Molecular and Cell Biology: Neurobiology

Bachelor of Arts (BA)

The undergraduate major in Molecular and Cell Biology (MCB) encompasses the diversity of scientific interests of the Department's faculty. Neurobiology is the study of the brain—how it controls behavior, generates sensory perception, learns, thinks, and feels—and what goes wrong in neurological and neuropsychiatric disease. Advanced methods from molecular biology, genetics, physiology, computational biology and engineering are used to understand brain function mechanistically from single neurons to complex neural networks. Neuroscience is in a period of rapid discovery yielding important advances for biomedical research and translational medicine.

Declaring the Major

MCB is not an impacted major. Therefore, the program will accept any interested student who meets the minimum course and GPA requirements and is realistically able to complete the major requirements during the student's remaining time at Cal.

In order to declare the MCB major, students must have completed or be enrolled in BIOLOGY 1A/BIOLOGY 1AL (C or better on first midterm) and CHEM 3B (past the early drop deadline), have at least a 2.0 overall GPA, a 2.0 GPA in the lower-division prerequisites for the major, and know which emphasis you will declare. (Note: Transfer students must have completed at least one semester at UC Berkeley and have received a 2.0 GPA in the courses that they have taken for the major). Intended MCB students are not required to have completed the Math or Physics requirement at the time of declaration (though the requirement must be met in order to graduate).

To start the major declaration process, students must (1) fill out the MCB major declaration form online (https://mcb.berkeley.edu/internal/uao/declaration) and (2) download and fill out the Petition to Declare a Major (http://ls-advise.berkeley.edu/fp/fp.html) .

Students should bring the Petition to Declare a Major to the Undergraduate Advising Office (3060 Valley Life Sciences Building) no earlier than the next business day to discuss their academic plan. When signing in, students should inform the Intake Adviser that they declared online. S/he will hand them the printed course planning form to take to an academic adviser for planning their courses in the major. Please note that major declarations are limited during the first week of class and the first week of TeleBEARS Phase 1. Any restrictions will be advertised on the homepage and in the weekly email. Please plan accordingly.

Honors Program

The MCB honors program offers exceptional senior students recognition for outstanding academic achievement and excellence in research. To graduate with honors in the major, students must satisfy the following:

1. Complete at least two credited semesters of research including four to eight units of MCELLBI H196A and/or MCELLBI H196B (Honors Research)
2. Have a cumulative Berkeley grade point average (GPA) of at least 3.3 in all work completed at UC Berkeley
3. Have at least a 3.5 GPA in the MCB major requirements or 3.5 GPA in MCB upper division courses
4. Present their research in an approved forum, such as an MCB symposium, the Undergraduate Poster Session, or other scientific meeting
5. Write an honors thesis approved by an MCB faculty sponsor

Additional information on the honors program is available in the Undergraduate Affairs Office and on the MCB website (http://mcb.berkeley.edu/undergrad/major/honors-program/honors) .

Minor Program

There is no minor program in Molecular and Cell Biology.

Other Molecular and Cell Biology Majors (Emphases)

Biochemistry & Molecular Biology (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/molecular-cell-biology-biochemistry) (BMB)
Cell and Developmental Biology (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/molecular-cell-biology-developmental) (CDB)
Genetics, Genomics, & Development (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/molecular-cell-biology-genetics) (GG & D)
Immunology & Pathogenesis (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/molecular-cell-biology-immunology) (IM & P)

In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All courses taken to fulfill the major requirements below must be taken for graded credit, other than courses listed which are offered on a *Pass/No Pass* basis only. Other exceptions to this requirement are noted as applicable.
2. No more than one upper-division course may be used to simultaneously fulfill requirements for a student's major and minor programs, with the exception of minors offered outside of the College of Letters and Science.
3. A minimum grade point average (GPA) of 2.0 must be maintained in both upper- and lower-division courses used to fulfill the major requirements.

For information regarding residence requirements and unit requirements, please see the College Requirements tab.

Lower-division Requirements

MATH 10A	Methods of Mathematics: Calculus, Statistics, and Combinatorics	4
MATH 10B	Methods of Mathematics: Calculus, Statistics, and Combinatorics	4
CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory	4
CHEM 3A & 3AL	Chemical Structure and Reactivity and Organic Chemistry Laboratory	5

CHEM 3B & 3BL	Chemical Structure and Reactivity and Organic Chemistry Laboratory	5
BIOLOGY 1A & 1AL	General Biology Lecture and General Biology Laboratory	5
BIOLOGY 1B	General Biology Lecture and Laboratory	4
PHYSICS 8A	Introductory Physics [1]	4
PHYSICS 8B	Introductory Physics [1]	4

[1] PHYSICS 7A and PHYSICS 7B can be taken in place of PHYSICS 8A and PHYSICS 8B.

Upper-division Requirements

MCELLBI 102	Survey of the Principles of Biochemistry and Molecular Biology	4
MCELLBI 104	Genetics, Genomics, and Cell Biology	4
MCELLBI 160	Cellular and Molecular Neurobiology	4
MCELLBI 160L	Neurobiology Laboratory	4
or MCELLBI 163	Mammalian Neuroanatomy	
MCELLBI 163	Mammalian Neuroanatomy	4
MCELLBI 161	Circuit, Systems and Behavioral Neuroscience	4
One NEU Elective from List A or List B that excludes MCELLBI 131		4

NEU Elective A List

BIO ENG 121	BioMEMS and Medical Devices	4
BIO ENG 143	Computational Methods in Biology	4
COG SCI C127	Cognitive Neuroscience	3
INTEGBI 131	General Human Anatomy	3
INTEGBI C139	Course Not Available	3
INTEGBI C143A	Biological Clocks: Physiology and Behavior	3
INTEGBI C143B	Hormones and Behavior	3
INTEGBI C144	Animal Behavior	4
MATH 110	Linear Algebra	4
MCELLBI C100A	Biophysical Chemistry: Physical Principles and the Molecules of Life	4
MCELLBI 130A	Cell and Systems Biology	4
MCELLBI 132	Biology of Human Cancer	4
MCELLBI 135A	Topics in Cell and Developmental Biology: Molecular Endocrinology	3
MCELLBI 136	Physiology	4
MCELLBI 137	Computer Simulation in Biology	3
MCELLBI 141	Developmental Biology	4
MCELLBI C145	Course Not Available	4
MCELLBI 150	Molecular Immunology	4
PHYSICS 112	Introduction to Statistical and Thermal Physics	4
PHYSICS 132	Course Not Available	
PSYCH C112	Course Not Available	3
PSYCH C113	Biological Clocks: Physiology and Behavior	3
PSYCH C115B	Course Not Available	4
PSYCH C116	Hormones and Behavior	3
PSYCH 117	Human Neuropsychology	3
PSYCH C127	Cognitive Neuroscience	3
PB HLTH 141	Introduction to Biostatistics	5
PB HLTH 142	Introduction to Probability and Statistics in Biology and Public Health	4

NeU Elective B List

MCELLBI 160L	Neurobiology Laboratory (Allowed only if MCB 163 is used as lab requirement)	4
MCELLBI 163	Mammalian Neuroanatomy (Allowed only if MCB 160L is used as lab requirement)	4
MCELLBI 165	Neurobiology of Disease	3
MCELLBI 166	Biophysical Neurobiology	3
MCELLBI 167	Course Not Available	

Undergraduate students in the College of Letters and Science must fulfill the following requirements in addition to those required by their major program.

For detailed lists of courses that fulfill college requirements, please see the College of Letters and Sciences (http://guide.berkeley.edu/archive/2014-15/undergraduate/colleges-schools/letters-science) page in this bulletin.

Entry Level Writing

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing Requirement. Fulfillment of this requirement is also a prerequisite to enrollment in all reading and composition courses at UC Berkeley.

American History and American Institutions

The American History and Institutions requirements are based on the principle that a U.S. resident graduated from an American university should have an understanding of the history and governmental institutions of the United States.

American Cultures

American Cultures is the one requirement that all undergraduate students at Cal need to take and pass in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity and culture of the United States. AC courses offer students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American Culture.

Quantitative Reasoning

The Quantitative Reasoning requirement is designed to ensure that students graduate with basic understanding and competency in math, statistics, or computer science. The requirement may be satisfied by exam or by taking an approved course.

Foreign Language

The Foreign Language requirement may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

Reading and Composition

In order to provide a solid foundation in reading, writing and critical thinking the College requires two semesters of lower division work in composition. Students must complete a first-level reading and

composition course by the end of their second semester and a second-level course by the end of their fourth semester.

Breadth Requirements

The undergraduate breadth requirements provide Berkeley students with a rich and varied educational experience outside of their major program. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

Unit Requirements

- 120 total units, including at least 60 L&S units
- Of the 120 units, 36 must be upper division units
- Of the 36 upper division units, 6 must be taken in courses offered outside your major department

Residence Requirements

For units to be considered in "residence," you must be registered in courses on the Berkeley campus as a student in the College of Letters and Science. Most students automatically fulfill the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless you go abroad for a semester or year or want to take courses at another institution or through University Extension during your senior year. In these cases, you should make an appointment to see an adviser to determine how you can meet the Senior Residence Requirement.

Note: Courses taken through UC Extension do not count toward residence.

Senior Residence Requirement

After you become a senior (with 90 semester units earned toward your B.A. degree), you must complete at least 24 of the remaining 30 units in residence in at least two semesters. To count as residence, a semester must consist of at least 6 passed units. Intercampus Visitor, EAP, and UC Berkeley-Washington Program (UCDC) units are excluded.

You may use a Berkeley summer session to satisfy one semester of the Senior Residence Requirement, provided that you successfully complete 6 units of course work in the Summer Session and that you have been enrolled previously in the College.

Modified Senior Residence Requirement

Participants in the UC Education Abroad Program (EAP) or the UC Berkeley-Washington Program (UCDC) may meet a Modified Senior Residence Requirement by completing 24 (excluding EAP) of their final 60 semester units in residence. At least 12 of these 24 units must be completed after you have completed 90 units.

Upper Division Residence Requirement

You must complete in residence a minimum of 18 units of upper division courses (excluding EAP units), 12 of which must satisfy the requirements for your major.

Sample Plans of Study

The sample plans below show a four-year plan for completing the major, taking classes only during Fall and Spring semesters. All of the lower-division classes are offered during the Summer as well. Please consult the sample plan appropriate to your track.

Please note that the sample plans below include only courses required for your major. For more detailed information regarding other requirements, including unit minimums per semester, Letters and Science Breadth Requirements, Reading and Composition (R & C), and the American Cultures (AC) requirements, please see the College Requirements tab.

Freshman Admits

				Freshman
	Fall	**Units**	**Spring**	**Units**
MATH 10A		4	MATH 10B	4
CHEM 1A & 1AL		4	BIOLOGY 1A & 1AL	5
		8		**9**
				Sophomore
	Fall	**Units**	**Spring**	**Units**
CHEM 3A & 3AL		5	CHEM 3B & 3BL	5
BIOLOGY 1B		4	PHYSICS 8A	4
		9		**9**
				Junior
	Fall	**Units**	**Spring**	**Units**
MCELLBI 102		4	MCB Core Course	
PHYSICS 8B		4	MCB Lab	
		8		**0**
				Senior
	Fall	**Units**	**Spring**	**Units**
MCB Core Course			MCB Elective	
MCB Elective				
		0		**0**

Total Units: 43

Fall Program for Freshmen Students

				Freshman
	Fall	**Units**	**Spring**	**Units**
MATH 1A		4	MATH 1B	4
			CHEM 1A & 1AL	4
		4		**8**
				Sophomore
	Fall	**Units**	**Spring**	**Units**
BIOLOGY 1A & 1AL		5	CHEM 3A & 3AL	5
PHYSICS 8A		4	BIOLOGY 1B	4
		9		**9**
				Junior
	Fall	**Units**	**Spring**	**Units**
CHEM 3B & 3BL		5	MCELLBI 102	4
PHYSICS 8B		4	MCB Elective	
		9		**4**
				Senior
	Fall	**Units**	**Spring**	**Units**
MCB Core Course			MCB Lab	

MCB Elective	MCB Core Course
0	0

Total Units: 43

Mission

The Department of Molecular and Cell Biology (MCB) is a large department that is subdivided into five divisions: Biochemistry, Biophysics, and Structural Biology (BBS); Cell and Developmental Biology (CDB); Genetics, Genomics & Development (GGD); Immunology & Pathogenesis (IMMP); and Neurobiology (NEU). All MCB students complete the same lower division coursework to gain critical training in Biology, Mathematics, Chemistry, and Physics. All or most lower division coursework is completed before major declaration. Upon declaring the major, MCB students choose an emphasis, or specialization, which determines the upper division core courses they will take and elective choices from which they will choose. Students can choose among several areas of specialization; emphases are broadly defined along divisional lines and allow students to focus on a more defined topic within MCB. MCB students who elect to participate in independent research may choose from sponsoring research laboratories within any MCB division, or, upon approval, in laboratories outside the Department (other UCB departments, LBNL, CHORI, UCSF, biotechnology companies). The MCB major provides excellent preparation for many careers and post-baccalaureate training programs, including graduate programs and heath-related professional programs (e.g., medicine, dentistry, optometry, pharmacy), science writing, law school, biotechnology, teaching, and academic research.

Learning Goals for the Major

1. Describe basic biological concepts and principles
2. Appreciate the different levels of biological organization, from molecules to ecosystems
3. Understand that biology has a chemical, physical, and mathematical basis
4. Explain the importance of the scientific method to understanding natural phenomena
5. Effectively communicate scientific data and ideas, both orally and in writing
6. Critically evaluate data, develop a hypothesis, and design experiments to address an interesting and novel problem
7. Demonstrate advanced knowledge in a specialized field of molecular and cell biology

MCB offers three types of undergraduate advising: staff advisers, faculty advisers, and peer advisers (http://mcb.berkeley.edu/undergrad/advising/advising-office/advising-services/#PAWS) .

Staff Advisers

Staff academic advisors are trained to support students and assist them in successfully completing their MCB major. They are excellent resources for questions concerning administration and academics, or finding out about other available services. Students should see a staff adviser for the following:

- Ask questions about major requirements
- Ask advice about schedule planning
- Declare the MCB major
- Consult about research opportunities, graduate and professional schools, career opportunities, scholarships, and internships
- Get their Adviser Code (AC) to access Tele-BEARS registration
- Get information and course control numbers (CCN's) for independent research
- Request general assistance, advice or information
- Find out about upcoming events and programs

Staff advisers are primarily available for drop-in advising, though limited appointments are available for more complex issues such as probation, academic difficulty and re-admission. If students would like to schedule an appointment, they should call 510-643-8895 during drop-in advising hours.

The general email address is mcbuao@berkeley.edu which is checked daily, Monday-Friday, so students will receive an answer to questions within one business day.

Advising Staff:
James Depealteau, 510-643-8895
Anwar Thomas, 510-643-8895

Faculty Advisers

Faculty advisers are MCB professors assigned to advise students about the MCB department, its courses, research, and other academic issues. Students are assigned a faculty adviser when they declare an MCB major. Students should see their faculty advisers for the following:

- Receive guidance toward achieving academic and career goals
- Ask questions about the content of MCB courses
- Request exceptions to MCB major requirements and policies (obtain their signature on MCB Substitution Form)
- Ask questions about biological research and about the field of biology in general
- Ask for recommendations on which graduate schools to attend
- Get their signature on the Curriculum Planning Form, after speaking with a UAO staff advisor first

For a list of advisers and their office hours, please see the Department's website (http://mcb.berkeley.edu/undergrad/advising/advising-office/advising-services) . Office hours listed are designated for drop-in advising unless otherwise noted. Faculty adviser office hours are effective from the first day of instruction until the final day of instruction for the fall and spring semesters. Faculty advisers are not available for office hours during winter or summer break. Students may refer to staff drop-in advising hours during summer sessions and non-instructional periods.

Peer Adviser Walk-in Services (PAWS)

Peer advisers are junior & senior MCB majors who volunteer their time to complement the UAO advising services by sharing their knowledge of and experience with lower-division requirements and upper-division classes, experience with student groups on campus, preparation for life beyond the BA, and use of various campus resources. To see the schedule and more information about who the peer advisers are and which courses they have taken, click here (http://mcb.berkeley.edu/undergrad/advising/advising-office/peer-advising) .

Undergraduate Research

Under the guidance of an MCB faculty sponsor, undergraduates in the MCB major may have the opportunity to work in a laboratory to gain valuable experience in scientific research. Interested students must take the initiative to make such arrangements. Over 40% of MCB majors work in a lab to gain valuable experience in scientific research. To get started, students should talk with classmates, peer advisers, a staff undergraduate adviser, graduate student instructors (GSIs), and faculty about their interest in learning more about laboratory research. For more information on research, see How to Find a Lab Position (http://mcb.berkeley.edu/undergrad/research/research/lab) .

Benefits of research:

- Science is a way to figure things out, so doing research will aid students in other aspects of their life. Students will ask and answer open ended questions and link seemingly disconnected pieces of information to find results that were not predicted.
- Explore things at the cutting edge and that no one has explored before.
- Learn tenacity, problem solving, and learn to be critical about the details because things have to be reproducible.
- Solve mysteries and experience the excitement of discovery.

Students may receive academic credit for their work by enrolling in an independent study course: MCELLBI 99/MCELLBI 199 or MCELLBI H196A/MCELLBI H196B. Enrollment applications are due in the Undergraduate Advising Office by the fifth week of each semester.

Other Research Opportunities

For additional resources for information regarding research opportunities, please see the links below:
Undergraduate Research Apprentice Program (URAP) (http://research.berkeley.edu/urap)
Scholarship Connection (http://scholarships.berkeley.edu)
Summer research opportunities (http://mcb.berkeley.edu/undergrad/research/research/summer-research)
Office of Research (http://vcresearch.berkeley.edu/faculty-expertise)

Funding for Student Research

There are a variety of ways to support your research. The Department recommends attending a workshop at the Office of Undergraduate Research (http://research.berkeley.edu/resources.php) or looking for funding opportunities on their website (http://research.berkeley.edu/opportunities.php?option=bab) or the Scholarship Connection website (http://scholarships.berkeley.edu) .

Molecular and Cell Biology: Neurobiology

MCELLBI 15 Current Topics in the Biological Sciences 2 Units
Students in this course will critically examine modern methods of biological investigations and their social implications. Relevant literature will be used to present basic biological concepts that address the cultural, technological and health aspects of current topics in the biological sciences. Designing and evaluating scientific questions will be stressed.
Rules & Requirements

Prerequisites: Suitable for freshmen who plan to major in a biological science

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Matsui

MCELLBI C31 Big Ideas in Cell Biology 3 Units
An introduction for students who do not intend to major in biology but who wish to satisfy their breadth requirement in Biological Sciences. Some major concepts of modern biology, ranging from the role of DNA and the way cells communicate, to interactions of cells and creatures with their environment, will be discussed without jargon and with attention to their relevance in contemporary life and culture.
Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Wilt

Also listed as: L & S C30X

MCELLBI 32 Introduction to Human Physiology 3 Units
A comprehensive introduction to human cell biology. The course will concentrate on basic mechanisms underlying human life processes, including cells and membranes; nerve and muscle function; cardiovascular, respiratory, renal, and gastrointestinal physiology; metabolism, endocrinology, and reproduction.
Rules & Requirements

Prerequisites: One year high school or college chemistry

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Machen, Ball

MCELLBI 32L Introduction to Human Physiology Laboratory 2 Units
Experiments and demonstrations are designed to amplify and reinforce information presented in 32. Exercises include investigations into the structure and function of muscle, nerve, cardiovascular, renal, respiratory, endocrine, and blood systems.
Rules & Requirements

Prerequisites: 32 or may be taken concurrently

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 3 hours of laboratory per week

Summer:
6 weeks - 2 hours of lecture and 8 hours of laboratory per week
8 weeks - 2 hours of lecture and 6 hours of laboratory per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Ball

MCELLBI 41 Genetics and Society 3 Units
Basic communication of inheritance; gene mapping; gene expression and genetic disease in animals and humans; social inheritance of genetics.
Rules & Requirements

Prerequisites: Primarily for students not specializing in biology

Credit Restrictions: Students will receive no credit after taking Biology 1A, Biology 1B, or Letters and Science 18.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Summer:
6 weeks - 7.5 hours of lecture per week
8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI C44 Biology for Voters 3 Units
This is a Discovery Course for non-Biology majors designed to introduce lower-division college students to biology through the lens of the contemporary problems facing people, the planet and the species of the planet. Modern genetic contributions will be presented on such issues as genetic engineering of plants and animals, the emergence of new pathogens, the role of genetic variation among individuals, and the extent to which DNA is and isn't destiny. Each week will close with the presentation and discussion of a defining biological challenge facing the world.
Objectives & Outcomes

Student Learning Outcomes: The learning objectives will be, at one end, to understand what an experiment is, how is it controlled and what does one need to know about an experiment to be able to rely upon any conclusion. That is the fundamental issue in all science, and is frequently overlooked in many media accounts of science. A second objective is to learn enough of the language of biology to be able to ask the kind of informed questions that we would want all elected representatives to pay attention to. A third objective is for students to cultivate confidence that through non-specialized information sources they can become informed consumers of contemporary scientific thought, and to develop those habits of intellect to think about evidence in a scientific manner. A fourth objective is for students to enjoy the abundance of high quality books, articles and multimedia that will enable a lifetime of discovery outside the structure of a college course.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Rine, Urnov

Also listed as: L & S C30Y

MCELLBI 50 The Immune System and Disease 3 Units
Course will discuss how the immune system resolves, prevents, or causes disease. A general overview of the immune system will be covered in the first five weeks followed by five weeks discussing infectious diseases including anthrax, mad cow, herpes, malaria, tuberculosis, and HIV. In addition, other lectures will focus on current immunology topics including vaccines, autoimmunity, allergy, transplantation, and cancer.
Rules & Requirements

Prerequisites: High school chemistry or Chemistry 1A and high school biology or BIOLOGY 1A. BIOLOGY 1AL is not required

Credit Restrictions: Students will receive no credit for 50 after taking 102 or C100A/Chemistry C130.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Beatty

MCELLBI 55 Plagues and Pandemics 3 Units
Discussion of how infectious agents cause disease and impact society at large. We will examine historical and current examples of plagues and pandemics and consider the question of what we should do to ameliorate the impact of infectious disease in the future. The course is intended for non-majors and will begin by briefly providing necessary background in microbiology and immunology. The primary focus in each subsequent week, however, will be on discussing a particular infectious disease. The course will be broad in scope covering biological, historical, ethical and social implications of each disease.
Rules & Requirements

Credit Restrictions: Students will receive no credit for 55 after taking 100, C100A, 100B, 102, 103, C103, 150, Chemistry C130, Plant and Microbial Biology C103, and Public Health C102.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Beatty, Vance

MCELLBI C61 Brain, Mind, and Behavior 3 Units
Introduction to human brain mechanisms of sensation, movement, perception, thinking, learning, memory, and emotion in terms of anatomy, physiology, and chemistry of the nervous system in health and disease. Intended for students in the humanities and social sciences and others not majoring in the biological sciences.
Rules & Requirements

Credit Restrictions: Students will receive no credit for Molecular and Cell Biology C61 after completing Molecular and Cell Biology 61, N61, W61, Psychology C61, Molecular and Cell Biology 104, C100A/ Chemistry C130, Molecular and Cell Biology 110, 130A, 136, 160, C160/ Neuroscience C160 or Integrative Biology 132. A deficient grade in Molecular and Cell Biology 61, N61, W61, or Psychology C61 may be removed by taking Molecular and Cell Biology C61/Psychology C61.<BR/ >

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Presti

Also listed as: PSYCH C61

MCELLBI W61 Brain, Mind, and Behavior 3 Units
This course deals with the structure and function of the human nervous system, with an emphasis on how brain physiology and chemistry are related to human behavior. This is a comprehensive introduction to the exciting field of contemporary neuroscience for students of all backgrounds and interests, including those from the humanities and social sciences, as well as physical and biological sciences. The Final Examination will be administered in a proctored setting. See Schedule of Classes for meeting information. This course is web-based.
Rules & Requirements

Credit Restrictions: Students will receive no credit for W61 after taking 61, C61, N61, or Letters and Science C30W. A deficient grade in 61, C61, N61, or Letters and Science C30W may be removed by taking W61.

Hours & Format

Summer:
6 weeks - 7 hours of web-based lecture and 2.5 hours of web-based discussion per week
8 weeks - 5.5-6 hours of web-based lecture and 1.5 hours of web-based discussion per week

Online: This is an online course.

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Presti

Formerly known as: N61

MCELLBI C62 Drugs and the Brain 3 Units
The history, chemical nature, botanical origins, and effects on the human brain and behavior of drugs such as stimulants, depressants, psychedelics, analgesics, antidepressants, antipsychotics, steroids, and other psychoactive substances of both natural and synthetic origin. The necessary biological, chemical, and psychological background material for understanding the content of this course will be contained within the course itself.

Rules & Requirements

Credit Restrictions: Students will receive no credit for C62 after taking 62, C100A/Chemistry C130, 102, 104, 110, 130A, 136, C160/Neuroscience C160,
Integrative Biology 132, Letters and Science C30T, or Psychology C19 .

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 4.5 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Presti

Also listed as: L & S C30T/PSYCH C19

MCELLBI 63 Introduction to Functional Neuroanatomy 3 Units
This course emphasizes beginning anatomy of the brain and spinal cord to individuals interested in understanding the dynamics of motor and sensory functions in the human body. Students in the Departments of Education, Psychology, and Integrative Biology, as well as students interested in medicine and the life sciences, are especially encouraged to attend.

Hours & Format

Summer:
4 weeks - 12 hours of lecture per week
6 weeks - 7.5 hours of lecture per week
8 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Reyes

MCELLBI C64 Exploring the Brain: Introduction to Neuroscience 3 Units
This course will introduce lower division undergraduates to the fundamentals of neuroscience. The first part of the course covers basic membrane properties, synapses, action potentials, chemical and electrical synaptic interactions, receptor potentials, and receptor proteins. The second part of the course covers networks in invertebrates, memory and learning behavior, modulation, vertebrate brain and spinal cord, retina, visual cortex architecture, hierarchy, development, and higher cortical centers.

Rules & Requirements

Prerequisites: High school chemistry or Chemistry 1A; high school biology or BIOLOGY 1A. BIOLOGY 1AL is not required

Credit Restrictions: Students will receive no credit for Molecular and Cell Biology/Psychology C64 after taking Molecular and Cell Biology C61/Letters and Science C30W, 104, 100A/Chemistry C130, Molecular and Cell Biology 110, 130A, 136, 160, C160/Neuroscience C160, or Integrative Biology 132. Students may remove a deficient grade in Molecular and Cell Biology C64/Psychology C64 after Molecular and Cell Biology 64.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 4 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Caporale

Also listed as: PSYCH C64

MCELLBI 84B Sophomore Seminar 1 or 2 Units
Sophomore seminars are small interactive courses offered by faculty members in departments all across the campus. Sophomore seminars offer opportunity for close, regular intellectual contact between faculty members and students in the crucial second year. The topics vary from department to department and semester to semester. Enrollment limited to 15 sophomores.
Rules & Requirements

Prerequisites: At discretion of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-2 hours of seminar per week

Summer:
6 weeks - 4-6 hours of seminar per week
8 weeks - 3-4 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MCELLBI 90A Freshman Seminars: Biochemistry and Molecular Biology 1 Unit
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Rules & Requirements

Prerequisites: Open to freshmen only

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MCELLBI 90B Freshman Seminars: Cell and Developmental Biology 1 Unit
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Rules & Requirements

Prerequisites: Open to freshmen only

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MCELLBI 90C Freshman Seminars: Genetics and Development 1 Unit
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Rules & Requirements

Prerequisites: Open to freshmen only

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MCELLBI 90D Freshman Seminars: Immunology 1 Unit
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Rules & Requirements

Prerequisites: Open to freshmen only

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MCELLBI 90E Freshman Seminars: Neurobiology 1 Unit
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Rules & Requirements

Prerequisites: Open to freshmen only

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MCELLBI 91D Immunology 2 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester.
Rules & Requirements

Prerequisites: Open to freshmen and sophomores only

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MCELLBI C96 Studying the Biological Sciences 1 Unit
Freshmen will be introduced to the "culture" of the biological sciences, along with an in-depth orientation to the academic life and the culture of the university as they relate to majoring in biology. Students will learn concepts, skills, and information that they can use in their major course, and as future science professionals. Restricted to freshmen in the biology scholars program.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Matsui

Also listed as: INTEGBI C96/PLANTBI C96

MCELLBI 98 Directed Group Study 1 - 4 Units
Lectures and small group discussions focusing on topics of interest, varying from semester to semester.
Rules & Requirements

Prerequisites: Freshmen and sophomores only

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MCELLBI 99 Supervised Independent Study 1 - 4 Units
Rules & Requirements

Prerequisites: 3.3 GPA and consent of instructor

Credit Restrictions: One unit of credit is given for every three hours of work in the lab per week to a maximum of 4 units.

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer:
8 weeks - 1.5-7.5 hours of independent study per week
10 weeks - 1.5-6 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MCELLBI 100B Biochemistry: Pathways, Mechanisms, and Regulation 4 Units
We survey cellular metabolic pathways, with focus on the underlying chemistry, bioenergetics, and mechanisms. We discuss signaling in the context of a physical chemical understanding of diffusion, transport and molecular interactions. We will highlight the intertwining of signaling and dysregulation with metabolic disorders and cancer, and the production of renewable chemicals such as biofuels. The course is designed for majors in the biochemistry and molecular biology, genetics and development, or immunology emphases.
Rules & Requirements

Prerequisites: C100A/Chemistry C130

Credit Restrictions: Students will receive 3 units for Molecular and Cell Biology 100B after taking Molecular and Cell Biology 102 and no credit after taking Chemistry 135.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Kuriyan, Savage, Alper

MCELLBI C100A Biophysical Chemistry: Physical Principles and the Molecules of Life 4 Units
Thermodynamic and kinetic concepts applied to understanding the chemistry and structure of biomolecules (proteins, DNA, and RNA). Molecular distributions, reaction kinetics, enzyme kinetics. Bioenergetics, energy transduction, and motor proteins. Electrochemical potential, membranes, and ion channels.
Rules & Requirements

Prerequisites: Chemistry 3A or 112A, Mathematics 1A, BIOLOGY 1A and 1AL; Chemistry 3B or 112B recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 5.5 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Also listed as: CHEM C130

MCELLBI 102 Survey of the Principles of Biochemistry and Molecular Biology 4 Units
A comprehensive survey of the fundamentals of biological chemistry, including the properties of intermediary metabolites, the structure and function of biological macromolecules, the logic of metabolic pathways (both degradative and biosynthetic) and the molecular basis of genetics and gene expression.
Rules & Requirements

Prerequisites: BIOLOGY 1A, 1AL, and Chemistry 3B (or equivalent courses). Recommended: a course in physical chemistry

Credit Restrictions: Students will receive 2 units of credit for 102 after taking 100B or C100A/Chemistry C130. Students will receive no credit for 102 after taking 110 and any of 100B or C100A/Chemistry C130. No credit for 102 after taking Chemistry 135.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer:
8 weeks - 6 hours of lecture and 2 hours of discussion per week
10 weeks - 4 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI C103 Bacterial Pathogenesis 3 Units
This course for upper division and graduate students will explore the molecular and cellular basis of microbial pathogenesis. The course will focus on model microbial systems which illustrate mechanisms of pathogenesis. Most of the emphasis will be on bacterial pathogens of mammals, but there will be some discussion of viral and protozoan pathogens. There will be an emphasis on experimental approaches. The course will also include some aspects of bacterial genetics and physiology, immune response to infection, and the cell biology of host-parasite interactions.
Rules & Requirements

Prerequisites: 100, 102 or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Portnoy

Also listed as: PB HLTH C102/PLANTBI C103

MCELLBI 104 Genetics, Genomics, and Cell Biology 4 Units
This course will introduce students to key concepts in genetic analysis, eukaryotic cell biology, and state-of-the-art approaches in genomic medicine. Lectures will highlight basic knowledge of cellular processes with the basis for human diseases, particularly cancer. Prerequisite courses will have introduced students to the concepts of cells, the central dogma of molecular biology, and gene regulation. Emphasis in this course will be on eukaryotic cell processes, including cellular organization, dynamics, and signaling.
Rules & Requirements

Prerequisites: 102

Credit Restrictions: Students will receive 1 unit for Molecular and Cell Biology 104 after completing Molecular and Cell Biology 140 or C142/ Integrative Biology C163, or 3 units after completing Molecular and Cell Biology 110 or 130.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 110 Molecular Biology: Macromolecular Synthesis and Cellular Function 4 Units
Molecular biology of prokaryotic and eukaryotic cells and their viruses. Mechanisms of DNA replication, transcription, translation. Structure of genes and chromosomes. Regulation of gene expression. Biochemical processes and principles in membrane structure and function, intracellular trafficking and subcellular compartmentation, cytoskeletal architecture, nucleocytoplasmic transport, signal transduction mechanisms, and cell cycle control.
Rules & Requirements

Prerequisites: C100A (may not be taken concurrently); Plan 1 Emphasis 1 (BMB) majors should take 100B prior to 110

Credit Restrictions: Students will receive 3 units of credit for 110 after taking 104.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI C110L General Biochemistry and Molecular Biology Laboratory 4 Units
Experimental techniques of biochemistry and molecular biology, designed to accompany the lectures in Molecular and Cell Biology 100B and 110.
Rules & Requirements

Prerequisites: 110 (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 2-2 hours of lecture and 6-8 hours of laboratory per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Also listed as: CHEM C110L

MCELLBI C112 General Microbiology 4 Units
This course will explore the molecular bases for physiological and biochemical diversity among members of the two major domains, Bacteria and Archaea. The ecological significance and evolutionary origins of this diversity will be discussed. Molecular, genetic, and structure-function analyses of microbial cell cycles, adaptive responses, metabolic capability, and macromolecular syntheses will be emphasized.
Rules & Requirements

Prerequisites: BIOLOGY 1A and 1B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Ryan

Also listed as: PLANTBI C112

MCELLBI C112L General Microbiology Laboratory 2 Units
Experimental techniques of microbiology designed to accompany the lecture in C112 and C148. The primary emphasis in the laboratory will be on the cultivation and physiological and genetic characterization of bacteria. Laboratory exercises will include the observation, enrichment, and isolation of bacteria from selected environments.
Rules & Requirements

Prerequisites: C112 (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of laboratory and 1 hour of discussion per week

Summer: 10 weeks - 6 hours of laboratory and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructors: Komeili, Taga

Also listed as: PLANTBI C112L

MCELLBI C114 Introduction to Comparative Virology 4 Units
This course will provide a comparative overview of virus life cycles and strategies viruses use to infect and replicate in hosts. We will discuss virus structure and classification and the molecular basis of viral reproduction, evolution, assembly, and virus-host interactions. Common features used during virus replication and host cellular responses to infection will be covered. Topics also included are common and emerging virus diseases, their control, and factors affecting their spread.
Rules & Requirements

Prerequisites: Introductory chemistry (Chemistry 1A or 3A-3B or equivalent) and introductory biology (BIOLOGY 1A, 1AL, and 1B or equivalent) and general biochemistry (Molecular and Cell Biology C100A or equivalent--preferably completed but may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Glaunsinger, Jackson

Also listed as: ESPM C138/PLANTBI C114

MCELLBI C116 Microbial Diversity 3 Units
This course for upper-division and graduate students will broadly survey myriad types of microbial organisms, both procaryote and eucaryote, using a phylogenetic framework to organize the concept of "biodiversity." Emphasis will be on the evolutionary development of the many biochemical themes, how they mold our biosphere, and the organisms that affect the global biochemistry. Molecular mechanisms that occur in different lineages will be compared and contrasted to illustrate fundamental biological strategies. Graduate students additionally should enroll in C216, Microbial Diversity Workshop.
Rules & Requirements

Prerequisites: Upper-division standing. C112 or consent of instructor and organic chemistry (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Coates

Formerly known as: 116

Also listed as: PLANTBI C116

MCELLBI 118 The Cancer Karyotype: What it is and What it Does 1 Unit
Mutational cancer theories do not explain why cancers: 1) have clonal individual karyotypes; 2) have polygenic transcriptomes and phenotypes; 3) have flexible karyotypes, which evolve progressive malignancy and drug resistance, but maintain autonomy and even immortality; and 4) Why carcinogens induce cancer only after conspicuously long latent periods of years to decades. To answer these questions, this course tests a new karyotypic theory, which postulates that cancers evolve much like new species.
Rules & Requirements

Prerequisites: 102. 104 recommended

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Duesberg

MCELLBI 130A Cell and Systems Biology 4 Units
This course will provide a detailed discussion of a wide range of topics in cell biology emphasizing experimental approaches and key experiments that have provided important insights. The course is aimed at conveying an understanding of how cellular structure and function arise as a result of the properties of cellular macromolecules. An emphasis will be placed on the dynamic nature of cellular organization and will include a description of physical properties of cells (dimensions, concepts of free energy, diffusion, biophysical properties). Students will be introduced to quantitative aspects of cell biology and a view of cellular function that is based on integrating multiple pathways and modes of regulation (systems biology).
Rules & Requirements

Prerequisites: 102 and 104. Instructors may waive 104 prerequisite for non-Molecular and Cell Biology majors

Credit Restrictions: Students will receive no credit for 130A after taking 130.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 132 Biology of Human Cancer 4 Units
The course is designed for students interested in learning about the molecular and cell biology of cancer and how this knowledge is being applied to the prevention, diagnosis and therapy of cancer. Topics covered include tumor pathology and epidemiology; tumor viruses and oncogenes; intracellular signaling; tumor suppressors; multi-step carcinogenesis and tumor progression; genetic instability in cancer; tumor-host interactions; invasion and metastasis; tumor immunology; cancer therapy.
Rules & Requirements

Prerequisites: 102 or 110 (may be taken concurrently); BIOLOGY 1A, 1AL, 1B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: 135G

MCELLBI 133L Physiology and Cell Biology Laboratory 4 Units
Experimental analyses of central problems in cell biology and physiology using modern techniques, including DNA cloning and protein biochemistry, fluorescence microscopy of the cytoskeleton and organelles, DNA transfection and cell cycle analysis of cultured mammalian cells, RNA interference and drug treatments to analyze ion channel function in cell contractility and intracellular signaling, and somatosensation.
Rules & Requirements

Prerequisites: 104

Credit Restrictions: Students will receive no credit for 133L after taking 130L.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 7 hours of laboratory per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

MCELLBI C134 Chromosome Biology/Cytogenetics 3 Units
Survey of behavior, structure, and function of chromosomes with emphasis on behavior in model organisms. Topics include mitosis, meiosis, chromosome aberrations, genome function, dosage compensation, transposons, repetitive DNA, and modern cytological imaging.
Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Cande, Karpen

Also listed as: PLANTBI C134

MCELLBI 135A Topics in Cell and Developmental Biology: Molecular Endocrinology 3 Units
Molecular mechanisms by which hormones elicit specific responses and regulate gene expression; hormone-receptor interaction; synthesis, transport and targeting of hormones, growth factors and receptors.
Rules & Requirements

Prerequisites: Molecular and Cell Biology 102, BIOLOGY 1A, 1AL, 1B, Chemistry 3A-3B or equivalent, or consent of instructor

Credit Restrictions: Students will receive no credit for Molecular and Cell Biology 135A after taking Physiology 142.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Firestone

MCELLBI 136 Physiology 4 Units
Principles of mammalian (primarily human) physiology emphasizing physical, chemical, molecular and cellular bases of functional biology. The following topics will be covered: cellular and membrane ion and nonelectrolyte transport; cell and endocrine regulation; autonomic nervous system regulation; skeletal, smooth and cardiac muscle; cardiovascular physiology; respiration; renal physiology; gastrointestinal physiology. Discussion section led by Graduate Student Instructor will review material covered in lecture.
Rules & Requirements

Prerequisites: BIOLOGY 1A, 1AL, 1B, PHYSICS 8A. PHYSICS 8B recommended

Credit Restrictions: Students will receive no credit for 136 after Integrative Biology 132.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 137 Computer Simulation in Biology 3 Units
Modeling and computer simulation of dynamic biological processes using special graphical interfaces requiring very little mathematical or computer experience. Models are drawn from the current literature to teach concepts and technique. The later part of the course is a workshop for student-selected individual projects. Computer work may be done at home or in the university laboratory.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructors: Macey, Oster

Formerly known as: 136L

MCELLBI 140 General Genetics 4 Units
In-depth introduction to genetics, including mechanisms of inheritance; gene transmission and recombination; transposable DNA elements; gene structure, function, and regulation; and developmental genetics. Some exams may be given in the evening.
Rules & Requirements

Prerequisites: BIOLOGY 1A and 1AL,BIOLOGY 1A

Credit Restrictions: Students will receive 1 unit of credit for Molecular and Cell Biology 140 after completing either Molecular and Cell Biology 104, C142, or Integrative Biology C163.,Students will receive 1 unit of credit for Molecular and Cell Biology 140 after completing Molecular and Cell Biology 104, C142, or Integrative Biology C163.

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 140 General Genetics 4 Units
In-depth introduction to genetics, including mechanisms of inheritance; gene transmission and recombination; transposable DNA elements; gene structure, function, and regulation; and developmental genetics. Some exams may be given in the evening.
Rules & Requirements

Prerequisites: BIOLOGY 1A and 1AL,BIOLOGY 1A

Credit Restrictions: Students will receive 1 unit of credit for Molecular and Cell Biology 140 after completing either Molecular and Cell Biology 104, C142, or Integrative Biology C163.,Students will receive 1 unit of credit for Molecular and Cell Biology 140 after completing Molecular and Cell Biology 104, C142, or Integrative Biology C163.

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 140L Genetics Laboratory 4 Units
Experimental techniques in classical and molecular genetics.
Rules & Requirements

Prerequisites: Molecular and Cell Biology 104 or 140. May be taken concurrently

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 6 hours of laboratory per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

MCELLBI 141 Developmental Biology 4 Units
An introduction to principles and processes of embryonic and post-embryonic development, stressing mechanisms of cell and tissue interactions, morphogenesis and regulation of gene expression.
Rules & Requirements

Prerequisites: 102 or C100A; BIOLOGY 1A, 1AL, and 1B; 110 or 130 recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: 131

MCELLBI 143 Evolution of Genomes, Cells, and Development 3 Units
This course is intended for upper-division undergraduates seeking an interactive course based on modern concepts in evolution and comparative genomics. The course will emphasize the contribution of molecular evolution to a series of seminal events in life's history: origin of life; origin of cells; origin of eukaryotes; origin of multicellularity; evolution of animal development; human origins.
Rules & Requirements

Prerequisites: BIOLOGY 1A-1B and Molecular and Cell Biology C100A or 102; 104 or 140 recommended

Credit Restrictions: Student will receive no credit for 143 after taking Integrative Biology 163.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructors: King, Levine, Patel

MCELLBI C148 Microbial Genomics and Genetics 4 Units
Course emphasizes bacterial and archaeal genetics and comparative genomics. Genetics and genomic methods used to dissect metabolic and development processes in bacteria, archaea, and selected microbial eukaryotes. Genetic mechanisms integrated with genomic information to address integration and diversity of microbial processes. Introduction to the use of computational tools for a comparative analysis of microbial genomes and determining relationships among bacteria, archaea, and microbial eukaryotes.
Rules & Requirements

Prerequisites: Molecular and Cell Biology C100A/Chemistry C130 or Molecular and Cell Biology 102

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Brenner, Glass

Formerly known as: Plant and Microbial Biology 118

Also listed as: PLANTBI C148

MCELLBI 149 The Human Genome 3 Units
This is an upper division course for majors in MCB with an interest in an in-depth exploration of the forces that shape the human genome and the human population, as well as the ways that human genetic information can be used in medicine, ancestry and forensics. The course will combine lectures and discussion of research papers.
Rules & Requirements

Prerequisites: MCB 140, MCB 104 or equivalent

Credit Restrictions: Students will receive 2 units for Molecular and Cell Biology 149 after taking Integrative Biology 164.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructors: Eisen, Meyer, Rokhsar

MCELLBI 150 Molecular Immunology 4 Units
Fundamentals of immunology with emphasis on biochemical and molecular approaches to study of the immune system and its application in medicine and biotechnology. Topics covered include description of the immune system, antibody and T-cell receptor structure and function, genes of the immunoglobulin superfamily, cells and molecular mediators that regulate the immune response, allergy, autoimmunity, immunodeficiency, tissue and organ transplants, and tumor immunology.
Rules & Requirements

Prerequisites: C100A/Chemistry C130, or 102

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 150L Immunology Laboratory 4 Units
Experimental techniques in mammalian molecular biology and cellular immunology. Molecular techniques covered include PCR and recombinant DNA procedures such as gene cloning, gene transfer, DNA sequencing, Southern blot, and restriction mapping. Immunological techniques covered include cell culture and monoclonal antibody production, flow cytometry, ELISA, immunoprecipitation, and western blot.
Rules & Requirements

Prerequisites: Molecular and Cell Biology 150 (may be taken concurrently); consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 8 hours of laboratory and 1 hour of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Formerly known as: Microbiology 103L

MCELLBI 160 Cellular and Molecular Neurobiology 4 Units
Comprehensive introductory survey of cellular and molecular neuroscience, including cellular neurophysiology, ion channel function, synaptic function and plasticity, sensory transduction, and brain development. Includes introduction to molecular basis of neurological disease. Analysis from the level of molecules to cells to simple circuits.
Rules & Requirements

Prerequisites: BIOLOGY 1A and 1AL. Prerequisite or co-requisite: PHYSICS 8B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Molecular and Cell Biology C160/Neuroscience C160

MCELLBI 160L Neurobiology Laboratory 4 Units
Experimental analyses of properties and interactions of nerve cells and systems, illustrating principal features and current methods. Techniques employed include computer simulation of neuron properties, electrophysiological recording and stimulation of nerves and cells, digitally enhanced video imaging of outgrowth, fluorescence immunocytochemistry, analysis of sensory: CNS mapping, human-evoked potential recording, sensory psychophysics.
Rules & Requirements

Prerequisites: BIOLOGY 1A, 1AL; PHYSICS 8A-8B, Molecular and Cell Biology C100A/Chemistry C130 or 102; Molecular and Cell Biology 160; or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 8 hours of laboratory per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 161 Circuit, Systems and Behavioral Neuroscience 4 Units
Comprehensive survey of circuits and systems neuroscience, including sensory and motor systems, learning and memory, neuromodulatory systems and brain state and higher functions.
Biological and computational principles of neural circuit function. Analysis from the level of small circuits to behavior.
Rules & Requirements

Prerequisites: Molecular and Cell Biology 160

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 163 Mammalian Neuroanatomy 4 Units
Development, structure (gross and microscopic), and functional relationships of the mammalian nervous system.
Rules & Requirements

Prerequisites: BIOLOGY 1A. BIOLOGY 1AL is not required

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MCELLBI 165 Neurobiology of Disease 3 Units
The molecular, cellular, and neural circuit basis of neurological disease. Includes neurochemistry and reward systems, neural development and its disorders, addiction, neurodegenerative and neuropsychiatric disorders. Students will read and discuss primary papers from the research literature.
Rules & Requirements

Prerequisites: Molecular and Cell Biology 160

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Caporale

MCELLBI 166 Biophysical Neurobiology 3 Units
Electrochemistry and ion transport phenomena, equivalent circuits, excitability, action potentials, voltage clamp and the Hodgkin-Huxley model. Biophysical properties of ion channels. Statistical and electrophysiological models of synaptic transmission, Quantitative models for dendritic structure and neuronal morphogenesis. Sensory transduction, cellular networks as computational devices, information processing and transfer.
Objectives & Outcomes

Course Objectives: 1) Derive equations for Nernst and GHK membrane potential from fundamental physics concepts.
2) Describe the experiments and theory underlying the Hodgkin-Huxley model.
3) Understand biophysical properties of gating particles called ion channels.
4) Apply and solve equivalent circuit models to describe resting and excitable cells, synaptic transmission and sensory transduction.
5) Use Poisson, Gaussian and binomial distributions to analyze the gating of ion channels, synaptic transmission, and absolute sensitivity of vision.
6) Model dendritic structure based on quantitative descriptors of shape and energy minimization theory.
7) Explain experiments and models of sensory transduction, neuronal integration and lateral inhibition.

Rules & Requirements

Prerequisites: BIOLOGY 1A, 1AL, PHYSICS 8A-8B, Chemistry 1A, 3A/3AL-3B, or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Elul, Isacoff, Miller

MCELLBI 180 Undergraduate Teaching of Biology 1A Laboratory 1 or 2 Units
Course consists of a weekly three-hour training session that focuses on laboratory techniques, instructional aids, and problem solving, plus an additional three hour weekly laboratory where the UGSI is required to assist a GSI in the instruction of laboratory (answering questions, providing demonstrations, etc.).
Rules & Requirements

Prerequisites: BIOLOGY 1A, 1AL with a minimum grade of B. Appointment as a UGSI in biology by consent of instructor. Restricted to undergraduate students

Repeat rules: Course may be repeated for a maximum of 4 units.Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of session per week

Summer: 8 weeks - 3 hours of session per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MCELLBI 180C Undergraduate Teaching of Molecular and Cell Biology 32 Laboratory 1 - 2 Units
Course consists of a weekly three-hour training session that focuses on laboratory techniques, instructional aids, and problem solving, plus an additional three-hour weekly laboratory where the UGSI is required to assist a GSI in the instruction of laboratory (answering questions, providing demonstrations, etc.). Students will be graded on lecture and laboratory attendance and preparation of one quiz.
Rules & Requirements

Prerequisites: 32, 136, or Integrative Biology 132 and Molecular and Cell Biology 32L or Integrative Biology 132L laboratory courses in physiology with minimum grades of B. Appointment as a UGSI in physiology by consent of instructor

Repeat rules: Course may be repeated for a maximum of 4 units.Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of session per week

Summer:
6 weeks - 8 hours of session per week
8 weeks - 6 hours of session per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

MCELLBI H196A Honors Research 1 - 4 Units
Individual research and thesis preparation under the supervision of a faculty member. Acceptance to the Molecular and Cell Biology Honors Program is required. Contact the MCB Undergraduate Affairs Office, 3060 Valley Life Sciences Building, for application and details. Honor students must complete at least two semesters of research, taking a minimum of 4 units and a maximum of 8 units of H196A-196B. If desired, one semester of 199 can be used to replace H196A.
Rules & Requirements

Prerequisites: Senior honors status and consent of instructor

Repeat rules: Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer: 8 weeks - 1.5-7.5 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MCELLBI H196B Honors Research 1 - 4 Units
Individual research and completion of thesis under the supervision of a faculty member. This course satisfies the thesis requirement for the Molecular and Cell Biology Department Honors Program. Contact the MCB Undergraduate Affairs Office, 3060 Valley Life Sciences Building, for program details and an application. Honor students must complete at least two semesters of research, taking a minimum of 4 units and a maximum of 8 units of H196A-196B. One semester of H196B is required.
Rules & Requirements

Prerequisites: Senior honors status and consent of instructor

Repeat rules: Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer: 8 weeks - 1.5-7.5 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

MCELLBI 197 Supervised Internship 1 Unit
Supervised experience relevant to specific topics of biology in off-campus organizations. Written report and evaluation from internship supervisor required.
Rules & Requirements

Prerequisites: Consent of MCB Faculty, restricted to MCB majors and prospective majors only. Certification from supervisor that credit is required

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of internship per week

Summer: 8 weeks - 6 hours of internship per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MCELLBI 198 Directed Group Study 1 - 4 Units
Lectures and small group discussions focusing on topics of interest, varying from semester to semester.
Rules & Requirements

Prerequisites: Upper division standing

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MCELLBI 199 Supervised Independent Study and Research 1 - 4 Units
Enrollment restrictions apply; see the Introduction to Courses and Curricula section of this catalog.

Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer:
6 weeks - 1-4 hours of independent study per week
8 weeks - 1-4 hours of independent study per week
10 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.