall

Enrollment requirement: MCB 181R
Honors Course: Honors Contract
Honors Course: Honors Contract
Writing Emphasis: Writing Emphasis Course

MCB 414: Science and Theology (3 units)
Description: Exploration of the interface between science and theology to understand the obstacles to their rational integration.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Recommendations and additional information: MCB 404; open to science majors or others with consent of instructor.

MCB 416A: Bioinformatics and Functional Genomic Analysis (3 units)
Description: The course introduces computational and bioinformatics methods for the analysis of high-throughput experimental data in functional genomics, using the analysis of next-generation RNA-sequencing as a leading example. The course discusses related biological concepts and techniques, statistical methods and models, and provides hands-on experience with data analysis using R-based open-source software Bioconductor. The course prepares the students to perform independent analyses of genomic data in an interdisciplinary environment such as a research lab or pharmaceutical company.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: ABE 416A, BIOC 416A, ECOL 416A, GENE 416A
Co-convened with: MCB 516A
Course typically offered:
Main Campus: Spring (even years only)

Recommendations and additional information: Basic statistical knowledge and programming experience.

MCB 422: Problem Solving with Genetic Tools (3 units)
Description: Computer-simulated laboratory. Solving problems via genetic experiments in yeast and Mendelian genetic systems. Individual projects, assessed by regular written lab reports, require deduction and discovery of genotype, pathway, and genetic phenomena through crosses and phenotypic observation. In addition, a mutagenesis design assignment, oral presentation on a monogenic disease, and two literature reviews (on Cancer and Genome editing) will be assigned. Approximately 30 minute active lectures followed by solving of problems in class.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: ECOL 422
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: MCB 304, ECOL 320 or PLS 312.
Enrollment requirement: MCB Majors Only.
Honors Course: Honors Contract
Honors Course: Honors Contract
Writing Emphasis: Writing Emphasis Course

MCB 424L: Plant Biotechnology (2 units)
Description: This laboratory course is designed for science undergraduates as well as graduate students who are interested in strengthening their hands-on experience with the techniques involved in developing superior food, feed and fiber crops.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Laboratory Required
Also offered as: ENVS 424L, PLS 424L
Co-convened with: MCB 524L
Course typically offered:
Main Campus: Spring

Recommendations and additional information: PLS 340, 360
Home department: School of Plant Science

MCB 424R: Plant Biotechnology (3 units)
Description: This course is designed for science undergraduates as well as graduate students who are interested in strengthening their knowledge of the techniques involved in developing superior food, feed and fiber crops.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Also offered as: ENVS 424R, PLS 424R
Course typically offered:
Main Campus: Spring

Recommendations and additional information: PLS 340, 360
Home department: School of Plant Science

MCB 425: Cancer Discoveries (3 units)
Description: This is a course that is designed to help advanced students understand cancer genetics, cell biology, tissue microenvironment, metastasis and clinical therapeutics. Recent advances and their implications for the field will be emphasized.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Co-convened with: MCB 525
Course typically offered:
Main Campus: Spring

Enrollment requirement: MCB 325 or MCB 305(Concurrent Enrollment okay)

MCB 432: Comparative Immunology (3 units)
Description: How have vertebrate immune systems evolved from simple origins? We will cover comparative immunology of prokaryotes, protozoans, plants, fungi, invertebrates, and "lower" vertebrates. By studying the origins and evolution of immunity across the history of life, and following the progression of immune system complexity across different lineages, we begin to see patterns that help explain how our immune system developed from those of our ancestors. Such comparative study will highlight the strengths and weaknesses of our immune system, and point to ways in which other organisms have overcome the same pathogenic stresses we currently face. This class will pull together data from many fields, including immunology, molecular and cell biology, ecology, and evolution.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Also offered as: ACBS 432, ECOL 432, ENTO 432, MIC 432
Co-convened with: MCB 532
Course typically offered:
Main Campus: Fall

Home department: Entomology
Enrollment requirement: MCB 181R and MCB 181L, ECOL 182R and ECOL 182L, or instructor consent.

MCB 433: Medical and Molecular Virology (4 units)
Description: Structure, classification, replication, and mechanisms of pathogenesis of human and animal viruses.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: MCB 433, MIC 433
Also offered as: MIC 433
Course typically offered:
Main Campus: Spring

Recommendations and additional information: MIC 181R, MIC 181L, MIC 205A or consent of instructor.
Home department: Veterinary Science & Microbiology

MCB 435: Cellular and Molecular Machines (3 units)
Description: The objective of this course is for every student to understand the biochemical basis for the assembly and function of cellular and molecular machines, to understand the biological context within which they function, and to learn to use molecular graphics to understand, display and teach others about molecular and cellular machines at the atomic level. A few examples of molecular and cellular machines include polymerases, ribosomes, helicases, ATP synthase, myosin, kinesin, and dynein.Much of class time will be devoted to small group activities: 1) to solidify biochemistry concepts that are the basis of interaction in large molecular assemblies that move, 2) to solidify molecular and cell biology concepts that put molecular/cellular machines in a biological context, and 3) to learn to use molecular graphics software to enhance understanding of macromolecular machines at the atomic level.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Spring

Enrollment requirement: BIOC 181R and (BIOC 384 or BIOC 462A) and (MCB 304 or BIOC 466).

MCB 437: Life in Extreme Environments (3 units)
Description: Extreme environments are numerous and diverse on Earth. Despite harsh environmental conditions, microbes have been found thriving from the deepest seafloors to the highest mountains, from the coldest polar regions to the hottest and most arid deserts or steaming hot springs. Microbes survival in such extreme and varied conditions allows them to play fundamental roles in global nutrient cycling. The course will encompass foundational material for the study of life in extreme environments. In this course, we will examine microbial adaptations to their environment, how the adaptive responses affect microorganisms¿ evolution and how microorganisms modify their environment. We will consider physical extremes, such as temperature, radiation, pressure, and geochemical extremes (e.g., desiccation, salinity, pH, depletion of oxygen or extreme redox potential). We will also assess how the study of life in extreme environments can provides critical elements of answer to important questions such as: ``How did life appear on our planet?¿¿, ¿How microbes made Earth habitable?¿ and ``Could life exist beyond our planet?¿¿, and explore the impact of human activity on ecosystems. Additionally, we will explore the wide application potential of this area of research in the fields of medicine, biotechnology, chemical and pharmaceutical industry, or cosmetics.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Co-convened with: MCB 537
Course typically offered:
Main Campus: Fall, Spring

Field trip: None

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 440: Mechanisms in Plant Development (3 units)
Description: Focuses on the molecular genetic mechanisms of plant development using primarily the current model systems.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: ECOL 440, MCB 440
Also offered as: ECOL 440, PLS 440
Co-convened with: MCB 540
Course typically offered:
Main Campus: Fall

Recommendations and additional information: PLS 312 or ECOL 320. Recommend: BIOC 384, PLS 360 and MCB 304.
Home department: School of Plant Science
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 442: Human Genetics: Sex, Crime, and Disease (3 units)
Description: Human Genetics: Sex, Crime, and Disease is an advanced genetics course and an introduction to the exciting and rapidly evolving field of human genetics. Through lectures, readings and case studies, students will gain an in-depth understanding of the human genome, current issues in human heredity and genetic diseases, and research methods in human genetics. Students will explore the societal implication of topics such as the human genome project, DNA fingerprinting, genetic testing for disease risk, use of genetics in genealogy and forensics, and gene therapy. Students will also acquire or improve their critical reading skills of primary scientific literature.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Spring

Enrollment requirement: MCB 181R and MCB 304 or equivalent upper-division genetics course.
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 446: Insect Pathogens: Biocontrol Agents & Biological Models (4 units)
Description: Ecology and biology of insect pathogens (viruses, bacteria, protozoa, nematodes). Diagnostics, safety testing of pathogens. Genomics and genetic engineering of entomopathogens. Insect pathogens as biological model organisms. Applications in medical and veterinary research and pharmaceutical bioprospecting.
Grading basis: Regular Grades
Career: Undergraduate
Course Components:

Discussion	May Be Offered
Laboratory	May Be Offered
Lecture	Required

Repeatable: Course can be repeated a maximum of 2 times.
Equivalent to: INSC 446, MCB 446, MIC 446, PLP 446, VSC 446
Also offered as: ENTO 446, MIC 446, PLP 446
Course typically offered:
Main Campus: Spring

Recommendations and additional information: ENTO 411, ENTO 415L, ENTO 415R or consent of instructor.
Field trip: Field trip.
Home department: Entomology

MCB 447: Big Data in Molecular Biology and Biomedicine (3 units)
Description: Recent technological advances enable the collection of massive biological data sets, both in the research lab and in the medical clinic. These Big Data offer opportunities for discovering new biology, but they also demand new analysis approaches. This course will introduce students with a strong molecular biology background to the use of Big Data statistics. Students will learn how to visualize complex data, identify biologically relevant clusters, model relationships between variables, and classify entities. They will apply these techniques to a diverse range of biological Big Data, including electronic medical records, gene expression measurements, and human population genetic sequences. Students will learn through homework, in-class exercises, and a substantive final project.
Grading basis: Regular Grades
Career: Undergraduate
Course Components:

Lecture	Required

Course typically offered:
Main Campus: Fall

Field trip: none
Enrollment requirement: MCB 181R or equivalent; MATH 263, MCB 315, or equivalent; and MATH 122B or MATH 125.
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 448A: Plant Biochemistry and Metabolic Engineering (3 units)
Description: Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: BIOC 448A, CHEM 448A, ECOL 448A, MCB 448A
Also offered as: BIOC 448A, CHEM 448A, ECOL 448A, PLS 448A
Co-convened with: MCB 548A
Course typically offered:
Main Campus: Fall

Recommendations and additional information: CHEM 241A/B or CHEM 242A/B; BIOC 462A/B or BIOC 460 or consent of instructor.
Home department: School of Plant Science

MCB 449A: Plant Genetics and Genomics (3 units)
Description: A 3 unit lecture/discussion course that provides an advanced treatment of the current knowledge and experimental approaches used in genetic and genomic analysis, with emphasis on plants. Basic understanding of Mendelian genetics, gene and genome structure and function is required.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: ECOL 449A, GENE 449A, MCB 449A
Also offered as: ECOL 449A, GENE 449A, PLS 449A
Co-convened with: MCB 549A
Recommendations and additional information: PLS 312.
Home department: School of Plant Science

MCB 450: Advances in Molecular Medicine (3 units)
Description: Discussion of the molecular aspects of medical research frontiers and human diseases. This is a Writing Emphasis Course that requires written essays, web page design, and oral presentations
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Recommendations and additional information: MCB 181R, CHEM 241B; an advanced course in genetics, molecular, and cell biology.
Writing Emphasis: Writing Emphasis Course

MCB 455: Developmental Mechanisms (3 units)
Description: Molecular and cellular mechanisms of development, with emphasis on model systems.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Equivalent to: BIOC 455
Course typically offered:
Main Campus: Fall

Recommendations and additional information: MCB 181R, MCB 181L; an advanced course in genetics, molecular or cell biology.
Writing Emphasis: Writing Emphasis Course

MCB 470: The Cell and the Environment (3 units)
Description: The molecular and cellular responses to the environment.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Spring

Recommendations and additional information: MCB 410, and/or biochemistry.
Writing Emphasis: Writing Emphasis Course

MCB 473: Recombinant DNA Methods and Applications (4 units)
Description: This course offers an intensive lab experience to teach students the practical and theoretical aspects of modern molecular biology. In the first part of the course, recombinant DNA methods and bioinformatics are used to clone and identify an unknown gene. In the second part of the course DNA microarray technology is used to determine the effect of environmental stress on the global gene expression program in yeast, and to identify genes that control the stress response. Weekly lectures compliment the lab sessions, covering the theory and principles underlying the experiments performed during the course.
Grading basis: Regular Grades
Career: Undergraduate
Flat Fee: $150
Course Components: Discussion Required
Lecture Required
Equivalent to: BIOC 473, GENE 473, MIC 473, MICR 473, PLS 473
Co-convened with: MCB 573
Course typically offered:
Main Campus: Spring

Enrollment requirement: (MCB 181R and 181L) or MCB 184.
Writing Emphasis: Writing Emphasis Course

MCB 479: Art of Scientific Discovery (3 units)
Description: Techniques of posing questions and solving puzzles encountered in scientific research, with emphasis on life sciences and mathematics.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Repeatable: Course can be repeated a maximum of 2 times.
Equivalent to: ECOL 479, MCB 479
Also offered as: CMM 479, ECOL 479
Co-convened with: MCB 579
Course typically offered:
Main Campus: Fall

Home department: Cellular & Molecular Medicine

MCB 480: Introduction to Systems Biology (3 units)
Description: The proteins in a cell are organized into networks and circuits that act to process information and control cell activity. In this course we will explore the structure and function of these circuits through discussion of the relevant literature and by building and testing mathematical models of simple/toy circuits. Emphasis will be placed on key concepts such as hysteresis, ultrasensitivity, adaptation, robustness and noise propagation.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Co-convened with: MCB 580
Course typically offered:
Main Campus: Fall

Recommendations and additional information: MCB 181R, MCB 181L and MATH 129. One upper division biology/biochem course or consent of instructor.

MCB 481: History of Molecular Genetics: People, Ideas, Methods, Experiments (3 units)
Description: This course will examine the people, ideas and key experiments that contributed to the revolution in genetics following the discovery of DNA structure in 1953. Topics will include the role of diverse model organisms for genetic analysis, the logic and limits of reductionism, the development and impact of genomics, the conservation of fundamental processes and the current and future impact of these discoveries on ourselves.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Co-convened with: MCB 581
Recommendations and additional information: MCB 411 and MCB 320; or MCB 304; or consent of the instructor.
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 482: Modeling Human Disease (3 units)
Description: The course focuses on the use of model organisms and other approaches to tackle current topics in biomedical and life sciences. Emphasis will be placed on discoveries that identify causes of, and therapies for, human disease. The course will be divided into four sections, each taught by an MCB faculty who is an expert in the topic under discussion. Students will be required to actively participate in critical thinking exercises throughout the course.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Co-convened with: MCB 582
Course typically offered:
Main Campus: Spring

Recommendations and additional information: It is preferred that the students have successfully completed MCB 304 or MCB 305. Students who have not yet completed these courses may be enrolled with Instructor approval.
Enrollment requirement: MCB 181R
Honors Course: Honors Contract
Honors Course: Honors Contract

MCB 484: Cardiovascular Muscle Biology and Disease (3 units)
Description: This course is geared towards obtaining knowledge and quantitative insights in the molecular and integrative biology of muscle with an emphasis on cardiac muscle and the heart. It will focus on the molecular mechanisms that underlie the function and plasticity of muscle, including mechanisms of disease. In addition to lectures, the course will promote critical thinking and analysis skills by reading and analyzing primary research articles.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Lecture Required
Also offered as: BME 484, CMM 484, PSIO 484
Co-convened with: MCB 584
Course typically offered:
Main Campus: Spring

Home department: Physiology, Graduate Level
Enrollment requirement: PSIO 201, PSIO 202 (C or better in these two courses required for PRP and PSIO majors and minors) and PSIO 303A or PSIO 303B. MCB 410 or MCB 305 can substitute all course requisites for non-majors/minors PSIO/PRP.
Honors Course: Honors Contract
Honors Course: Honors Contract

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 491: Preceptorship (1 - 3 units)
Description: Specialized work on an individual basis, consisting of instruction and practice in actual service in a department, program, or discipline. Teaching formats may include seminars, in-depth studies, laboratory work and patient study.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated for a maximum of 9 units.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 492: Directed Research (1 - 6 units)
Description: Individual or small group research under the guidance of faculty.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated for a maximum of 12 units.
Equivalent to: ECOL 492, GEOS 492
Course typically offered:
Main Campus: Fall, Spring, Summer

Student Engagement Activity: Discovery
Student Engagement Competency: Innovation and Creativity

MCB 493: Internship (1 - 6 units)
Description: Specialized work on an individual basis related to molecular and cellular biology, consisting of training and practice in actual service in a technical, business, or governmental establishment.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated for a maximum of 6 units.
Course typically offered:
Main Campus: Fall, Spring, Summer

Student Engagement Activity: Professional Development
Student Engagement Competency: Professionalism

MCB 493A: Internship: Genetics and Human Health (1 - 6 units)
Description: Internships consist of specialized duties that provide training and practice in actual service in settings such as business, research laboratory, or government office. Only internships pertinent to molecular and cellular biology (usually of a research nature) may be considered for MCB 493 credit.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 10 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 493B: Internship: Education and Communication (1 - 6 units)
Description: Internships consist of specialized duties that provide training and practice in actual service in settings such as business, research laboratory, or government office. Only internships pertinent to molecular and cellular biology (usually of a research nature) may be considered for MCB 493 credit.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 10 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 493C: Internship: Systems and Big Data Biology (1 - 6 units)
Description: Internships consist of specialized duties that provide training and practice in actual service in settings such as business, research laboratory, or government office. Only internships pertinent to molecular and cellular biology (usually of a research nature) may be considered for MCB 493 credit.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 10 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 494: Practicum (1 - 3 units)
Description: The practical application, on an individual basis, of previously studied theory and the collection of data for future theoretical interpretation.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 496A: Laboratory Presentations and Discussions (1 unit)
Description: Small group laboratory presentations and discussions.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 7 times.
Co-convened with: MCB 596A
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Consult instructor before enrolling.

MCB 497A: Special Tutoring Workshop (1 - 5 units)
Description: A special tutoring workshop associated with the MCB 181 lecture class. Students may enroll for 1-5 units. Tutors will attend all class meetings of one 181 lecture section, assist with in-class activities and exams, and hold regular office hours in the Koffler Tutoring Center. The once-weekly 497A meetings will be devoted to the introduction of techniques to improve tutors' ability to interact with 181 students and assist them in mastering foundational biology topics.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Workshop Required
Repeatable: Course can be repeated for a maximum of 10 units.
Equivalent to: BIOC 497A
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: MCB 320 or PLS 312; MCB 410 or MCB 411 or equivalent courses (e.g., BIOC 466). Open primarily to juniors and seniors in life sciences with at least a B in MCB 181. Instructor interview required for admission.

MCB 498: Senior Capstone (1 - 5 units)
Description: A culminating experience for majors involving a substantive project that demonstrates a synthesis of learning accumulated in the major, including broadly comprehensive knowledge of the discipline and its methodologies. Senior standing required.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated for a maximum of 10 units.
Course typically offered:
Main Campus: Fall, Spring

Student Engagement Activity: Discovery
Student Engagement Competency: Innovation and Creativity

MCB 498A: Senior Capstone in Genetics and Human Health (1 - 5 units)
Description: A culminating experience for majors involving a substantive project that demonstrates a synthesis of learning accumulated in the major, including broadly comprehensive knowledge of the discipline and its methodologies. Senior standing required. Qualified students working on an individual basis with professors who have agreed to supervise such work. Work will be in the area of genetics and human health.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 10 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 498B: Senior Capstone in MCB: Biology Education and Communication (1 - 5 units)
Description: A culminating experience for majors involving a substantive project that demonstrates a synthesis of learning accumulated in the major subplan, including broadly comprehensive knowledge of the discipline and its methodologies. Senior standing required. Qualified students working on an individual basis with professors who have agreed to supervise such work. Work will be in the area of biology education and communication.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 10 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 498C: Senior Capstone in MCB: Systems and Big Data Biology (1 - 5 units)
Description: A culminating experience for majors involving a substantive project that demonstrates a synthesis of learning accumulated in the major subplan, including broadly comprehensive knowledge of the discipline and its methodologies. Senior standing required. Qualified students working on an individual basis with professors who have agreed to supervise such work. Work will be in the area of systems and big data biology.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 10 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Recommendations and additional information: Instructor permission required.

MCB 498H: Honors Thesis (3 units)
Description: An honors thesis is required of all the students graduating with honors. Students ordinarily sign up for this course as a two-semester sequence. The first semester the student performs research under the supervision of a faculty member; the second semester the student writes an honors thesis.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated for a maximum of 9 units.
Course typically offered:
Main Campus: Fall, Spring

Enrollment requirement: Student must be active in the Honors College.
Honors Course: Honors Course
Honors Course: Honors Course
Student Engagement Activity: Discovery
Student Engagement Competency: Innovation and Creativity
Writing Emphasis: Writing Emphasis Course

MCB 499: Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Alternative Grading: S, P, F
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Student Engagement Activity: Discovery
Student Engagement Competency: Innovation and Creativity

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 499H: Honors Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work.
Grading basis: Regular Grades
Career: Undergraduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Enrollment requirement: Student must be active in the Honors College.
Honors Course: Honors Course
Honors Course: Honors Course

MCB 500: Computer Concepts and Perl Programming (3 units)
Description: Basic Perl programming with applications to biology and fundamental computer concepts that are necessary to efficiently utilize computers in biological research. Graduate-level requirements include writing two functional specifications.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: BIOC 500, ECOL 500, GENE 500, PLS 500
Also offered as: GENE 500, PLS 500
Co-convened with: MCB 400
Course typically offered:
Main Campus: Fall

Interdisciplinary Interest Area: BIOC - Biochemistry
Interdisciplinary Interest Area: ECOL - Ecology & Evolution Bio

MCB 512A: Biological Electron Microscopy (5 units)
Description: Provides theoretical background and practical experience in transmission and scanning electron microscopy that are necessary for the efficient and effective application of ultra-structural and cytochemical techniques as research tools.
Grading basis: Regular Grades
Career: Graduate
Course Components: Laboratory May Be Offered
Lecture Required
Equivalent to: ANS 512, ANS 512A, BIOC 512, BIOC 512A, CBA 512, CBA 512A, EIS 512A, ENTO 512, ENTO 512A, MBIM 512, MCB 512, PATH 512, PATH 512A, PLP 512, PLP 512A, PSIO 512, PSIO 512A, VSC 512, VSC 512A
Also offered as: ACBS 512A, CMM 512A, EIS 512A, PATH 512A, PLP 512A, PSIO 512A
Recommendations and additional information: One college-level course in each of physics, chemistry, and biology.
Interdisciplinary Interest Area: BIOC - Biochemistry

MCB 516A: Statistical Bioinformatics and Genomic Analysis (3 units)
Description: The course introduces statistical methods and algorithms for analysis of high-throughput experiments in molecular biology using analysis of gene expression microarrays as a leading example. The course provides hands-on experience with data analysis, critical review of literature and communication of the results. Graduate-level requirement include a research project, written report, and a class presentation.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: ABE 516A, BIOC 516A, ECOL 516A, GENE 516A
Co-convened with: MCB 416A
Course typically offered:
Main Campus: Spring (even years only)

Recommendations and additional information: Basic statistical knowledge and programming experience.
Interdisciplinary Interest Area: BIOC - Biochemistry
Interdisciplinary Interest Area: ECOL - Ecology & Evolution Bio

MCB 520: College Science Teaching and Learning (3 units)
Description: An introduction to scholarship on college level teaching and learning in science. Appropriate for graduate students pursuing academic careers in college or university science departments.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Spring

MCB 524L: Plant Biotechnology (2 units)
Description: This course is designed for science undergraduates as well as graduate students who are interested in strengthening their hands-on experience with the techniques involved in developing superior food, feed and fiber crops.
Grading basis: Regular Grades
Career: Graduate
Course Components: Laboratory Required
Also offered as: ENVS 524L, PLS 524L
Co-convened with: MCB 424L
Course typically offered:
Main Campus: Spring

Recommendations and additional information: PLS 340, 360
Home department: School of Plant Science

MCB 524R: Plant Biotechnology (3 units)
Description: This course is designed for science undergraduates as well as graduate students who are interested in strengthening their knowledge of the techniques involved in developing superior food, feed and fiber crops.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Also offered as: ENVS 524R, PLS 524R
Course typically offered:
Main Campus: Spring

Recommendations and additional information: PLS 340, 360
Home department: School of Plant Science

MCB 528L: Microbial Genetics Laboratory (2 units)
Description: Laboratory associated with lecture course on Prokaryotic gene structure and function; methods of gene transfer and mapping, DNA structure, replication, transcription, and translation. Hands-on computer analysis of DNA sequences and gene cloning strategies. Graduate-level requirements include the DNA sequence of an entire operon from any one of a variety of bacteria and additionally analyze one product from the operon using several GCG protein analysis programs. Also extra exam questions.
Grading basis: Regular Grades
Career: Graduate
Flat Fee: $70
Course Components: Laboratory Required
Equivalent to: ECOL 528L, MCB 528L, MIC 528L, MICR 528L, PLS 528L, SWES 528L, VSC 528L
Also offered as: ACBS 528L, ECOL 528L, ENVS 528L, MIC 528L, PLP 528L, PLS 528L
Course typically offered:
Main Campus: Spring

Home department: Plant Pathology

MCB 528R: Microbial Genetics (3 units)
Description: Prokaryotic gene structure and function; methods of gene transfer and mapping, DNA structure, replication, transcription, and translation. Hands-on computer analysis of DNA sequences and gene cloning strategies. Principles of regulation of gene expression. Graduate-level requirements include a DNA sequence of an entire operon from any one of a variety of bacteria and additionally analyze one product from the operon using several GCG protein analysis programs plus an extensive exam.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: ECOL 528R, GENE 528, GENE 528R, MCB 528R, MIC 528R, MICR 528R, PLP 528, PLS 528R, SWES 528R, VSC 528R
Also offered as: ACBS 528R, ECOL 528R, ENVS 528R, MIC 528R, PLP 528R, PLS 528R
Course typically offered:
Main Campus: Spring
Distance Campus: Spring

Home department: Plant Pathology

MCB 532: Comparative Immunology (3 units)
Description: How have vertebrate immune systems evolved from simple origins? We will cover comparative immunology of prokaryotes, protozoans, plants, fungi, invertebrates, and "lower" vertebrates. By studying the origins and evolution of immunity across the history of life, and following the progression of immune system complexity across different lineages, we begin to see patterns that help explain how our immune system developed from those of our ancestors. Such comparative study will highlight the strengths and weaknesses of our immune system, and point to ways in which other organisms have overcome the same pathogenic stresses we currently face. This class will pull together data from many fields, including immunology, molecular and cell biology, ecology, and evolution. Graduate students will prepare and give one oral presentation of a specific topic to the class, which will be graded.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Also offered as: ACBS 532, ECOL 532, EIS 532, IMB 532, MIC 532
Co-convened with: MCB 432
Course typically offered:
Main Campus: Fall

Home department: Committee on Entomology and Insect Science
Enrollment requirement: MCB 181R and MCB 181L, ECOL 182R and ECOL 182L, or instructor consent.

MCB 537: Life in Extreme Environments (3 units)
Description: Extreme environments are numerous and diverse on Earth. Despite harsh environmental conditions, microbes have been found thriving from the deepest seafloors to the highest mountains, from the coldest polar regions to the hottest and most arid deserts or steaming hot springs. Microbes survival in such extreme and varied conditions allows them to play fundamental roles in global nutrient cycling. The course will encompass foundational material for the study of life in extreme environments. In this course, we will examine microbial adaptations to their environment, how the adaptive responses affect microorganisms' evolution and how microorganisms modify their environment. We will consider physical extremes, such as temperature, radiation, pressure, and geochemical extremes (e.g., desiccation, salinity, pH, depletion of oxygen or extreme redox potential). We will also assess how the study of life in extreme environments can provides critical elements of answer to important questions such as: "How did life appear on our planet?", "How microbes made Earth habitable?" and "Could life exist beyond our planet?", and explore the impact of human activity on ecosystems. Additionally, we will explore the wide application potential of this area of research in the fields of medicine, biotechnology, chemical and pharmaceutical industry, or cosmetics.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Co-convened with:
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: MCB181R (or equivalent), and at least one upper division Molecular Biology, Biochemistry, Microbiology, or Astrobiology course (unless explicit instructor permission is received).
Field trip: None

MCB 539: Methods in Cell Biology and Genomics (3 units)
Description: In-depth, practical and theoretical analysis of novel, experimental methods that advance our understanding of modern biology.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Also offered as: GENE 539, PCOL 539, PLS 539, PSIO 539
Course typically offered:
Main Campus: Fall (even years only)

Home department: School of Plant Science

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 540: Mechanisms in Plant Development (3 units)
Description: Focuses on the molecular genetic mechanisms of plant development using primarily the current model systems. Graduate-level requirements include seven journal club discussions and presentations for graduate students and honors undergraduate students.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: ECOL 540, MCB 540
Also offered as: ECOL 540, PLS 540
Co-convened with: MCB 440
Course typically offered:
Main Campus: Fall

Recommendations and additional information: PLS 312 or ECOL 320. Recommend: BIOC 384, PLS 360 and MCB 304.
Home department: School of Plant Science

MCB 546: Genetic and Molecular Networks (4 units)
Description: This course will explore the analysis of biological systems using genetic and molecular tools. Discussion of primary literature papers focusing on model systems.
Grading basis: Regular Grades
Career: Graduate
Course Components: Discussion May Be Offered
Lecture Required
Course typically offered:
Main Campus: Spring

Recommendations and additional information: Undergraduate genetics course, molecular biology course, and consent of instructor.

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 548A: Plant Biochemistry and Metabolic Engineering (3 units)
Description: Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course. Graduate-level requirements include 2 or 3 short individual oral presentations and a term paper.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: BIOC 548A, CHEM 548A, ECOL 548A, MCB 548A
Also offered as: BIOC 548A, CHEM 548A, ECOL 548A, PLS 548A
Co-convened with: MCB 448A
Course typically offered:
Main Campus: Fall

Home department: School of Plant Science

MCB 549A: Plant Genetics and Genomics (3 units)
Description: A 3-unit lecture/discussion course that provides an advanced treatment of the current knowledge and experimental approaches used in genetic and genomic analysis, with emphasis on plants. Basic understanding of Mendelian genetics, gene and genome structure and function is required. Graduate-level requirements include leading 3 course discussions on review articles and problem sets and write a paper based on each of the three research discussions that they lead.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: ECOL 549A, GENE 549A, MCB 549A
Also offered as: ECOL 549A, GENE 549A, PLS 549A
Co-convened with:
Home department: School of Plant Science

MCB 553: Functional and Evolutionary Genomics (4 units)
Description: Computational, functional, and evolutionary approaches to genomics, including bioinformatics and laboratory methods relevant to many modern research approaches in biology. Graduate-level requirements include students completing independently designed lab exercises and relate these to the primary literature in a paper. Undergraduate students will only complete defined lab exercises.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: BIOC 553, BIOC 553R, ECOL 553R, MCB 553
Also offered as: BIOC 553, ECOL 553, EIS 553
Co-convened with:
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Concurrent registration, ECOL 553L for first year IGERT fellows.
Home department: Ecology & Evolutionary Biology

MCB 560: Advanced Plant Biology (4 units)
Description: Advanced, graduate-level treatment of current understanding of development, metabolism, response to environmental signals and stress, interactions with other organisms, and plant origins and crop domestication.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Also offered as: ECOL 560, PLP 560, PLS 560
Course typically offered:
Main Campus: Fall

Recommendations and additional information: MCB 181R, PLS 360, and BIOC 462A. Basic molecular biology, plant biology and biochemistry are necessary to succeed in this class. Equivalent courses will be acceptable to fulfill these requisites.
Home department: School of Plant Science

MCB 570: Applications of Cell and Molecular Biology for Teachers (3 units)
Description: Principles of cell and molecular biology with a focus on applications and current research appropriate for secondary school biology. This course is designed for prospective and in-service science teachers who need to develop a deeper understanding of central ideas in cell and molecular biology. Core topics in the course include structure function relationships, gene expression, membrane biology, cell structure, and regulation of cell division. Graduate-level requirements include developing a lesson plan at the end of each major unit that incorporates the key concepts of the unit.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Co-convened with: BIOC 470
Recommendations and additional information: CHEM 151, CHEM 152 and MCB 181R or equivalents. Chemistry, Biochemistry, Molecular Cellular Biology, Physiology, Nutrition Science, Microbiology minors are excluded from enrolling.

MCB 572: Advanced Genetics for Teachers (3 units)
Description: Principles of genetics with a focus on applications and current research appropriate for teachers of secondary school biology. This course is designed for prospective and in-service science teachers who wish to develop a deeper understanding of central ideas in genetics. Core topics include the molecular basis for inheritance, basic descriptive genetics and the mathematical patterns that explain genetic patterns, gene regulation, genomics, and the use of genetic technologies to address human problems. This course is designed to be on-line. In-service science teachers may take the course for graduate credit by completing additional graduate-level course work. Graduate-level requirements include developing a lesson plan at the end of each major unit of the course that incorporates the key concepts of the unit into their curriculum.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Recommendations and additional information: CHEM 151, CHEM 152, MCB 181R or equivalents. Excluded majors: Chemistry, Biochemistry, Molecular Cellular Biology, Physiology, Nutrition Science, Microbiology, Ecology and Evolutionary Biology and Biology.

MCB 572A: Cell Systems (4 units)
Description: Advanced treatment of regulation of basic cellular processes in both single-celled and multicellular eukaryotic organisms. Focus on experimental research aimed at understanding cellular networks and circuitry, as well as their evolution. An introduction to modeling cell systems will be embedded within the context of the course. This is primarily a discussion-based, student-led course.
Grading basis: Regular Grades
Career: Graduate
Course Components: Discussion Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: MCB 304, MCB 305, and consult instructor before enrolling.

MCB 573: Recombinant DNA Methods and Applications (4 units)
Description: This course offers an intensive lab experience to teach students the practical and theoretical aspects of modern molecular biology. In the first part of the course, recombinant DNA methods and bioinformatics are used to clone and identify an unknown gene. In the second part of the course DNA microarray technology is used to determine the effect of environmental stress on the global gene expression program in yeast, and to identify genes that control the stress response. Weekly lectures compliment the lab sessions, covering the theory and principles underlying the experiments performed during the course.Graduate level requirements will include additional assignments, such as presenting and discussing research papers applicable to the lab projects or recent advances in molecular biology techniques.
Grading basis: Regular Grades
Career: Graduate
Flat Fee: $150
Course Components: Discussion Required
Lecture Required
Equivalent to: BIOC 573, GENE 573, MIC 573, MICR 573, PLS 573
Also offered as: BIOC 573, GENE 573, MIC 573, PLS 573
Co-convened with: MCB 473
Course typically offered:
Main Campus: Spring

MCB 575: Scientific Communication (3 units)
Description: A graduate-level course focused on the effective dissemination of scientific information through distinct modes of oral and written communication. Through practical examples of activities common to the profession (writing a grant proposal and presenting research work orally), students will develop the skills necessary to effectively communicate scientific ideas, experiments and results. Each of the activities will be dissected into key skill sets that will be individually developed with the aid of interactive discussions and peer review. In addition, students will develop documents to describe their research experiences and motivations and submit an application for a graduate research fellowship from the NSF, if eligible.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Registration requires successful completion of four (4) graduate-level courses in biology for a total of 12 units.
Enrollment requirement: Currently enrolled in MCB 595A.

MCB 577: Principles of Cell Biology (4 units)
Description: Intensive, graduate-level introduction to principles and mechanisms of cell biology, including current research strategies in the field.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: ANAT 577, MCB 577
Also offered as: CMM 577
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Consent of course coordinator.
Home department: Cellular & Molecular Medicine

MCB 579: Art of Scientific Discovery (3 units)
Description: Techniques of posing questions and solving puzzles encountered in scientific research, with emphasis on life sciences and mathematics. Graduate-level requirements include use of all techniques in a semester-long research project and final paper.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Repeatable: Course can be repeated a maximum of 2 times.
Equivalent to: ECOL 579, MCB 579
Also offered as: CMM 579, ECOL 579
Co-convened with: MCB 479
Course typically offered:
Main Campus: Fall

Home department: Cellular & Molecular Medicine

MCB 580: Introduction to Systems Biology (3 units)
Description: The proteins in a cell are organized into networks and circuits that act to process information and control cell activity. In this course we will explore the structure and function of these circuits through discussion of the relevant literature and by building and testing mathematical models of simple/toy circuits. Emphasis will be placed on key concepts such as hysteresis, ultrasensitivity, adaptation, robustness and noise propagation. Graduate-level requirements include more complex independent projects and a formal presentation to the class.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: CE 580
Also offered as: BE 580
Co-convened with: MCB 480
Course typically offered:
Main Campus: Fall

Recommendations and additional information: MCB 181R, MCB 181L and MATH 129. One upper division biology/biochem course or consent of instructor.

MCB 581: History of Molecular Genetics: People, Ideas, Methods, Experiments (3 units)
Description: Graduate-level requirements include an additional research paper related to one of the class topics and a presentation and discussion with the class.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: BIOC 581, NRSC 581
Co-convened with: MCB 481
Recommendations and additional information: MCB 411 and MCB 320; or MCB 304; or consent of the instructor.

MCB 582: Modeling Human Disease (3 units)
Description: The course focuses on the use of model organisms and other approaches to tackle current topics in biomedical and life sciences. Emphasis will be placed on discoveries that identify causes of, and therapies for, human disease. The course will be divided into four sections, each taught by an MCB faculty who is an expert in the topic under discussion. Students will be required to actively participate in critical thinking exercises throughout the course. Graduate-level requirements include submission of a final term paper in the form of a mock-grant proposal; the standard on the grading rubric will be adjusted appropriately.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Co-convened with: MCB 482
Course typically offered:
Main Campus: Spring

Recommendations and additional information: It is preferred that the students have successfully completed MCB 304 or MCB 305. Students who have not yet completed these courses may be enrolled with Instructor approval.

MCB 584: Cardiovascular Muscle Biology and Disease (3 units)
Description: This course is geared towards obtaining knowledge and quantitative insights in the molecular and integrative biology of muscle with an emphasis on cardiac muscle and the heart. It will focus on the molecular mechanisms that underlie the function and plasticity of muscle, including mechanisms of disease. In addition to lectures, the course will promote critical thinking and analysis skills by reading and analyzing primary research articles. Graduate-level requirements include writing a research proposal that addresses an unresolved area in muscle biology (to be selected from a list of research articles provided at the beginning of the semester).
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Equivalent to: ANAT 584, CBA 584, NRSC 584
Also offered as: BME 584, CMM 584, PSIO 584
Co-convened with: MCB 484
Course typically offered:
Main Campus: Spring

Home department: Physiology, Graduate Level

MCB 585: Multidisciplinary Approaches to Solving Biological Problems (4 units)
Description: MCB585 is an advanced graduate course focused on multidisciplinary approaches to biological questions, using the central dogma as an experimental framework. Students will explore the integration of classic and modern approaches to biological problem solving through a critical and integrated analysis of existing research and through active learning exercises based on hypothesis-building and testing at the edges of current knowledge.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture Required
Course typically offered:
Main Campus: Fall

Recommendations and additional information: 1. One year of graduate-level coursework2. Two core courses required for the MCB, BIOC or CMM PhD3. At least one additional core course in either of the other two PhD programs

MCB 588: Principles of Cellular and Molecular Neurobiology (4 units)
Description: Detailed introduction to the biology of nerve cells, emphasizing cellular neurophysiology, synaptic mechanisms, and analysis of neural development.
Grading basis: Regular Grades
Career: Graduate
Course Components: Laboratory May Be Offered
Lecture Required
Equivalent to: ANAT 588, BIOC 588, CBA 588, EIS 588, INSC 588, MCB 588, PSIO 588
Also offered as: BIOC 588, CMM 588, EIS 588, NRSC 588, PSIO 588
Course typically offered:
Main Campus: Fall

Recommendations and additional information: Consult program office before enrolling.
Home department: Committee on Neuroscience

MCB 595: Molecular and Cellular Biology Journal Club (1 unit)
Description: Student participation in the presentation and discussion of current literature and research in various areas of molecular, cellular, and developmental biology.
Grading basis: Regular Grades
Career: Graduate
Course Components: Colloquium Required
Repeatable: Course can be repeated for a maximum of 10 units.
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Open to majors only.

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 595E: Topics in Research (2 units)
Description: The exchange of scholarly information and research findings for graduate students participating in the NIH/IMSD Minority Health Disparities Program.
Grading basis: Regular Grades
Career: Graduate
Course Components: Colloquium Required
Repeatable: Course can be repeated a maximum of 2 times.
Equivalent to: ANAT 595E
Course typically offered:
Main Campus: Fall, Spring

MCB 595G: Cancer Biology: Focus on Breast Cancer (1 unit)
Description: This a graduate-level journal club which will focus on the biology of cancer with a specific focus on breast cancer-related peer-reviewed research articles.
Grading basis: Regular Grades
Career: Graduate
Course Components: Colloquium Required
Repeatable: Course can be repeated a maximum of 7 times.
Equivalent to: BIOC 595G, CBA 595G, CBIO 595G, PCOL 595G
Also offered as: CBIO 595G, CMM 595G, PCOL 595G
Interdisciplinary Interest Area: BIOC - Biochemistry

MCB 595H: Problems in the Biology of Complex Diseases (2 units)
Description: Complex diseases (CDs: e.g., asthma, allergy, COPD, obesity, inflammatory bowel disease, hypertension, coronary artery disease, diabetes, rheumatoid arthritis, multiple sclerosis, schizophrenia) are the next major challenge in human biology because they are at the same time unique, common and difficult to decipher. The complexity of CDs lies in their pathogenesis, in which a constellation of environmental and genetic factors interact in intricate ways to alter biological thresholds and response patterns, modifying disease susceptibility. Since both genes and environmental exposures contribute to CDs, the biological pathways involved in CD pathogenesis depend on the genetic background of a given population and the specific environment to which that population is exposed. Hence, asthma, obesity and hypertension in Arizona may not be the same as asthma, obesity and hypertension in Iceland.
Grading basis: Regular Grades
Career: Graduate
Course Components: Colloquium Required
Equivalent to: GENE 595H, IMB 595H, MCB 595H
Also offered as: CMM 595H, GENE 595H, IMB 595H, PCOL 595H
Course typically offered:
Main Campus: Spring

Home department: Cellular & Molecular Medicine

MCB 596: Molecular and Cellular Biology Seminar (1 unit)
Description: Students will discuss research in progress with a variety of guest lecturers in various areas of molecular, cellular, developmental and systems biology.
Grading basis: Regular Grades
Career: Graduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 5 times.
Course typically offered:
Main Campus: Fall, Spring

Enrollment requirement: Enrollment in MCB596 is restricted to MCB majors in the PhD or AMP program and to current ABBS students (unless explicit instructor permission is received).

MCB 596A: Laboratory Presentations and Discussions (1 unit)
Description: Small group laboratory presentations and discussions. Graduate-level requirements include presentations based on dissertation research.
Grading basis: Regular Grades
Career: Graduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 7 times.
Co-convened with: MCB 496A
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Open to majors only.

MCB 596M: Exploring Life on the WWW: The Digital Dissemination of Biological Research (3 units)
Description: This course is designed for aspiring life scientists and science teachers. It will improve students' literacy in the areas of life science data management, information technology, and the effective exchange of scientific information across disciplines and professional cultures. Graduate-level requirements include an individual project and participation in a group project. Undergraduates will only have to participate in group projects.
Grading basis: Regular Grades
Career: Graduate
Course Components: Seminar Required
Repeatable: Course can be repeated a maximum of 2 times.
Equivalent to: ECOL 596M, ENTO 596M, IRLS 596M, MCB 596M, TTE 596M
Also offered as: ECOL 596M, EIS 596M, IRLS 596M, TLS 596M
Course typically offered:
Main Campus: Spring

Recommendations and additional information: Consent of instructor.
Home department: GIDP on Entomology and Insect Science

MCB 597C: Current Topics for Biological Teaching (1 unit)
Description: The practical application of theoretical learning within a group setting and involving an exchange of ideas and practical methods, skills, and principles.
Grading basis: Regular Grades
Career: Graduate
Course Components: Studio — May Be Offered
Workshop — Required
Repeatable: Course can be repeated a maximum of 29 times.
Equivalent to: ARL 597C, ECOL 597C, EXSS 597C, MCB 597C
Recommendations and additional information: Open to in-service and pre-service teachers only, 18 units of biological sciences.

MCB 599: Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work. Graduate students doing independent work which cannot be classified as actual research will register for credit under course number 599, 699, or 799.
Grading basis: Alternative Grading: S, P, F
Career: Graduate
Course Components: Independent Study — Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 657: Cancer Biology for Teachers (3 units)
Description: Explore recent development in our understanding of the mechanism of cancer and how these developments lead to improvements in treatment and prevention of cancer. Educational materials will be explored to help teach this subject in the secondary classroom.
Grading basis: Regular Grades
Career: Graduate
Course Components: Lecture — Required
Recommendations and additional information: Must have at least 18 units of Biology coursework. Must be a middle or high school science teacher.

MCB 693: Internship (1 - 6 units)
Description: Specialized work on an individual basis, consisting of training and practice in actual service in a technical, business, or governmental establishment.
Grading basis: Alternative Grading: S, P, F
Career: Graduate
Course Components: Independent Study — Required
Repeatable: Course can be repeated a maximum of 3 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 695A: Journal Club (1 unit)
Description: Enrolled students take turns selecting and leading the discussion on articles from the primary literature. Enrollment is open to students with interests in any of the three focus areas of the Dept. of Plant Sciences: Plant Biology, Genetics and Genomics; Horticultural and Crop Sciences; and Plant Pathology and Microbiology. Goals of the course include: fostering interaction among students with diverse interests and backgrounds, keeping abreast of current publications of broad interest, and providing a forum where free discussion is encouraged.
Grading basis: Regular Grades
Career: Graduate
Course Components: Colloquium Required
Repeatable: Course can be repeated for a maximum of 4 units.
Equivalent to: MCB 695A, PLS 695A
Also offered as: PLP 695A, PLS 695A
Course typically offered:
Main Campus: Fall, Spring

Home department: Plant Pathology

MCB 695D: Human Genetic Disease Colloquium (3 units)
Description: The course will cover a few medical genetic disorders in depth, with different topics each year. Clinical presentation, pathophysiology, genetic mechanisms and biochemical features will be considered. Readings will come mainly from the primary biomedical literature.
Grading basis: Regular Grades
Career: Graduate
Course Components: Colloquium Required
Repeatable: Course can be repeated a maximum of 4 times.
Equivalent to: BIOC 695D, GENE 695D, MCB 695D, NRSC 695D, PSIO 695D
Also offered as: BIOC 695D, CMM 695D, GENE 695D, NRSC 695D, PSIO 695D
Course typically offered:
Main Campus: Spring

Home department: Cellular & Molecular Medicine

MCB 695E: Science, Society, and Ethics (1 unit)
Description: Practical colloquium focusing on ethical issues raised in the research laboratory setting.
Grading basis: Alternative Grading: S, P, F
Career: Graduate
Course Components: Colloquium Required
Equivalent to: CBA 695E, GENE 695E, NRSC 695E
Also offered as: CMM 695E
Course typically offered:
Main Campus: Spring

MCB 696A: Laboratory Presentations and Discussion (1 - 3 units)
Description: Laboratory small group presentations and discussion.
Grading basis: Regular Grades
Career: Graduate
Course Components: Seminar Required
Repeatable: Course can be repeated for a maximum of 12 units.
Course typically offered:
Main Campus: Fall, Spring

MCB 699: Independent Study (1 - 5 units)
Description: Qualified students working on an individual basis with professors who have agreed to supervise such work. Graduate students doing independent work which cannot be classified as actual research will register for credit under course number 599, 699, or 799.
Grading basis: Alternative Grading: S, P, F
Career: Graduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 792: Directed Research (1 - 4 units)
Description: This course is designed to aid PhD students in their search and selection of a research area and research advisor.
Grading basis: Regular Grades
Career: Graduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 10 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

Field trip: None.

MCB 795A: Introduction to Research (1 - 6 units)
Description: The exchange of scholarly information and/or secondary research, usually in a small group setting. Instruction often includes lectures by several different persons. Research projects may or may not be required of course registrants.
Grading basis: Regular Grades
Career: Graduate
Course Components: Colloquium Required
Repeatable: Course can be repeated for a maximum of 10 units.
Course typically offered:
Main Campus: Fall, Spring

Recommendations and additional information: Open to MCB and ABBS majors only.

-SA represents a Student Abroad & Student Exchange offering
-CC represents a Correspondence Course offering
May Be Offered Departments may offer this component in some semesters. See the Schedule of Classes for term-specific offerings.

MCB 900: Research (1 - 8 units)
Description: Individual research, not related to thesis or dissertation preparation, by graduate students.
Grading basis: Alternative Grading: S, P, F
Career: Graduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 910: Thesis (1 - 8 units)
Description: Research for the master's thesis (whether library research, laboratory or field observation or research, artistic creation, or thesis writing). Maximum total credit permitted varies with the major department.
Grading basis: Alternative Grading: S, P, F
Career: Graduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer

MCB 920: Dissertation (1 - 9 units)
Description: Research for the doctoral dissertation (whether library research, laboratory or field observation or research, artistic creation, or dissertation writing).
Grading basis: Alternative Grading: S, P, F
Career: Graduate
Course Components: Independent Study Required
Repeatable: Course can be repeated a maximum of 99 times.
Course typically offered:
Main Campus: Fall, Spring, Summer