Molecular Environmental Biology

Bachelor of Science (BS)

The Molecular Environmental Biology (MEB) major is designed to expose students to the organization and function of biological organisms. Molecular approaches are expected to play an increasing role in environmental problem-solving in the near future, and their success will depend upon a sound understanding of biological principles from molecular through ecological levels. The program trains students in the organization and function of biological organisms and their integration into the environment.

Declaring the Major

Advice on admission for freshmen and transfer students can be found on the Rausser College Admissions Guide (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/#admissionstext) page or the Rausser College 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 Resource's undeclared option and declare the major by the end of their fourth semester. Transfer students 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 change of major or change of college, please see chapter 6 of the Rausseer College of Natural Resources Undergraduate Student Handbook (https://nature.berkeley.edu/handbook/). (https://nature.berkeley.edu/handbook/) Students can meet with peer advisors or academic advisors for full guidance.

- There is a 3.0 GPA requirement to transfer into the Rausser College of Natural Resources from other colleges on campus.
- Required pre-requisite courses to declare the Molecular Environmental Biology are: Chemistry 1A/L and 3A/L, one semester of Biology (1A/L or 1B), R1A and R1B, Math 1A or 16A or 10A, and a second quantitative course in either Math (1B, 16B, 10B) or Statistics (STAT 2, C8, 20, 25, 131A, PB HLTH 141, 142A).
  - It is recommended that students complete the ESPM lower-division core courses prior to declaring.
- Undeclared students must declare a major by the end of their fourth semester. Failure to declare a major by junior standing will result in a registration block, and you will not be able to enroll in any courses until you are declared.
- Current UC Berkeley students who entered as freshmen are expected to be able to graduate in a total of 8 semesters (summers excluded). Exceptions are rarely granted. Students should be progressing in major requirements each semester.
- All major requirements must be taken for a letter grade (including breadth).
- Both halves of the Reading and Composition requirement must be completed by the end of the fourth semester.

Honors Program

Students with a grade point average (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 design, conduct, and report on an individual research project working with a faculty sponsor. For further information on registering for the Honors Symposium and on Honors requirements, please see the Rausser College of Natural Resources website (http://nature.berkeley.edu/site/honors_program.php).

Minor Program

There is no minor program in Molecular Environmental Biology.

Other Majors and Minors Offered by the Department of Environmental Science, Policy, and Management

Conservation and Resource Studies (http://guide.berkeley.edu/undergraduate/degree-programs/conservation-resource-studies/) (Major and Minor)
Environmental Sciences (http://guide.berkeley.edu/undergraduate/degree-programs/environmental-sciences/) (Major only)
Food Systems (https://nature.berkeley.edu/advising/minors/food-systems/) (Minor only)
Ecosystem Management and Forestry (http://guide.berkeley.edu/undergraduate/degree-programs/ecosystem-management-forestry/) (Major and Minor)
Geospatial Information Science and Technology (https://nature.berkeley.edu/advising/minors/gist/) (Minor only)
Society and Environment (http://guide.berkeley.edu/undergraduate/degree-programs/society-environment/) (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.

Structure of the MEB Major

The lower division coursework provides a strong foundation in biological principles, and the upper division areas introduce students to the organization and function of biological organisms at the molecular, cellular, organismal, and ecological levels. The major also offers specialization through six Areas of Concentration: (1) animal health and behavior, (2) biodiversity, (3) ecology, (4) environmental and human health, (5) global change biology, and (6) insect biology.

**The curriculum has been revised effective Fall 2016. Students admitted prior to Fall 16 and following the previous curriculum should refer to the 15-16 (http://guide.berkeley.edu/archive/2015-16/undergraduate/degree-programs/molecular-environmental-biology/#majorrequirementstext)Guide.

Lower Division Requirements

Breadth Requirement

Select courses from L&S “7 Breadth” Categories (https://ls.berkeley.edu/seven-course-breadth-requirement/)

One course (3-4 units) in *Arts & Literature*, *Historical Studies*, or *Philosophy & Values*

One course (3-4 units) in *Social & Behavioral Sciences* or *International Studies*

Reading & Composition Requirement

Students must complete Reading & Composition (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/reading-composition-requirement/) by the end of sophomore year.

Core Requirement

ESPM Environmental Science Core	
Select one of the following:	
ESPM 2	The Biosphere [3]
ESPM 6	Environmental Biology [3]
ESPM C10	Environmental Issues [4]
ESPM 15	Introduction to Environmental Sciences [3]
ESPM C46	Climate Change and the Future of California [4]
ESPM Social Science Core	
Select one of the following:	
ESPM 5	FROM FARM TO TABLE: FOOD SYSTEMS IN A CHANGING WORLD [4]
ESPM C11	Americans and the Global Forest [4]
ESPM C22AC	Fire: Past, Present and Future Interactions with the People and Ecosystems of California [4]
ESPM 50AC	Introduction to Culture and Natural Resource Management [4]
ESPM 60	Environmental Policy, Administration, and Law [4]
Science Core	
Complete all of the following:	
CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory
CHEM 3A & 3AL	Chemical Structure and Reactivity and Organic Chemistry Laboratory
CHEM 3B & 3BL	Chemical Structure and Reactivity and Organic Chemistry Laboratory
BIOLOGY 1A & 1AL	General Biology Lecture and General Biology Laboratory
BIOLOGY 1B	General Biology Lecture and Laboratory [4]
PHYSICS 8A	Introductory Physics [4] [2]
Quantitative Core (2 courses)	
Select one of the following:	
MATH 1A	Calculus [4]
MATH 10A	Methods of Mathematics: Calculus, Statistics, and Combinatorics [4]
MATH 16A	Analytic Geometry and Calculus [3] [1]
Select one of the following:	
MATH 1B	Calculus [4]
MATH 10B	Methods of Mathematics: Calculus, Statistics, and Combinatorics [4]
MATH 16B	Analytic Geometry and Calculus [3]
STAT 2	Introduction to Statistics [4]
STAT C8	Foundations of Data Science [4]
STAT 20	Introduction to Probability and Statistics [4]
STAT 131A	Course Not Available [4]
PB HLTH 141	Introduction to Biostatistics [5]
PB HLTH 142	Introduction to Probability and Statistics in Biology and Public Health [4]
PB HLTH W142	Introduction to Probability and Statistics in Biology and Public Health [4]

[2] For pre-health students, PHYSICS 8B is required in addition to PHYSICS 8A.

Upper division Requirements

Select two courses from Area A and two courses from Area B. Also complete 12 units in Area of Concentration and two lab courses.

Area A: Genetics, Molecular, Cell, and Developmental Biology

CHEM 135	Chemical Biology	3
ESPM 108B	Environmental Change Genetics (lab included)	3
INTEGBI 141	Human Genetics	3
INTEGBI 161	Population and Evolutionary Genetics	4
INTEGBI 162	Ecological Genetics	4
INTEGBI 164	Human Genetics and Genomics (lab included)	4
MCELLBI C100A/ CHEM C130	Biophysical Chemistry: Physical Principles and the Molecules of Life	4
MCELLBI 102	Survey of the Principles of Biochemistry and Molecular Biology	4
MCELLBI 104	Genetics, Genomics, and Cell Biology	4
MCELLBI 110	Molecular Biology: Macromolecular Synthesis and Cellular Function	4
MCELLBI 130	Cell and Systems Biology	4
MCELLBI 133L	Physiology and Cell Biology Laboratory (lab included)	4
MCELLBI 137L	Physical Biology of the Cell (lab included)	4
MCELLBI 140	General Genetics	4
MCELLBI 141	Developmental Biology	4
PLANTBI C109	Evolution and Ecology of Development	3
PLANTBI C112 & C112L	General Microbiology and General Microbiology Laboratory (lab course optional)	4, 2
PLANTBI 135	Physiology and Biochemistry of Plants	3
PLANTBI 150	Plant Cell Biology	3
PLANTBI 160	Plant Molecular Genetics	3
PB HLTH 162A & PB HLTH 162L	Public Health Microbiology and Public Health Microbiology Laboratory (lab course optional)	3, 2

Area B: Ecology, Evolution, and Organismal Biology

ESPM C105	Natural History Museums and Biodiversity Science (lab included)	3
ESPM 106	American Wildlife: Management and Policy in the 21st Century	3
ESPM 108A	Trees: Taxonomy, Growth, and Structures (lab included)	3
ESPM 111	Ecosystem Ecology	4
ESPM 112 & 112L	Microbial Ecology and Microbial Metagenomic Data Analysis Lab (lab course optional)	3, 1
ESPM 113	Insect Ecology	3

ESPM 114	Wildlife Ecology	3
ESPM C115C	Fish Ecology (lab included)	3
ESPM 116B	Grassland and Woodland Ecology (lab included)	4
ESPM C125	Biogeography	4
ESPM 131	Soil Microbiology and Biogeochemistry	3
ESPM 132	Spider Biology (lab included)	4
ESPM 137	Landscape Ecology (Lab included)	3
ESPM C138/ PLANTBI C114	Introduction to Comparative Virology	4
ESPM 140	General Entomology (lab included)	4
ESPM 142	Insect Behavior	3
ESPM 144	Insect Physiology	3
INTEGBI 102LF	Introduction to California Plant Life with Laboratory	4
INTEGBI 103LF	Invertebrate Zoology with Laboratory	5
INTEGBI 104LF	Natural History of the Vertebrates with Laboratory	5
INTEGBI 132 & 132L	Survey of Human Physiology and Mammalian Physiology Laboratory (lab course optional)	4, 2
INTEGBI 140	Biology of Human Reproduction	4
INTEGBI 148	Comparative Animal Physiology	3
INTEGBI 150	Evolutionary Environmental Physiology	3
INTEGBI 151 & 151L	Plant Physiological Ecology and Plant Physiological Ecology Laboratory (lab course optional)	4, 2
INTEGBI 153	Ecology	3
INTEGBI 154 & 154L	Plant Ecology and Plant Ecology Laboratory (lab course optional)	5
INTEGBI 157LF	Ecosystems of California (lab included)	4
INTEGBI 167	Evolution and Earth History: From Genes to Fossils	4
INTEGBI 168L	Plants: Diversity and Evolution	4
INTEGBI 181L	Paleobotany - The 500-Million Year History of a Greening Planet (lab included)	4
INTEGBI 184L	Morphology of the Vertebrate Skeleton with Laboratory	4
INTEGBI C185L/ ANTHRO C100	Human Paleontology (lab included)	5
MCELLBI 136	Physiology	4
NUSCTX 103	Nutrient Function and Metabolism	3
PLANTBI C110L	Biology of Fungi with Laboratory (lab included)	4
PLANTBI 113	California Mushrooms (lab included)	3
PLANTBI C116	Microbial Diversity	3
PLANTBI 120 & 120L	Biology of Algae and Laboratory for Biology of Algae (lab course optional)	2, 2

Lab Requirement

Select two upper division courses which include a lab, as part of the Areas A or B or Area of Concentration requirements. Additionally, this requirement may be fulfilled by: (1) One 3-4 unit independent study lab (research units numbered 192C, H196, or 199); Summer Forestry Field Camp; or the Moorea Field Study course.

Area of Concentration Requirement

Select 12 units from one concentration below. Up to four independent study units (research units numbered 192C, H196, or 199) may be applied to the concentration.

Animal Health & Behavior

ESPM C103	Principles of Conservation Biology	4
ESPM 106	American Wildlife: Management and Policy in the 21st Century	3
ESPM 114	Wildlife Ecology	3
ESPM C126	Animal Behavior	4
ESPM 142	Insect Behavior	3
ESPM C156	Animal Communication	3
ESPM 157	Data Science in Global Change Ecology (lab included)	4
ESPM 158	Biodiversity Conservation in Working Landscapes (lab included)	4
ESPM 186	Management and Conservation of Rangeland Ecosystems	4
ESPM C192	Molecular Approaches to Environmental Problem Solving	2
INTEGBI 104LF	Natural History of the Vertebrates with Laboratory	5
INTEGBI 135	The Mechanics of Organisms	4
INTEGBI C135L/ BIO ENG C136L/ EL ENG C145O	Laboratory in the Mechanics of Organisms	3
INTEGBI C143A/ PSYCH C113	Biological Clocks: Physiology and Behavior	3
INTEGBI C143B/ PSYCH C116	Hormones and Behavior	3
INTEGBI 146LF	Behavioral Ecology with Laboratory	5
INTEGBI 148	Comparative Animal Physiology	3
INTEGBI 173LF	Mammalogy with Laboratory	5
INTEGBI 174LF	Ornithology with Laboratory	4
INTEGBI 175LF	Herpetology with Laboratory	4
INTEGBI 184L	Morphology of the Vertebrate Skeleton with Laboratory	4
PSYCH 121	Animal Cognition	3

Biodiversity

ESPM C103	Principles of Conservation Biology	4
ESPM C105	Natural History Museums and Biodiversity Science (lab included)	3
ESPM 106	American Wildlife: Management and Policy in the 21st Century	3
ESPM 108A	Trees: Taxonomy, Growth, and Structures (lab included)	3
ESPM C125	Biogeography	4
ESPM C126	Animal Behavior	4
ESPM 132	Spider Biology (lab included)	4
ESPM 140	General Entomology (lab included)	4
ESPM 142	Insect Behavior	3
ESPM 147	Field Entomology (“Ants,” “Beetles,” and “Spiders” (1 unit each) SP. All three courses must be completed to equal one “lab course”)	1

ESPM C156	Animal Communication	3
ESPM 157	Data Science in Global Change Ecology (lab included)	4
ESPM C192	Molecular Approaches to Environmental Problem Solving	2
INTEGBI 102LF	Introduction to California Plant Life with Laboratory	4
INTEGBI 103LF	Invertebrate Zoology with Laboratory	5
INTEGBI 104LF	Natural History of the Vertebrates with Laboratory	5
INTEGBI 160	Evolution	4
INTEGBI 168L	Plants: Diversity and Evolution	4
INTEGBI 173LF	Mammalogy with Laboratory	5
INTEGBI 174LF	Ornithology with Laboratory	4
INTEGBI 175LF	Herpetology with Laboratory	4
INTEGBI 183L	Evolution of the Vertebrates with Laboratory	4
INTEGBI 184L	Morphology of the Vertebrate Skeleton with Laboratory	4
PLANTBI C110L	Biology of Fungi with Laboratory	4
PLANTBI 113	California Mushrooms (lab included)	3
PLANTBI C116	Microbial Diversity	3
PLANTBI 120	Biology of Algae	2
PLANTBI 120L	Laboratory for Biology of Algae	2

Ecology

ESPM C103	Principles of Conservation Biology	4
ESPM C104/ ENVECON C115	Modeling and Management of Biological Resources	4
ESPM 105A	Sierra Nevada Ecology (Summer Forestry Camp)	4
ESPM 111	Ecosystem Ecology	4
ESPM 112	Microbial Ecology	3
ESPM 112L	Microbial Metagenomic Data Analysis Lab	1
ESPM 113	Insect Ecology	3
ESPM 114	Wildlife Ecology	3
ESPM C115A	Freshwater Ecology	3
ESPM C115C	Fish Ecology (lab included)	3
ESPM 116B	Grassland and Woodland Ecology (lab included)	4
ESPM 117	Urban Garden Ecosystems (lab included)	4
ESPM 118	Agricultural Ecology	4
ESPM C130	Terrestrial Hydrology	4
ESPM 131	Soil Microbiology and Biogeochemistry	3
ESPM 134	Fire, Insects, and Diseases in Forest Ecosystems	3
ESPM 137	Landscape Ecology (lab included)	3
ESPM 147	Field Entomology (“Ants,” “Beetles,” and “Spiders” (1 unit each) SP. All three courses must be completed to equal one “lab course”)	1
ESPM 152	Global Change Biology	3
ESPM 157	Data Science in Global Change Ecology (lab included)	4
ESPM 158	Biodiversity Conservation in Working Landscapes (lab included)	4
ESPM 173	Introduction to Ecological Data Analysis (lab included)	3
ESPM 174	Design and Analysis of Ecological Research (lab included)	4
ESPM 181A	Fire Ecology (lab included)	3
ESPM C192	Molecular Approaches to Environmental Problem Solving	2
INTEGBI 102LF	Introduction to California Plant Life with Laboratory	4
INTEGBI 120	Introduction to Quantitative Methods In Biology	4
INTEGBI 151	Plant Physiological Ecology	4
INTEGBI 151L	Plant Physiological Ecology Laboratory	2
INTEGBI 153	Ecology	3
INTEGBI 154	Plant Ecology	3
INTEGBI 154L	Plant Ecology Laboratory	2
INTEGBI 160	Evolution	4
PLANTBI 180	Environmental Plant Biology	2

Environment & Human Health

ANTHRO 135	Paleoethnobotany: Archaeological Methods and Laboratory Techniques (lab included)	4
ESPM C126/ INTEGBI C144	Animal Behavior	4
ESPM C138/ PLANTBI C114	Introduction to Comparative Virology	4
ESPM C148/ NUSCTX C114	Pesticide Chemistry and Toxicology	3
ESPM 152	Global Change Biology	3
ESPM 157	Data Science in Global Change Ecology (lab included)	4
ESPM 158	Biodiversity Conservation in Working Landscapes (lab included)	4
ESPM/NUSCTX C159	Human Diet	4
ESPM 162	Bioethics and Society	4
ESPM 162A	Health, Medicine, Society and Environment	4
ESPM C167	Environmental Health and Development	4
ESPM C192	Molecular Approaches to Environmental Problem Solving	2
INTEGBI 116L	Medical Parasitology (lab included)	4
INTEGBI 117	Medical Ethnobotany	2
INTEGBI 117LF	Medical Ethnobotany Laboratory	2
INTEGBI 120	Introduction to Quantitative Methods In Biology	4
INTEGBI 131	General Human Anatomy	3
INTEGBI 131L	General Human Anatomy Laboratory	2
INTEGBI 137	Human Endocrinology	4
INTEGBI 140	Biology of Human Reproduction	4
INTEGBI C143A/ PSYCH C113	Biological Clocks: Physiology and Behavior	3
INTEGBI C143B/ PSYCH C116	Hormones and Behavior	3
MCELLBI 135A	Topics in Cell and Developmental Biology: Molecular Endocrinology	3
MCELLBI 150	Molecular Immunology	4
MCELLBI 160	Cellular and Molecular Neurobiology	4
MCELLBI 165	Neurobiology of Disease	3
NUSCTX 103	Nutrient Function and Metabolism	3
NUSCTX 108A	Introduction and Application of Food Science	3
NUSCTX 110	Toxicology	4
NUSCTX 160	Metabolic Bases of Human Health and Diseases	4

NUSCTX 166	Nutrition in the Community	3
PLANTBI C103	Bacterial Pathogenesis	3
PB HLTH 101	A Sustainable World: Challenges and Opportunities	3
PB HLTH 116	Seminar on Social, Political, and Ethical Issues in Health and Medicine (P/NP okay for major)	3
PB HLTH 150B	Human Health and the Environment in a Changing World	3
PB HLTH 196	Special Topics in Public Health ("Artificial Intelligence in Medicine and Health Policy")	3
PSYCH 110	Introduction to Biological Psychology	3

Global Change Biology

CIV ENG 107	Climate Change Mitigation	3
ENE,RES 101	Ecology and Society	3
ENE,RES 102	Quantitative Aspects of Global Environmental Problems	4
ENVECON C102	Natural Resource Economics	4
ENVECON C175	The Economics of Climate Change	4
EPS 102	History and Evolution of Planet Earth	4
EPS 115	Stratigraphy and Earth History	4
EPS C181/ GEOG C139	Atmospheric Physics and Dynamics	3
ESPM 108B	Environmental Change Genetics (lab included)	3
ESPM 137	Landscape Ecology (lab included)	3
ESPM 152	Global Change Biology	3
ESPM 157	Data Science in Global Change Ecology (lab included)	4
ESPM C167	Environmental Health and Development	4
ESPM C170	Carbon Cycle Dynamics	3
ESPM C192	Molecular Approaches to Environmental Problem Solving	2
GEOG 140A	Physical Landscapes: Process and Form	4
GEOG 142	Climate Dynamics	4
GEOG 143	Global Change Biogeochemistry	3
GEOG 149B	Climate Impacts and Risk Analysis	3
GEOG/LD ARCH C188	Geographic Information Systems	4
INTEGBI 154	Plant Ecology	3
INTEGBI 154L	Plant Ecology Laboratory	2
INTEGBI 159	The Living Planet: Impact of the Biosphere on the Earth System	3
LD ARCH 110	Ecological Analysis	3
LD ARCH 110L	Ecological Analysis Laboratory	2
PLANTBI 122	Bioenergy	2
PLANTBI 180	Environmental Plant Biology	2

Insect Biology/Arthropod Science

ESPM 140	General Entomology (ESPM 140 required for Insect Biology concentration. Lab included.)	4
ESPM C105	Natural History Museums and Biodiversity Science (lab included)	3
ESPM 113	Insect Ecology	3
ESPM 132	Spider Biology (lab included)	4
ESPM 134	Fire, Insects, and Diseases in Forest Ecosystems	3
ESPM 142	Insect Behavior	3
ESPM 144	Insect Physiology	3
ESPM 147	Field Entomology (“Ants,” “Beetles,” and “Spiders” (1 unit each) SP. All three courses must be completed to equal one “lab course”)	1
ESPM C148/ NUSCTX C114	Pesticide Chemistry and Toxicology	3
ESPM 157	Data Science in Global Change Ecology (lab included)	4
ESPM 172	Remote Sensing of the Environment (lab included)	3
ESPM C192	Molecular Approaches to Environmental Problem Solving	2

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 breath 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 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.

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. 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

Fall 2020 & Spring 2021 – Changes in Policies and Procedures

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 semesterand 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 (https://nature.berkeley.edu/advising/AY-2020-2021-policy-adjustments/).

Mission

Molecular Environmental Biology (MEB) focuses on biological organisms and the hierarchy of life, from molecules and genes through cells, organisms, communities and ecosystems. The breadth of this biological science program provides an important perspective for students who have a passion for biology and are interested in the application of biological principles to understand how organisms function in their environment. Also a pre-medical or pre-health science major, the discipline offers an array of six areas of concentration within biology: animal health and behavior, biodiversity, ecology, environmental and human health, insect biology, and global change biology.

Learning Goals for the Major

1. Holistic multidisciplinary thinking - understanding the “big picture"
   a. Interdisciplinarity & Crossdisciplinarity: The ability to understand and work across different disciplines (crossdisciplinarity) and to integrate the knowledge and methods from them (interdisciplinarity)
   b. Multiple processes: Recognition that biology and the environment involve multiple processes, as do solutions to modern problems
   c. Interconnectedness: Understanding that biology and the environment are interconnected at many spatial, temporal, and hierarchical levels
   d. Global and international approaches: Appreciating that the environment is necessarily global in nature and solutions to problems require international approaches
2. Training in the hierarchy of biology
   a. Fundamentals of Science: Training in the cores areas of physics, chemistry, biology, and mathematics
   b. Quantitative skills: Necessary tools for addressing biological problems
   c. Biochemistry: An understanding of the fundamentals of biological chemistry, including the properties of intermediary metabolites, the structure and function of biological macromolecules, and the logical basis of genetics and gene expression
   d. Molecular biology/Genetics: The molecular biology of bacterial, archaeal and eukaryotic cells and their viruses, mechanisms of DNA replication, transcription, translation, nuclear and organellar genome structure and function, regulation of gene expression, heritability, measures of selection, etc.
   e. Cell and developmental biology: Cell structure and function, cellular metabolic processes, embryonic and post-embryonic development and growth
   f. Organismal physiology: Understanding of physiological function, whether microbial, animal or plant, or comparison between different systems
   g. Organismal diversity: Emphasis on the nature of diversity whether plant, animal, fungus, protist, bacteria, or virus, the history of the lineages and life itself, global threats, how diversity is distributed, and the ecological and evolutionary processes that generate and maintain diversity.
   h. Ecology: The nature of interactions, biotic or abiotic, that dictate organismal distributions in space and time, energy flows, or population dynamics
   i. Laboratory experiences: Laboratory experiences allow students to gain hands-on experience in scientific approaches and methods
3. Analysis and application for students who choose the Animal Health & Behavior area of concentration
   a. Interaction of health and environment: Understanding how the environment, whether internal or external, affects organism health and behavior
   b. Expertise in health: Examination of the health of organisms from either physiological or environmental perspectives
   c. Epizootics: An appreciation of the potential for diseases in animal populations to spill over into humans as is the case in avian influenza or even the origins of HIV
4. Analysis and application for students who choose the Biodiversity area of concentration
   a. Biodiversity science: Detailed understanding of morphological and ecological diversity of a given organismic lineage

   b. Origins and evolution of life: Basic understanding of systematics and phylogenetics
   c. Quantifying biology: Knowledge of various sampling and species identification techniques to collect data
   d. Informatics: Proficiency in database development and management
5. Analysis and application for students who choose the Ecology area of concentration
   a. Principles of Ecology: Detailed understanding of ecological principles including energy flow, hydrologic, and mineral cycles, factors limiting species distribution and population size, and characteristics of species, populations, and communities
   b. Ecological interactions: Interactions relevant to different organismic groups.
   c. Biodiversity: Understanding of the biology of species, communities, and ecosystems.
6. Analysis and application for students who choose the Environment & Human Health area of concentration.
   a. Interaction of health and environment: Understanding of how the environment affects human health and well-being.
   b. Disease: Environmental epidemiology and the impacts of disease.
   c. Diet: Effects of nutrition and diet on human health.
7. Analysis and application for students who choose the Global Change Biology area of concentration.
   a. Global change biology expertise: How changes to the global environment impact organisms and ecosystems, including impacts to spatial and temporal distributions of organisms, ecological processes, and ecosystem functions.
   b. Global change and the environment: Global change biology in environmental science, including effects of human activities and impacts on human health and well-being.
   c. Environmental problem solving: Conservation and mitigation strategies, ecological analysis, and natural resource economics
8. Analysis and application for students who choose the Insect Biology area of concentration.
   a. Insects and biodiversity science: Understanding of major insects groups, relationships, and diversity.
   b. Insects and environmental science: Knowledge of the impacts of insects (positive and negative) in the environment.
   c. Quantifying insects and biology: Skills in collecting and identifying insects
9. Basic skills in research, analysis, communication.
   a. Reading carefully: Ability to read for detail and comprehension.
   b. Writing accurately: Ability to write succinctly, clearly, and coherently.
   c. Thinking critically: Critical thinking through the synthesis of biological knowledge from courses and lab work.
   d. Using theoretical and empirical knowledge: Ability to synthesize and apply information obtained through theory and observations.
   e. Quantitative skills: Obtaining the quantitative skills necessary for the subdisciplines.
   f. Analysis: Ability to perceive, tackle, and solve problems in environmental science.
   g. Research experience: Research experience to practice scientific approaches and methods. Work with a faculty mentor while participating in an undergraduate research program or designing an individual research project. Share research results or work in progress in the form of a paper, report, research poster, or public presentation.
   h. Communication: Strong communication skills, both written and verbal, to prepare for independent research work or team projects.
10. Lifetime skills.
   a. Continuing appreciation for biological systems: To develop a passion for biology and its interconnections with the environment.
   b. Representing science: To become an advocate for the training and knowledge of science, particularly the biological disciplines.
   c. Problem solving: To develop and practice scientific thinking and problem-solving skills, through data analysis, hypothesis testing, and critical reasoning, that translate to future careers inside and outside of biology.

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 Molecular Environmental Biology Major Map PDF. **(**https://vcue.berkeley.edu/sites/default/files/molecular_environmental_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. Visit our website (https://nature.berkeley.edu/advising/meet-cnr-advisors/) to explore all of our advising services.

Undergraduate Advisors, Molecular Environmental Biology

Leleña Avila (Last names A-R)
meb.ugrad@berkeley.edu
260 Mulford Hall
510-642-6730

Patricia Helyer (Last names S-Z)
meb.ugrad@berkeley.edu
260 Mulford Hall
510-642-1986