

# Microbial Biology

## Bachelor of Science (BS)

The Department of Plant and Microbial Biology (PMB) offers an undergraduate major program in Microbial Biology, leading to a Bachelor of Science (BS) degree. Microbial biology focuses on small life forms such as microbes, viruses, and fungi that make up the majority of planetary biomass. Microbes play fundamental roles in maintaining biosphere health. They degrade environmental pollutants, supply essential nutrients and chemicals directly to multicellular organisms, and engage in numerous beneficial symbioses with higher organisms.

## Admission to the Major

Advice on admission for freshmen and transfer students can be found on the Rausser College of Natural Resources Admissions Guide (<http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/#admissionstext>) page or the college's Prospective Student website (<https://nature.berkeley.edu/prospective-students/>). Freshman students may apply directly to the major, or they may select the Rausser College of Natural Resources's undeclared option and declare the major by the end of their fourth semester. Transfer students may apply directly to the major through the UC application.

Information for current Berkeley students who would like to declare the major after admission, including information on a change of major or change of college, please see chapter 6 of the Rausser College of Natural Resources Undergraduate Student Handbook (<https://nature.berkeley.edu/handbook/>). (<https://nature.berkeley.edu/handbook/>)

## Research Opportunities

In addition to the Berkeley campus Undergraduate Research Apprenticeship Program (URAP), Rausser College students can also apply for the college's Sponsored Projects for Undergraduate Research (SPUR) program. For more information, please see the college's website (<http://nature.berkeley.edu/research/undergraduate-research/>).

## Honors Program

Students with a GPA of 3.6 or higher may enroll in the Rausser College of Natural Resources Honors Program (H196) once they have reached upper division standing. To fulfill the program requirements, students work with a faculty sponsor to design, conduct, and report on an individual research project. For further information about registration for the honors symposium and the honors requirements, please see the college's website.

## Other Major Program offered by the Department of Plant and Microbial Biology

Genetics and Plant Biology (<http://guide.berkeley.edu/undergraduate/degree-programs/genetics-plant-biology/>) (Major only)

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. A minimum cumulative grade point average (GPA) of 2.0 is required.
3. A minimum GPA of 2.0 in upper division major requirements is required.
4. At least 15 of the 36 required upper division units must be taken in the Rausser College of Natural Resources.
5. A maximum of 16 units of independent study (courses numbered 97, 98, 99, 197, 198, and 199) may count toward graduation, with a maximum of 4 units of independent study per semester.
6. No more than 1/3 of the total units attempted at UC Berkeley may be taken *Pass/Not Pass*. This includes units in the Education Abroad Program and UC Intercampus Visitor or Exchange Programs.
7. A maximum of 4 units of physical education courses will count toward graduation.

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

## Lower Division Requirements

### Reading and Composition Requirement

Students are required to complete the reading and composition (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/reading-composition-requirement/>) requirement by the end of their sophomore year.

### Humanities & Social Sciences Requirement

Fifteen (15) units of coursework need to be taken from L&S breadth list (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/#breadthrequirementstext>), excluding biological and physical science courses. A maximum of 6 foreign language units can be used to fulfill the requirement.

Select one sequence from the following:

MATH 16A & MATH 16B & STAT 2	Analytic Geometry and Calculus and Analytic Geometry and Calculus and Introduction to Statistics	10
MATH 1A & MATH 1B & STAT 2	Calculus and Calculus and Introduction to Statistics	12
MATH 10A & MATH 10B	Methods of Mathematics: Calculus, Statistics, and Combinatorics and Methods of Mathematics: Calculus, Statistics, and Combinatorics <sup>1</sup>	8

Complete all of the following:

CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory	5
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 1B	General Biology Lecture and Laboratory	4
BIOLOGY 1A & 1AL	General Biology Lecture and General Biology Laboratory	5

PHYSICS 8A	Introductory Physics	4
Recommended, not required: PLANTBI 22		

<sup>1</sup> The Stats requirement can be fulfilled with STAT 2 / STAT 20 / DATA C8 / PBHLTH 142

## Upper Division Requirements

### Upper Division Core Requirements

MCELLBI 102	Survey of the Principles of Biochemistry and Molecular Biology	4
PLANTBI C112	General Microbiology	4
PLANTBI C112L	General Microbiology Laboratory	2
PLANTBI C148	Microbial Genomics and Genetics	4

### Upper Division Core Electives

Select two of the following:

PLANTBI C103	Bacterial Pathogenesis	3-4
	or INTEGBI 11 Organismal Microbiomes and Host-Pathogen Interactions	
	or PB HLTH 16 Public Health Microbiology	
PLANTBI 104L	Discovery-Based Research in Microbiology	2
PLANTBI C110L	Biology of Fungi with Laboratory	4
PLANTBI 113	California Mushrooms	3
PLANTBI C114	Introduction to Comparative Virology	4
PLANTBI C116	Microbial Diversity	3
PLANTBI 120	Biology of Algae	2,
& 120L	and Laboratory for Biology of Algae	2
PLANTBI 165	Plant-Microbe Interactions	3
ESPM 112	Microbial Ecology	3
	or ESPM 131 Soil Microbiology and Biogeochemistry	
MCELLBI N184	Intro to CRISPR: From Basic Biology to Genome Editing Technology	2
& N184L	and Intro to CRISPR Lab: From Basic Biology to Genome Editing Technology	

## Microbial Biology Concentrations

Option 1: Choose four courses from one of the concentrations below. One of the four courses may be selected from the upper division core electives list above, but may not be counted for both the upper division core elective requirement and your concentration.

Option 2: General Microbiology Concentration. Select any four courses from the concentrations below and/or the upper division core elective list above. Courses selected for Option 2 may not overlap with the courses used to fulfill the upper division elective requirement.

### Host-Pathogen Interactions

BIO ENG 100	Ethics in Science and Engineering <sup>1</sup>	3-4
	or ESPM 162 Bioethics and Society	
BIO ENG 135	Frontiers in Microbial Systems Biology	4
BIO ENG 168L	Practical Light Microscopy	3
INTEGBI 116L	Medical Parasitology	4
MCELLBI 104	Genetics, Genomics, and Cell Biology	4
MCELLBI 137L	Physical Biology of the Cell	4
MCELLBI 150	Molecular Immunology	4

MCELLBI 153	Molecular Medicine	4
PB HLTH 150A	Introduction to Epidemiology and Human Disease	4
PB HLTH 150B	Human Health and the Environment in a Changing World	3
PLANTBI C134	Genome Organization and Nuclear Dynamics	3
PLANTBI 135	Physiology and Biochemistry of Plants	3
PLANTBI C136	Advanced Plant Biochemistry	4
PLANTBI C146	Data Science for Biology	3
PLANTBI 150	Plant Cell Biology	3
PLANTBI 160	Plant Molecular Genetics <sup>1</sup>	3-4
	or MCELLBI 14 General Genetics	
PLANTBI 185	Techniques in Light Microscopy	3

<sup>1</sup> No more than one course may be taken from this group to satisfy the concentration requirement.

## Evolution/Computational Genomics

BIO ENG C131	Introduction to Computational Molecular and Cell Biology	4
BIO ENG 135	Frontiers in Microbial Systems Biology	4
COMPSCI 61A	The Structure and Interpretation of Computer Programs <sup>2</sup>	4
COMPSCI 61B	Data Structures <sup>2</sup>	4
COMPSCI 176	Algorithms for Computational Biology	4
ESPM C125	Biogeography	4
INTEGBI 134L	Practical Genomics	4
INTEGBI C160	Evolution	4
	or INTEGBI 16 Population and Evolutionary Genetics	
PLANTBI C146	Data Science for Biology	3
MCELLBI 140	General Genetics	4

<sup>1</sup> No more than one course may be taken from this group to satisfy the concentration requirement.

<sup>2</sup> CS 61A and CS 61B can be used as concentration electives even though they are lower division courses. However, they do not count as upper division units towards graduation.

## Ecology & Environmental Microbiology

BIO ENG 100	Ethics in Science and Engineering <sup>1</sup>	3-4
	or ESPM 162 Bioethics and Society	
BIO ENG 135	Frontiers in Microbial Systems Biology	4
BIO ENG 140L	Synthetic Biology Laboratory	4
BIO ENG 147	Principles of Synthetic Biology	4
BIO ENG 168L	Practical Light Microscopy	3
ESPM C125	Biogeography	4
ESPM 134	Fire, Insects, and Diseases in Forest Ecosystems	3
ESPM C153	Ecology	3
ESPM 157	Data Science in Global Change Ecology	4
INTEGBI 134L	Practical Genomics	4
INTEGBI 161	Population and Evolutionary Genetics	4
INTEGBI 162	Ecological Genetics	4
INTEGBI 172	Coevolution: From Genes to Ecosystems	4
PLANTBI C146	Data Science for Biology	3

PLANTBI C192	Molecular Approaches to Environmental Problem Solving	2
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<sup>1</sup> No more than one course may be taken from this group to satisfy the concentration requirement.

## Microbial Biotechnology

BIO ENG 100	Ethics in Science and Engineering <sup>1</sup>	3-4
or ESPM 162	Bioethics and Society	
BIO ENG 135	Frontiers in Microbial Systems Biology	4
BIO ENG 140L	Synthetic Biology Laboratory	4
BIO ENG 147	Principles of Synthetic Biology	4
BIO ENG 168L	Practical Light Microscopy	3
ESPM 157	Data Science in Global Change Ecology	4
MCELLBI 104	Genetics, Genomics, and Cell Biology	4
MCELLBI 137L	Physical Biology of the Cell	4
MCELLBI 140	General Genetics	4
MCELLBI 153	Molecular Medicine	4
PLANTBI 122	Bioenergy	2
PLANTBI C134	Genome Organization and Nuclear Dynamics	3
PLANTBI C136	Advanced Plant Biochemistry	4
PLANTBI C146	Data Science for Biology	3
PLANTBI 150	Plant Cell Biology	3
PLANTBI C192	Molecular Approaches to Environmental Problem Solving	2

<sup>1</sup> No more than one course may be taken from this group to satisfy the concentration requirement.

Reading and Composition (<http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/reading-composition-requirement/>)

In order to provide a solid foundation in reading, writing and critical thinking all majors in the College require 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.

Foreign Language (<http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/foreign-language-requirement/>): **EEP Majors only**

The Foreign Language requirement is only required by Environmental Economics and Policy (EEP) majors. It 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.

Quantitative Reasoning (<http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/quantitative-reasoning-requirement/>): **EEP Majors only**

The Quantitative Reasoning requirement is only required by Environmental Economics and Policy (EEP) majors. The requirement may be satisfied by exam or by taking an approved course.

## Undergraduate Breadth

Undergraduate breadth provide Berkeley students with a rich and varied educational experience outside of their major program and many students complete their breadth courses in their first two years. Breadth courses are built into the Rausser College major requirements and each major requires a different number of breadth courses and categories. The EEP major is the only college major that requires the entire 7 course breadth. Refer to the major snapshots on each Rausser College major page (<https://nature.berkeley.edu/advising/majors-minors/>) for additional information.

## High School Exam Credit

Rausser College students may apply high school exam credit (Advanced Placement, International Baccalaureate, A-Level Exam) towards many College and Major Requirements. See AP Exam Equivalency Chart and Higher Level IB Exam Equivalency Chart (<https://nature.berkeley.edu/advising/courses-grades/#AP%20Exam%20Equivalency%20Chat>) in the Rausser College Student Handbook (<https://nature.berkeley.edu/handbook/>) for more information.

## Unit Requirements

Students must complete at least 120 semester units of courses subject to certain guidelines:

- At least 36 units must be upper division courses, including a minimum of 15 units of upper division courses in the Rausser College.
- A maximum of 16 units of Special Studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) is allowed towards the 120 units; a maximum of four is allowed in a given semester.
- A maximum of 4 units of Physical Education from any school attended will count towards the 120 units.
- Students may receive unit credit for courses graded P (including P/ NP units taken through EAP) up to a limit of one-third of the total units taken and passed on the Berkeley campus at the time of graduation. Courses taken for P/NP in the Spring 2020 semester will not count toward this limit.

## Semester Unit Minimum

All Rausser College students must enroll in at least 12 units each fall and spring semester.

## Semester Unit Maximum

To request permission to take more than 20.5 units in a semester, please see the major adviser.

## Semester Limit

Students admitted as freshmen must graduate within 8 fall/spring semesters at UC Berkeley. Students admitted as transfer students must graduate within 4 fall/spring semesters at UC Berkeley. Students who go on EAP and UCDC can petition for additional semesters. Other UC-affiliated programs, such as the Gump Station in Moorea, may also be considered. Summer session, UC Extension and non-UC study abroad programs do not count towards this semester limit. Students approved for double majors or simultaneous degrees in two colleges may be granted an additional semester. Rausser College does not limit the number of total units a student can accrue.

## Senior Residence Requirement

Once you achieve and exceed 90 units (senior status), you must complete at least 24 of the remaining 30 units in residence at the Rausser College of Natural Resources over at least 2 semesters. To count as residence, a semester must consist of at least 6 passed units taken while the student is a member of Rausser. At least one of the two terms must be a fall or spring semester. Senior residence terms do not need to be completed consecutively. All courses offered on campus for the fall, spring, and summer terms by Berkeley departments and programs and all Berkeley online ("W") courses count. Inter-campus Visitor, Education Abroad Program, UC Berkeley Washington Program, and UC Berkeley Extension units do not count toward this requirement.

Students may use Summer Session to satisfy one semester of the Senior Residence Requirement, provided that 6 units of coursework are completed.

## Modified Senior Residence Requirement

Participants in a fall, spring or summer UC Education Abroad Program (UCEAP), Berkeley Summer Abroad, or the UC Berkeley Washington Program may meet a modified Senior Residence Requirement by completing 24 of their final 60 semester units in residence (excluding UCEAP). At least 12 of these 24 units must be completed after senior status is reached. International travel study programs sponsored by Summer Sessions and education abroad programs offered outside of the UC system do not qualify for modified senior residence.

Most students automatically satisfy the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless students go abroad for a semester or year or want to take courses at another institution or through University Extension during their senior year. In these cases, students should make an appointment to see an adviser to determine how they can meet the Senior Residence Requirement.

## Grade Requirements

- A 2.0 UC GPA is required for graduation.
- A 2.0 average in all upper division courses required of the major program is required for graduation.
- A grade of at least C- is required in all courses for the major. Major and minor coursework taken in Spring 2020, Fall 2020, and Spring 2021 may be completed with P/NP grading option. See more details below.

## Changes in Policies and Procedures during the COVID-19 Pandemic

### Fall 2020, Spring 2021, SUMMER 2021

After much consultation across the colleges of UC Berkeley, and via our college Executive Committee, the following decisions have been made about the selection of the P/NP grade option (CPN) by undergraduate students during the Fall 2020 & Spring 2021 semesters for the Rausser College of Natural Resources.

- College Course Requirements: Reading and Composition, Quantitative Reasoning, and Foreign Language requirements normally satisfied with letter grades may be met with a passed (P) grade during the Fall 2020 semester. This does not include the system-wide Entry Level Writing requirement. College Writing R1A must be taken for a letter grade and completed with a C or better to fulfill the Entry Level Writing requirement.

- Requirements to Graduate: No changes in policy.
  - Rausser College students must have at least a 2.0 cumulative UC GPA to declare a Rausser College major.
  - Non-Rausser College students must have at least a 3.0 cumulative UC GPA to change to or add a Rausser College major.
  - Students must have at least a 2.0 cumulative UC GPA to graduate, both overall and in the upper-division courses required for the major.
- Academic Probation: The terms for Academic Probation (AP) have been modified.
  - Rausser CNR students currently in good standing who earn all "P" grades will remain in good standing.
  - Students currently in good standing who earn NP grades, Incompletes, or failing letter grades for more than 50% of units will be placed on academic probation and will be required to meet with their college advisor and complete an Academic Success Plan for the subsequent semester.
  - Students on AP must take all coursework for letter grades. Students on AP may be removed from probationary status with sufficient letter graded course work to raise their cumulative GPA above 2.0.
  - Students on Academic Probation who do not attain sufficient letter-graded coursework to be removed from AP (ie. enough grade points to raise cumulative GPA above 2.0 cumulative GPA) will remain on AP for the subsequent semester and must complete an Academic Success Plan with their college advisor.
  - Students on Academic Probation who earn NP grades, Incompletes, or failing letter grades for more than 50% of units will be Subject to Dismissal and will be required to meet with their college advisor and complete an Academic Success Plan for the subsequent semester.
- Term Probation: Students in this category are placed on academic probation if their GPA falls below 1.5 in any fall or spring semester ("Term"). To get back into good standing, you must earn a UC Berkeley term GPA of 2.0 the following regular semester (fall/spring) and maintain an overall GPA of 2.0. If you fail to meet these conditions, you will be subject to dismissal from the University. For Fall 2020 & Spring 2021, the terms for Term Probation have been modified.
  - Rausser CNR students currently in good standing who earn all "P" grades will remain in good standing and will not be placed on Term Probation.
- Transferring Credit: If you are taking coursework through another institution in Fall 2020 & Spring 2021, P grades earned will be accepted for all degree requirements. Note: This does not include the systemwide Entry Level Writing requirement. College Writing R1A must be taken for a letter grade and completed with a C or better to fulfill the Entry Level Writing requirement.

For additional information, please see Changes to Policies and Procedures for Fall 2020, Spring 2021, & Summer 2021 (<https://nature.berkeley.edu/advising/AY-2020-2021-policy-adjustments/>).

### Spring 2020

In light of the substantial disruptions to instruction caused by the novel coronavirus emergency, the Berkeley Division of the Academic Senate made changes to grading options for the Spring 2020 semester. Rausser College adjusted college requirements as follows:

- **College Course Requirements:** All passing course work taken in Spring 2020 may be used for college requirements regardless of the grading option selected.
- **Requirements to Graduate:** To graduate, Rausser College students usually must have at least a 2.0 cumulative UC GPA to graduate, both overall and in the upper-division courses required for their major. For Spring 2020, students with at least a 1.9 cumulative GPA overall and in the upper-division courses required for their major to graduate will be considered as having met the requirement.
- **Academic Probation:** Recognizing the challenges to teaching and learning during the COVID-19 pandemic, Rausser College of Natural Resources will not be penalizing any students' academic progress for Spring 2020.
  - Students in good academic standing who earn all "P" grades will remain in good standing.
  - Students, who are in good standing, who earn NP grades, Incompletes, or failing grades for more than 50% of units will be required to meet with their college advisor and complete an Academic Success Plan for Fall 2020 by September 11, 2020, but will not be placed on Academic Probation.
  - Students on Academic Probation may be removed from probationary status with sufficient letter graded course work to raise their cumulative GPA above 2.0.
  - Students on Academic Probation who do not attain sufficient letter-graded coursework to be removed from AP (i.e. enough grade points to raise cumulative GPA above 2.0 cumulative GPA) will remain on AP for Fall 2020 and must complete an Academic Success Plan with their college advisor by September 11, 2020.
- **Term Probation:** Recognizing the challenges to teaching and learning during the COVID-19 pandemic, Rausser College of Natural Resources will not be penalizing any students' academic progress for Spring 2020.
  - Students in good academic standing who earn all "P" grades will remain in good standing.
  - Students on Term Probation, but not AP, may be removed from probationary status with passing grades in at least 50% of units for Spring 2020.
  - Students on Term Probation at the start of Spring 2020 who earn NP, Incomplete, or failing grades for more than 50% of units must complete an Academic Success Plan with their college advisor by September 11, 2020 and will remain on Term Probation.
- **Transferring Credit:** If you are taking coursework through another institution in Spring 2020 (i.e. through Concurrent Enrollment or instead of being enrolled in Spring 2020 at UC Berkeley) and that

institution has moved to a P/NP-default or P/NP-only grading model, P grades earned will be accepted for all degree requirements.

For additional information, please see Changes to Policies and Procedures for Spring 2020 (<https://nature.berkeley.edu/advising/spring-2020-changing-policies-faq/>).

## Learning Goals for the Major

Students should be able to do the following:

1. Demonstrate a solid grasp of the fundamentals of biology, chemistry, and math that are necessary for understanding the more advanced concepts that are presented in upper division major coursework.
2. Have the skills to evaluate scientific information as a result of receiving adequate training in statistics, computational biology and genomics.
3. Have an understanding and appreciation of microbial diversity in various ecosystems.
4. Have an understanding of the importance of microbes as related to biotechnology and human health.
5. Have an understanding of the scientific method and the microbial research process.
6. Demonstrate proficiency in scientific writing and presentation.
7. Have exposure to an undergraduate research experience. The goal is to give every microbial biology undergraduate the opportunity to do research in either a laboratory or field research setting. This experience would include reading and evaluating primary literature, critical thinking and the development of a hypothesis to test and other aspects of the scientific method including data analysis, as well as oral and written presentation of their research.
8. Appreciate the relationship between a microbial biology major and the community at large.

Major Maps help undergraduate students discover academic, co-curricular, and discovery opportunities at UC Berkeley based on intended major or field of interest. Developed by the Division of Undergraduate Education in collaboration with academic departments, these experience maps will help you:

- **Explore** your major and gain a better understanding of your field of study
- **Connect** with people and programs that inspire and sustain your creativity, drive, curiosity and success
- **Discover** opportunities for independent inquiry, enterprise, and creative expression
- **Engage** locally and globally to broaden your perspectives and change the world
- **Reflect** on your academic career and prepare for life after Berkeley

Use the major map below as a guide to planning your undergraduate journey and designing your own unique Berkeley experience.

View the Microbial Biology Major Map PDF. ([https://ue.berkeley.edu/sites/default/files/microbial\\_biology.pdf](https://ue.berkeley.edu/sites/default/files/microbial_biology.pdf))

In the Rausser College of Natural Resources, we provide holistic, individual advising services to prospective and current students who are pursuing major and minors in our college. We assist with a range of

topics including course selection, academic decision-making, achieving personal and academic goals, and maximizing the Berkeley experience.

If you are looking to explore your options, or you are ready to declare a major, double major, or minor, contact the undergraduate advisor for your intended major or minor. Visit our website (<https://nature.berkeley.edu/advising/meet-cnr-advisors/>) to explore all of our advising services.

#### Undergraduate Adviser, Microbial Biology

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## Microbial Biology

Expand all course descriptions [+] Collapse all course descriptions [-]

### PLANTBI 10 Plants, Agriculture, and Society 2 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Changing patterns of agriculture in relation to population growth, the biology and social impact of plant disease, genetic engineering of plants: a thousand years of crop improvement and modern biotechnology, interactions between plants and the environment, and effects of human industrial and agricultural activity on plant ecosystems. Knowledge of the physical sciences is neither required nor assumed.

Plants, Agriculture, and Society: Read More [+]

#### Hours & Format

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

#### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Staskawicz, David Zilberman

Plants, Agriculture, and Society: Read Less [-]

### PLANTBI 11 Fungi, History, and Society 3 Units

Terms offered: Spring 2020, Spring 2019, Spring 2018

Fungi have interacted with humans in both positive and negative ways throughout history. These interactions have included production of foods, medicines, fuels, plant and animal diseases, decay, allergies, and mind-altering drugs.

Fungi, History, and Society: Read More [+]

#### Hours & Format

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

#### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Bruns, Taylor

Fungi, History, and Society: Read Less [-]

### PLANTBI 13 Genetics for Nonscientists 3 Units

Terms offered: Fall 2022, Spring 2014, Spring 2013

How can genetics help increase the food supply even as farmland conditions degrade? How genetically unique are humans? What do buzzwords like GWAS and epigenetics refer to, and how are they impacting medicine and public health? This introductory course for non-science majors will explore topics like these as students learn the foundations of scientific reasoning, genetics concepts and approaches, and their promise and limits in addressing societal challenges past and present. Objectives include learning fundamentals of biology and their applications; building students' capacity to make informed interpretations of experimental data and policies involving "genetics" in a changing world; and to understand our place in nature.

Genetics for Nonscientists: Read More [+]

#### Hours & Format

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

#### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

Genetics for Nonscientists: Read Less [-]

### PLANTBI 20 Introduction to the Plant Sciences at Berkeley 1 Unit

Terms offered: Spring 2024, Fall 2022, Fall 2021

This course will include discussions on the academic path (courses) needed for the Genetics and Plant Biology major; an introduction to resources and facilities for studies of the plant sciences at Berkeley, such as the University Herbarium and the Botanical Garden; an exploration of plant science related careers, including presentations from guest speakers who work in organic farming, government, and Cooperative Extension; talks by faculty about their current research, and information about how to do research in a lab.

Introduction to the Plant Sciences at Berkeley: Read More [+]

#### Hours & Format

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

#### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Alternative to final exam.

**Instructors:** Feldman, Staskawicz

Introduction to the Plant Sciences at Berkeley: Read Less [-]

## PLANTBI 22 Microbial Friends and Foes 3 Units

Terms offered: Spring 2023, Spring 2022, Fall 2016

Although often unseen, microbes are everywhere! This course provides an overview of the beneficial and harmful roles played by microbes, including viruses, archaea, bacteria, protists and fungi. We will examine microbes in terrestrial, marine, and extreme environments and discuss their functions in ecosystem health and climate change. In addition, we will explore the profound effects of microbes on the course of history through their effects on agriculture and human health.

Microbial Friends and Foes: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Understand similarities and differences between viruses, archaea, bacteria, protists, and fungi.

Understand both beneficial and harmful functions of microbes in daily life.

Evaluate data and claims relating to microbes in real-life situations such as disease risk, probiotic efficacy, and climate change.

Understand how molecular properties and behaviors of microbes determine how they interact with their environment and with other organisms

### Hours & Format

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

### Summer:

6 weeks - 6 hours of lecture and 3 hours of discussion per week

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

10 weeks - 3 hours of lecture and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Glass Ryan Seed

Microbial Friends and Foes: Read Less [-]

## PLANTBI 24 Freshman Seminar 1 Unit

Terms offered: Fall 2024, Spring 2024, Fall 2023

Reading and discussion with Plant and Microbial Biology faculty on current research and topics in plant and microbial biology. Topics which may be discussed include microbial biology, plant genetics, plant development, plant pathology, agricultural biotechnology, and genetic engineering. Ideal for students who are considering a major in the Department of Plant and Microbial Biology. Enrollment is limited to 20 freshmen.

Freshman Seminar: Read More [+]

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final Exam To be decided by the instructor when the class is offered.

Freshman Seminar: Read Less [-]

## PLANTBI 39E Freshman/Sophomore Seminar 2 - 4 Units

Terms offered: Spring 2012

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. Enrollment limits are set by the faculty, but the suggested limit is 25.

Freshman/Sophomore Seminar: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Lindow

Freshman/Sophomore Seminar: Read Less [-]

## PLANTBI 40 The (Secret) Life of Plants 3 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

Covers contemporary topics in plant biology. Examines how plants grow, reproduce, and respond to the environment (e.g., to light) in ways distinct from animals. Presents basic principles of genetics, cell, and molecular biology. Basics of genetic engineering and biotechnology reveal how they are used to modify plants, and these socially relevant issues are assessed. Includes visit to modern plant biology research laboratory, and aspects of plant disease and diversity. Knowledge of the physical sciences neither required nor assumed.

The (Secret) Life of Plants: Read More [+]

### 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:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Zambryski

The (Secret) Life of Plants: Read Less [-]

## PLANTBI 84 Sophomore Seminar 1 or 2 Units

Terms offered: Spring 2011, Spring 2010, Spring 2009

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.

Sophomore Seminar: Read More [+]

### Rules & Requirements

**Prerequisites:** At discretion of instructor

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

### Hours & Format

#### Fall and/or spring:

5 weeks - 3-6 hours of seminar per week  
10 weeks - 1.5-3 hours of seminar per week  
15 weeks - 1-2 hours of seminar per week

#### Summer:

6 weeks - 2.5-5 hours of seminar per week  
8 weeks - 1.5-3.5 hours of seminar and 2-4 hours of seminar per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

Sophomore Seminar: Read Less [-]

## PLANTBI C96 Studying the Biological Sciences 1 Unit

Terms offered: Fall 2024, Fall 2023, Fall 2022

Students 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 courses, and as future science professionals.

Studying the Biological Sciences: Read More [+]

### 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:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Matsui

**Also listed as:** INTEGBI C96/MCELLBI C96

Studying the Biological Sciences: Read Less [-]

## PLANTBI 98 Directed Group Study 1 - 3 Units

Terms offered: Fall 2023, Fall 2015, Fall 2014

Lectures and small group discussions focusing on topics of interest, varying from semester to semester.

Directed Group Study: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

Directed Group Study: Read Less [-]

## PLANTBI 99 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Spring 2016, Fall 2015, Spring 2015

Lower division independent study and research intended for the academically superior student. Enrollment only with prior approval of faculty advisor directing the research.

Supervised Independent Study and Research: Read More [+]

### Rules & Requirements

**Prerequisites:** GPA of 3.4 or higher; lower division status

**Credit Restrictions:** Enrollment is restricted; see the section on Academic Policies-Course Number Guide in the Berkeley Guide.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of independent study per week

#### Summer:

6 weeks - 2.5-8 hours of independent study per week  
8 weeks - 1.5-6 hours of independent study per week  
10 weeks - 1.5-4.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

Supervised Independent Study and Research: Read Less [-]



## PLANTBI 101L Experimental Plant Biology Laboratory 3 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

Students will perform state-of-the-art research to address an important question in modern plant biology. The experimental progression exposes students to a variety of modern molecular approaches and techniques. Experimental design, data acquisition, and analysis of the student's real experimental data is emphasized. Research results will be presented in written and oral formats similar to those used in research laboratories.

Experimental Plant Biology Laboratory: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B; Plant and Microbial Biology 135, 150, and 160 (may be taken concurrently)

### Hours & Format

**Fall and/or spring:** 15 weeks - 6 hours of laboratory and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Wildermuth

Experimental Plant Biology Laboratory: Read Less [-]

## PLANTBI C103 Bacterial Pathogenesis 3 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

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.

Bacterial Pathogenesis: Read More [+]

### Rules & Requirements

**Prerequisites:** BIOLOGY 1A and CHEM 3B

**Credit Restrictions:** Students will receive no credit for MCELLBI C103 after completing PB HLTH 262.

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Portnoy

**Also listed as:** MCELLBI C103

Bacterial Pathogenesis: Read Less [-]

## PLANTBI 104L Discovery-Based Research in Microbiology 2 Units

Terms offered: Summer 2019 First 6 Week Session, Summer 2018 First 6 Week Session, Summer 2010 10 Week Session

An introduction to microbiology research in which students generate gene knockouts in *Caulobacter* and analyze the mutant phenotypes. Each student will disrupt one gene of known function and one gene of unknown function. Students will attend lectures focusing on the techniques to be employed and perform experiments under supervision. This course may be taken by students with no prior laboratory experience to expose them to discovery-oriented research.

Discovery-Based Research in Microbiology: Read More [+]

### Hours & Format

#### Summer:

6 weeks - 3 hours of lecture and 7.5 hours of laboratory per week

10 weeks - 1.5 hours of lecture and 4.5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Ryan

Discovery-Based Research in Microbiology: Read Less [-]

## PLANTBI C107L Principles of Plant Morphology with Laboratory 4 Units

Terms offered: Spring 2019, Fall 2017, Fall 2016

An analysis of the structural diversity of land plants with emphasis on the developmental mechanisms responsible for this variation in morphology and the significance of this diversity in relation to adaptation and evolution.

Principles of Plant Morphology with Laboratory: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Specht

**Also listed as:** INTEGBI C107L

Principles of Plant Morphology with Laboratory: Read Less [-]

## PLANTBI C109 Evolution and Ecology of Development 3 Units

Terms offered: Fall 2019, Fall 2018, Fall 2016

From the seahorse's body to the venus flytrap's jaws to the human brain, nature abounds with amazing adaptations. This interdisciplinary course explores how and why such biodiversity evolves as well as what limits diversity. Lectures and case studies will focus on core concepts, recent advances, and integrative approaches, placing special emphasis on the interplay between gene regulatory networks, the environment, and population genetics.

Evolution and Ecology of Development: Read More [+]

### Objectives & Outcomes

**Student Learning Outcomes:** • Explain how an interdisciplinary approach involving genetics, development, evolutionary biology, and ecology can be used to understand the processes that generate patterns of biodiversity.

- List and describe major questions, findings, and experimental approaches in the field of ecological and evolutionary developmental biology.
- Discuss biological research using specialized terminology and defend your opinions.
- Critically evaluate and interpret the primary scientific literature.
- Combine factual material with deductive reasoning to propose hypotheses and future research directions

### Rules & Requirements

**Prerequisites:** BIOLOGY 1A and 1B

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Blackman

**Also listed as:** INTEGBI C109

Evolution and Ecology of Development: Read Less [-]

## PLANTBI C110L Biology of Fungi with Laboratory 4 Units

Terms offered: Fall 2024, Fall 2022, Fall 2021

Selected aspects of fungi: their structure, reproduction, physiology, ecology, genetics and evolution; their role in plant disease, human welfare, and industry. Offered even fall semesters.

Biology of Fungi with Laboratory: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1B

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Bruns, Taylor

**Also listed as:** INTEGBI C110L

Biology of Fungi with Laboratory: Read Less [-]

## PLANTBI C112 General Microbiology 4 Units

Terms offered: Fall 2024, Summer 2024 10 Week Session, Fall 2023

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.

General Microbiology: Read More [+]

### 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 - 5 hours of lecture and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Ryan

**Also listed as:** MCELLBI C112

General Microbiology: Read Less [-]

## PLANTBI C112L General Microbiology Laboratory 3 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023

Students will become proficient in basic microbiology research methods and experimental design. The course covers fundamental principles and techniques of the microbiology lab including sterile technique, culturing, and microscopy. Students will learn these methods in the context of two structured, discovery-based research projects: predicting and analyzing the phenotypes of *E. coli* metabolic mutants, and isolating and characterizing bacteria with novel properties from environmental samples. Student will synthesize their results in the format of a Journal of Bacteriology research article and a scientific poster presentation.

General Microbiology Laboratory: Read More [+]

### 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 2 hours of discussion per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Komeili, Traxler

**Also listed as:** MCELLBI C112L

General Microbiology Laboratory: Read Less [-]

## PLANTBI 113 California Mushrooms 3 Units

Terms offered: Fall 2019, Fall 2017, Fall 2015

This is a hands-on class in identification of macro fungi. Emphasis will be on laboratory work with fresh and dried fungi. Short lectures at the beginning of labs focus on mushroom systematic, collection techniques, and identification. Three weekend field trips are required in addition to the weekly laboratory. Previous course experience with fungi is recommended, but not required. Grades are based on tests and a collection.

California Mushrooms: Read More [+]

### Rules & Requirements

**Prerequisites:** Consent of instructor

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Bruns

California Mushrooms: Read Less [-]

## PLANTBI C114 Introduction to Comparative Virology 4 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

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.

Introduction to Comparative Virology: Read More [+]

### 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 and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Glaunsinger

**Also listed as:** ESPM C138/MCELLBI C114

Introduction to Comparative Virology: Read Less [-]

## PLANTBI C116 Microbial Diversity 3 Units

Terms offered: Fall 2024, Fall 2022, Fall 2021

This course for upper-division and graduate students will broadly survey myriad types of microbial organisms, both prokaryote 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.

Microbial Diversity: Read More [+]

### 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:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Coates

**Formerly known as:** 116

**Also listed as:** MCELLBI C116

Microbial Diversity: Read Less [-]

## PLANTBI 120 Biology of Algae 2 Units

Terms offered: Spring 2024, Spring 2022, Spring 2020

General biology of freshwater and marine algae, highlighting current research and integrating phylogeny, ecology, physiology, genetics, and molecular biology.

Biology of Algae: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B. Concurrent registration in 120L recommended

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Niyogi

Biology of Algae: Read Less [-]

## PLANTBI 120L Laboratory for Biology of Algae 2 Units

Terms offered: Spring 2024, Spring 2022, Spring 2020

Laboratories include study of representative types, identification of specimens collected during several field trips, and experiments on development, physiology, and molecular genetics.

Laboratory for Biology of Algae: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B. Must be taken concurrently with 120

### Hours & Format

**Fall and/or spring:** 15 weeks - 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Niyogi

Laboratory for Biology of Algae: Read Less [-]

## PLANTBI 122 Bioenergy 2 Units

Terms offered: Spring 2024, Spring 2023, Spring 2021

Offers an assessment of global energy supply and demand, addresses the chemistry of climate change, examines the response of plants and microbes to changes in the environment, and emphasizes the role of biology and photosynthesis in offering solutions to related energy and societal problems. Bioenergy is examined from the point-of-view of potential biofuels, including aspects of the biological generation of hydrogen, hydrocarbons, fatty acids, lipids, and bio-oils, polymers and related materials.

Bioenergy: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A and 1B; Chemistry 3B

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Melis

Bioenergy: Read Less [-]

## PLANTBI C124 The Berkeley Lectures on Energy: Energy from Biomass 3 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013

After an introduction to the different aspects of our global energy consumption, the course will focus on the role of biomass. The course will illustrate how the global scale of energy guides the biomass research. Emphasis will be placed on the integration of the biological aspects (crop selection, harvesting, storage and distribution, and chemical composition of biomass) with the chemical aspects to convert biomass to energy. The course aims to engage students in state-of-the-art research.

The Berkeley Lectures on Energy: Energy from Biomass: Read More [+]

### Rules & Requirements

**Prerequisites:** Chemistry 1B or Chemistry 4B, Mathematics 1B, Biology 1A

**Repeat rules:** Course may be repeated for credit under special circumstances: Repeatable when topic changes with consent of instructor.

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Bell, Blanch, Clark, Smit, C. Somerville

**Also listed as:** BIO ENG C181/CHEM C138/CHM ENG C195A

The Berkeley Lectures on Energy: Energy from Biomass: Read Less [-]

## PLANTBI C134 Genome Organization and Nuclear Dynamics 3 Units

Terms offered: Spring 2024, Fall 2022, Spring 2022

This course focuses on the structure, functions, and dynamics of eukaryotic chromosomes and their organization within cell nuclei. All life on earth relies on genetic information, which is encoded within nucleic acids (DNA and RNA). Most organisms have DNA-based genomes; bacterial and archaeal genomes typically comprise a single circular DNA molecule, while the genomes of most eukaryotes are divided into a variable number of linear DNA molecules. These contiguous DNA strands, along with the associated proteins and other components that contribute to their organization and function, are known as "chromosomes."

Genome Organization and Nuclear Dynamics: Read More [+]

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Dernburg, Karpen

**Also listed as:** MCELLBI C134

Genome Organization and Nuclear Dynamics: Read Less [-]

## PLANTBI 135 Physiology and Biochemistry of Plants 3 Units

Terms offered: Fall 2024, Fall 2023, Fall 2022

A study of physiological and biochemical processes in higher plants, including water relations, ion transport, and hormone physiology; photosynthesis (light utilization and carbon assimilation), nitrogen and sulfur metabolism, and plant-specific biosynthetic pathways.

Physiology and Biochemistry of Plants: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Melis, Terry

Physiology and Biochemistry of Plants: Read Less [-]

## PLANTBI C136 Advanced Plant Biochemistry 4 Units

Terms offered: Spring 2024, Spring 2023

Students will build on the central metabolic pathways to learn about plant-specific metabolism from a more mechanistic perspective, including photosynthesis, regulation of sugar and starch metabolism, chloroplast-based pathways of inorganic nutrient (nitrogen, sulfur) processing, N<sub>2</sub> fixing in free-living and symbiotic bacteria, polyunsaturated fatty acid and oil biosynthesis and accumulation, secondary metabolism, cell-wall structure and biosynthesis. Instruction will focus on a research-based approach, including retrieving and researching the primary literature, and understanding experimental design in modern plant biochemistry.

Advanced Plant Biochemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** A minimum grade of C- in MCELLBI C100A/CHEM C130, MCELLBI 102, MCELLBI 104, MCELLBI 140, PLANTBI 135, or equivalent

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Merchant

**Also listed as:** MCELLBI C117

Advanced Plant Biochemistry: Read Less [-]

## PLANTBI C146 Data Science for Biology 3 Units

Terms offered: Spring 2024, Fall 2022, Spring 2007, Spring 2005

Biology has become a data science! This lab course aims for student curiosity to drive hands-on

case studies and coding projects about biological applications of data science. The course design

supports students' development of fundamental and transferable computational and statistical

skills for critically thinking about and using data in biology. Ethical considerations are

interwoven throughout. This course offers projects with multiple levels of sophistication and

complexity, enabling participation for students with varying levels of experience.

Data Science for Biology: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Students will become empowered to use basic coding approaches to access, work with, and analyze biological data

Students will learn how to appropriately apply statistical tests to biological data

Students will learn how to select and evaluate methods and tools for data analysis

Students will understand how to grapple with the ethical considerations of biological data

### Rules & Requirements

**Prerequisites:** Biology 1A; Biology 1B (can be taken concurrently); Data C8 or equivalent statistics and programming experience

### Hours & Format

**Fall and/or spring:** 15 weeks - 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

**Grading/Final exam status:** Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

**Instructors:** Brenner, Eisen

**Also listed as:** BIO ENG C146/MCELLBI C146

Data Science for Biology: Read Less [-]

## PLANTBI C148 Microbial Genomics and Genetics 4 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

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.

Microbial Genomics and Genetics: Read More [+]

### 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

### Summer:

8 weeks - 6 hours of lecture and 2 hours of discussion per week  
10 weeks - 5 hours of lecture and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Brenner, Taga

**Also listed as:** MCELLBI C148

Microbial Genomics and Genetics: Read Less [-]

## PLANTBI 150 Plant Cell Biology 3 Units

Terms offered: Spring 2024, Spring 2023, Fall 2021

An introduction to the structure, dynamics, and function of plant cells: organelle structure and development; intracellular trafficking of small and macromolecules; cellular signaling; cell division and specialization.

Plant Cell Biology: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-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:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Luan, Quail

Plant Cell Biology: Read Less [-]

## PLANTBI 160 Plant Molecular Genetics 3 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

A consideration of plant genetics and molecular biology. Topics include principles of genomics and gene functional analysis; regulation of gene expression in response to environmental and developmental stimuli; intercellular and intracellular signaling pathways; and the molecular and genetic basis for the exceptional cellular and developmental strategies adopted by plants.

Plant Molecular Genetics: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-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:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Fletcher, Daniel Zilberman

Plant Molecular Genetics: Read Less [-]

## PLANTBI 165 Plant-Microbe Interactions 3 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

This course will cover topics in molecular plant-microbe interactions ranging from how microbes cause disease to how plants defend themselves. A second goal of the course is to engage students in state-of-the-art research in the area of plant-microbe interactions.

Plant-Microbe Interactions: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B, Statistics 2 or 20 or 131A or Public Health 142. Completion of an upper division plant biology and an upper division microbiology course is recommended

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Somerville, Baker, Lewis

Plant-Microbe Interactions: Read Less [-]

## PLANTBI 170 Modern Applications of Plant Biotechnology 2 Units

Terms offered: Spring 2013, Spring 2012, Spring 2010

This course is designed to introduce students to the principles and applications of modern plant biotechnology. Basic concepts of modern agriculture will be reviewed in light of emerging biotechnology applications. Emphasis will be placed on understanding the tools and strategies involved in optimizing plant productivity.

Modern Applications of Plant Biotechnology: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructors:** Baker, Somerville

Modern Applications of Plant Biotechnology: Read Less [-]

## PLANTBI 177 Communicating Quantitative Information 2 Units

Terms offered: Prior to 2007

This course will cover several aspects of communicating quantitative information, with a primary focus on visualizations for publications, presentations, and posters. Other topics include sharing of data and analyses, such as new publication models and interactive notebooks, as well as lifecycle data management and publication. Primary discussion will be on conceptual issues, and students will be expected to use various systems and resources as self-directed homestudy.

Communicating Quantitative Information: Read More [+]

### Rules & Requirements

**Prerequisites:** Instructor Approval

### Hours & Format

**Fall and/or spring:** 15 weeks - 1.5 hours of seminar and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Brenner

Communicating Quantitative Information: Read Less [-]

## PLANTBI 180 Environmental Plant Biology 2 Units

Terms offered: Fall 2019, Fall 2017, Fall 2015

An integrated and multidisciplinary approach to the study of interactions between plants and the environment. Introduces physical parameters in the global and micro-environment that affect plant function; and molecular, cellular, and developmental aspects of plant response to suboptimal/adverse conditions. Underlying biochemistry, physiology, and molecular biology of plant adaptation and acclimation mechanisms. Examines consequences of industrial activity on plant growth and productivity.

Environmental Plant Biology: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A-1B

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Terry

Environmental Plant Biology: Read Less [-]

## PLANTBI 185 Techniques in Light Microscopy 3 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021

The course will be a detailed overview of the practice of light microscopy as applied to scientific investigation. The emphasis of the course will be on the correct and appropriate use of the light microscope for biological scientists; however students of other disciplines are welcome. The course will cover optical microscope theory, microscope components and mechanics, and optical techniques including detailed descriptions, demonstrations, and use of all the modern light microscope contrast methods. Students will receive hands-on experience in all microscope and digital imaging techniques via direct instruction and use of instrumentation in the College of Natural Resources Biological Imaging Facility.

Techniques in Light Microscopy: Read More [+]

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Ruzin

Techniques in Light Microscopy: Read Less [-]



## PLANTBI 190 Special Topics in Plant and Microbial Biology 1 - 4 Units

Terms offered: Summer 2014 Second 6 Week Session, Spring 2012, Spring 2011

This class is designed to develop skills in critical analysis of specific plant and/or microbial biology issues. Topics may vary from semester to semester.

Special Topics in Plant and Microbial Biology: Read More [+]

### Rules & Requirements

**Prerequisites:** Upper division standing or consent of instructor

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

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of lecture per week

### Summer:

6 weeks - 3-10 hours of lecture per week

8 weeks - 2-8 hours of lecture per week

10 weeks - 1.5-6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

Special Topics in Plant and Microbial Biology: Read Less [-]

## PLANTBI C192 Molecular Approaches to Environmental Problem Solving 2 Units

Terms offered: Fall 2020, Spring 2019, Fall 2018

Seminar in which students consider how modern biotechnological approaches, including recombinant DNA methods, can be used to recognize and solve problems in the area of conservation, habitat and endangered species preservation, agriculture and environmental pollution. Students will also develop and present case studies of environmental problems solving using modern molecular methods.

Molecular Approaches to Environmental Problem Solving: Read More [+]

### Rules & Requirements

**Prerequisites:** Junior or senior standing in the Genetics and Plant Biology or Microbial Biology major, or consent of instructor

### Hours & Format

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

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

**Instructor:** Lindow

**Formerly known as:** Environ Sci, Policy, and Management 192

**Also listed as:** ESPM C192

Molecular Approaches to Environmental Problem Solving: Read Less [-]

## PLANTBI H196 Honors Research - Plant and Microbial Biology 4 Units

Terms offered: Fall 2016, Spring 2016, Fall 2015

Supervised independent honors research specific to aspects of the plant and microbial biology major, followed by an oral presentation and a written report. Honors students must complete two semesters of research.

Honors Research - Plant and Microbial Biology: Read More [+]

### Rules & Requirements

**Prerequisites:** Upper division standing and minimum GPA. See College of Natural Resources Honors website for current minimum GPA. [http://nature.berkeley.edu/site/honors\\_program.php](http://nature.berkeley.edu/site/honors_program.php)

**Repeat rules:** Course may be repeated for credit without restriction.

### 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:** Plant and Microbial Biology/Undergraduate

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

Honors Research - Plant and Microbial Biology: Read Less [-]

## PLANTBI 198 Directed Group Studies in Plant Biology 1 - 3 Units

Terms offered: Spring 2024, Fall 2023, Fall 2015

Group studies of selected topics.

Directed Group Studies in Plant Biology: Read More [+]

### Rules & Requirements

**Prerequisites:** Consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

Directed Group Studies in Plant Biology: Read Less [-]

## **PLANTBI 199 Supervised Independent Study and Research 1 - 4 Units**

Terms offered: Spring 2023, Fall 2021, Fall 2020

Enrollment restrictions apply; see the Introduction to Courses and Curricula section of this catalog.

Supervised Independent Study and Research: Read More [\[+\]](#)

### **Rules & Requirements**

**Prerequisites:** Consent of instructor; overall GPA of 3.0

**Repeat rules:** Course may be repeated for credit without restriction.

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 0 hours of independent study per week

#### **Summer:**

6 weeks - 1-3 hours of independent study per week

8 weeks - 1-3 hours of independent study per week

### **Additional Details**

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

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

Supervised Independent Study and Research: Read Less [\[-\]](#)

## **PLANTBI 199S Sponsored Projects for Undergraduate Research (SPUR) 1 - 4 Units**

Terms offered: Not yet offered

The Sponsored Projects for Undergraduate Research (SPUR) program helps students get involved in research projects with world renowned faculty and staff researchers in the Rausser College of Natural Resource  
Sponsored Projects for Undergraduate Research (SPUR): Read More [\[+\]](#)

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 3-12 hours of laboratory per week

**Summer:** 12 weeks - 5-18 hours of laboratory per week

### **Additional Details**

**Subject/Course Level:** Plant and Microbial Biology/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Alternative to final exam.

Sponsored Projects for Undergraduate Research (SPUR): Read Less [\[-\]](#)