

## Molecular Environmental Biology Major Requirements (OPTION II)

<b>Lower Division Requirements: (note: all courses must be taken for a letter grade)</b>	
<input type="checkbox"/> ESPM Environmental Science Core: 1 course from ESPM 2, 6, C10 (L&S C30V), 15, or C46 <input type="checkbox"/> ESPM Social Science Core: 1 course from ESPM C11 (L&S C30U), C12 (ENG C77), 50AC or 60 <input type="checkbox"/> One course (3-4 units) in <i>Arts &amp; Literature, Historical Studies, or Philosophy &amp; Values</i> <input type="checkbox"/> One course (3-4 units) in <i>Social &amp; Behavioral Sciences or International Studies</i> Select courses from "7 Breadth" listing: <a href="http://ls-advise.berkeley.edu/requirements/lsreq.html#7breadth">http://ls-advise.berkeley.edu/requirements/lsreq.html#7breadth</a> <input type="checkbox"/> Two courses in Reading & Composition (8 units): R1A & R1B	
<b>Math</b>	<b>Chemistry</b>
<input type="checkbox"/> Math 16A/1A/10A: Calculus I [3-4] <input type="checkbox"/> Math 16B/1B/10B: Calculus II [3-4] <input type="checkbox"/> Statistics ( <i>Optional</i> ): 2, C8, 20, 25, PH 142A or Stat 131A <i>*note: For Concentrations #2, 3, or 5, Math 16B/1B/10B may be replaced by Statistics 2, C8, 20, 25, PH 142A or Stat 131A. Statistics is required for many pre-health and environmental research programs.</i>	<input type="checkbox"/> Chem 1A/L: General Chemistry [4] <input type="checkbox"/> Chem 3A/L: Organic Chemistry I [5] <input type="checkbox"/> Chem 3B/L: Organic Chemistry II [5]
<b>Physics</b>	<b>Biology</b>
<input type="checkbox"/> Physics 8A: Introductory Physics [4] <i>*note: Physics 8B is required for many pre-health programs</i>	<input type="checkbox"/> Bio 1A/L: General Biology [5] <input type="checkbox"/> Bio 1B: General Biology [4]
<b>Upper Division Requirements:</b>	
<input type="checkbox"/> <b>15 upper division units must be taken in the College of Natural Resources (EEP, ES, ESPM, NST, PMB)</b>	
<b>Biological Core:</b> Select two courses from area A and two courses from area B. No more than one course from each category. Complete area C and area D and 12 units in Area of Concentration. <b>With the exception of the lab courses, each course can be used to satisfy only one requirement. Courses cannot overlap with the Area of Concentration requirement.</b>	
<b>AREA A</b>	<input type="checkbox"/> <b>Biochemistry</b> CHEM 135: Chemical Biology (4)
	MCB 102: Biochemistry and Molecular Biology (4) MCB 110: General Biochemistry and Molecular Biology (4)
	<input type="checkbox"/> <b>Molecular Biology/Genetics</b> ESPM 108B: Environmental Change Genetics (3) PMB 160: Plant Molecular Genetics (3) IB 141: Human Genetics (3) IB 161: Population and Evolutionary Genetics (4)
	IB 162: Ecological Genetics (4) IB 164: Human Genetics and Genomics (4), <i>lab included</i> MCB 140: General Genetics (4) MCB 110: General Biochemistry and Molecular Biology (4) MCB 104: Genetics, Genomics, and Cell Biology (4)
	<input type="checkbox"/> <b>Cell &amp; Developmental Biology</b> MCB 130: Cell Biology (4) MCB 130 A: Cell and Systems Biology (4) MCB 133 L: Physiology and Cell Biology Lab (4) MCB 141: Developmental Biology (3)
	MCB 135E: Physiology of Human Development (3) MCB 137: Computer Simulation in Biology (3) PMB C112/MCB C112: General Microbiology (4), PMB C112L (2) PMB 150: Plant Cell Biology (3) PH 162A: Public Health Microbiology (3), PH 162L (1)
<b>AREA B</b>	<input type="checkbox"/> <b>Organismal Physiology</b> ESPM 144: Insect Physiology (3) IB 132: Survey of Human Physiology (3) IB 140: Human Reproduction (4) IB 148: Comparative Animal Physiology (3) IB 150: Evolutionary Environmental Physiology (3)
	IB 151: Plant Physiological Ecology (4), IB 151L (2) MCB 136: Physiology (4) NS 103: Nutrient Function and Metabolism (3) PMB C116/ MCB C116: Microbial Diversity (3) PMB 135: Physiology and Biochemistry of Plants (3)
	<input type="checkbox"/> <b>Organismal Diversity</b> ESPM 106: American Wildlife (3), <i>lab included</i> ESPM 108A: Trees: Taxonomy, Growth & Struct. (3), <i>lab included</i> ESPM 115B: Biology of Aquatic Insects (2) ESPM 132: Spider Biology (4), <i>lab included</i> ESPM C138/PMB C114/MCB C114: Intro Comparative Virology (4) ESPM 140: General Entomology (4), <i>lab included</i> IB 102 & L: Introduction to California Plant Life (2,2) IB 103 & L: Invertebrate Zoology (3,2)
	IB 104 & L: Natural History of the Vertebrates (3,2) IB 167: Evolution & Earth History: Genes to Fossils (4) IB 168 & L: Systematics of Vascular Plants (2,2) IB C185/ANTH C100: Human Paleontology (5) PMB 110 L: Biology of Fungi (4), <i>lab included</i> PMB 113: California Mushrooms (3), <i>lab included</i> PMB C116/ MCB C116: Microbial Diversity (3) PMB 120 & L: Biology of Algae (2, 2)
	<input type="checkbox"/> <b>Ecology</b> ESPM 102A: Resource Ecology (4), <i>lab included</i> ESPM 110: Primate Ecology (4) ESPM 111: Ecosystem Ecology (3) ESPM 112: Microbial Ecology (3) ESPM 113: Insect Ecology (3) ESPM 114: Wildlife Ecology (3) ESPM 115C: Fish Ecology (3), <i>lab included</i> ESPM 116A, B or C: Forest, Range, or Tropical Ecology (3 or 4)
	ESPM 119: Chemical Ecology (2) ESPM 131: Soil Microbial Ecology (3) ESPM 137: Landscape Ecology (3) <i>lab included</i> ESPM C149/IB C149: Molecular Ecology (4) IB 153: Population and Community Ecology (3) IB 154 & L: Plant Population and Community Ecology (2, 2) IB 157LF: Ecosystems of California (4) IB 159: The Living Planet: Biosphere and Earth Systems (3) IB 181: Paleobotany: History of a Greening Planet (4)
<b>C</b>	<input type="checkbox"/> <b>Senior Seminar:</b> ESPM 192: Molecular Approaches to Environmental Problem Solving (2) <b>Recommended Fall of Senior Year</b>
<b>D</b>	<b>Lab Requirement: two upper division courses – either in the Biological Core or Area of Concentration - must include a lab. 3-4 independent study lab units (H196, 199) may be used to fulfill one lab requirement.</b>

**\*See reverse side for Areas of Concentration\***

# Molecular Environmental Biology Major Requirements

**Area of Concentration Requirement:** Select 12 units from one concentration. Up to four independent study units (e.g., ESPM 199, ESPM H196) may be applied to the concentration.

## ANIMAL HEALTH & BEHAVIOR

- ESPM C103 /IB C156: Principles of Conservation Biology (4)
- ESPM 106: American Wildlife: Identification & Conservation (3) (*lab incl.*)
- ESPM 110: Primate Ecology (4)
- ESPM 114: Wildlife Ecology (3)
- ESPM C126/IB 144: Animal Behavior (4)
- ESPM 142: Insect Behavior
- ESPM 146 & L: Medical/Veterinary Entomology (3,1)
- ESPM 156: Animal Communication (3)
- ESPM 158: Biodiversity Conservation in Working Landscapes (4)
- ESPM 186: Management & Conservation of Rangeland Ecosystems (4)
- ESPM 188: Case Histories in Wildlife Management (2)
- IB 104LF: Natural History of the Vertebrates (5)
- IB 135: Mechanics of Organisms (4)
- IB 135L: Mechanics of Organisms Laboratory (3)
- IB C143A /Psych C113: Biological Clocks: Physiology & Behavior (3)
- IB C143B /Psych C116: Hormones & Behavior (3)
- IB 146: Behavioral Ecology (3)
- IB 148: Comparative Animal Physiology (3)
- IB 173LF: Mammalogy (5) (*lab incl.*)
- IB 184 or 184L: Morphology of the Vertebrate Skeleton (2,4)
- IB 186: Evolution of Hominid Behavior (4)
- Psych 121: Animal Cognition (3)

## GLOBAL CHANGE BIOLOGY

- CIV ENG 107: Climate Change Mitigation (3)
- ECON C102: Natural Resource Economics (2)
- ENE\_RES 101: Ecology & Society--Energy & Resources (3)
- ENE\_RES 102: Quantitative Aspects of Global Environmental Problems (4)
- ENV SCI 125: Environments of the San Francisco Bay Area (3)
- ENVECON C175: The Economics of Climate Change (4)
- EPS 102: History & Evolution of Planet Earth (4)
- EPS 115: Stratigraphy & Earth History (4)
- ESPM 152: Global Change Biology (3)
- ESPM C170: Carbon Cycle Dynamics (3)
- GEOG 142: Climate Dynamics (4)
- GEOG 143: Global Change Biogeochemistry (3)
- GEOG C139: Atmospheric Physics & Dynamics (3)
- IB 154,L: Plant Ecology (3,2)
- IB 159: The Living Planet: Biosphere and Earth Systems (3)
- LD ARCH 110L: Ecological Analysis Laboratory (3)
- LD ARCH C188: Geographic Information Systems (4)
- PMB 122: Bioenergy (2)
- PMB 180: Environmental Plant Biology (2)
- PB HLTH C160: Environmental Health & Development (4)
- UGIS 162E: Environmental Policymaking & the Politics of Climate Change (4)
- UGIS 176B: Green Governance (4)
- ANTHRO C129D: Holocene Paleocology: How Humans Changed the Earth (3)

## ECOLOGY

- ESPM 105A: Sierra Nevada Ecology (4) (*Summer Forestry Camp*)
- ESPM C103 /IB C156: Principles of Conservation Biology (4)
- ESPM 110: Primate Ecology (4)
- ESPM C104/EEP C115: Modeling & Management of Bio. Resources (4)
- ESPM 111: Ecosystem Ecology (3)
- ESPM 112: Microbial Ecology (3)
- ESPM 113: Insect Ecology (3)
- ESPM 114: Wildlife Ecology (3)
- ESPM 115C: Fish Ecology (3) (*lab included*)
- ESPM 116B: Range Ecology (3)
- ESPM 116C: Tropical Forest Ecology (3)
- ESPM 117: Urban Garden Ecosystems (4) (*lab included*)
- ESPM 118: Agricultural Ecology (3)
- ESPM 119: Chemical Ecology (2)
- ESPM C130/Geog C136: Water in Terrestrial Environment (3)
- ESPM 131: Soil Microbiology (3)
- ESPM 134: Fire, Insects, & Diseases in Forest Ecosystems (3)
- ESPM 137: Landscape Ecology (3) (*lab included*)
- ESPM 147: Field Entomology: "Ants," "Beetles," & "Spiders" (1 unit each) SP. All three courses = one lab course.
- ESPM C149 /IB C149: Molecular Ecology (4)
- ESPM 152: Global Change Biology (3)
- ESPM 158: Biodiversity Conservation in Working Landscapes (4)
- ESPM 172: Photogrammetry & Remote Sensing (3)
- ESPM 173: Introduction to Ecological Data Analysis (3)
- ESPM 174: Design & Analysis of Ecological Research (3)
- ESPM 181: Wildland Fire Science (3)
- ESPM 188: Case Histories in Wildlife Management (2)
- PMB 180: Environmental Plant Biology (2)
- IB 102LF: Introduction to California Plant Life (4)
- IB 151: Physiological Ecology of Plants (3)
- IB 153: Population & Community Ecology (3)
- IB 154,L: Plant Ecology (3,2)
- IB C155/Anthro C129D: Holocene Paleocology (3)
- IB 171: Plant Physiological Ecology (4)

## ENVIRONMENT & HUMAN HEALTH

- ANTHRO 135: Paleoethnobotany: Archaeological Methods & Laboratory Techniques (4) (*lab incl.*)
- ESPM C126/IB 144: Animal Behavior (4)
- ESPM C138/PB C114/MCB C114: Intro to Comparative Virology (4)
- ESPM C148 /NST C114: Pesticide Chemistry & Toxicology (3)
- ESPM 152: Global Change Biology (3)
- ESPM 158: Biodiversity Conservation in Working Landscapes (4)
- ESPM C159/NST C159: Human Diet (4)
- ESPM 162: Bioethics (4)
- ESPM 167: Environmental Health & Development (4)
- IB N116: Medical Parasitology (4) (*lab incl.*)
- IB 117: Medical Ethnobotany (2)
- IB 117L: Medical Ethnobotany Laboratory (2)
- IB 131: General Human Anatomy (3)
- IB 131L: General Human Anatomy Lab (2)
- IB 137: General Endocrinology (4)
- IB 140: Biology & Sociobiology of Human Reproduction (4)
- IB C143A /Psych C113: Biological Clocks: Physiology & Behavior (3)
- IB C143B /Psych C116: Hormones & Behavior (3)
- MCB 135 A: Molecular Endocrinology (3)
- MCB 150: Molecular Immunology (4)
- MCB 165: Molecular Neurobiology (3)
- NST 103: Nutrient Function & Metabolism (3)
- NST 108A: Intro to Food Science (3)
- NST 110: Food Toxicology (3)
- NST C119: Advanced Toxicology (3)
- NST 160: Metabolic Bases of Human Health & Diseases (4)
- NST 166: Nutrition in the Community (3)
- PMB C103 /MCB C103: Bacterial Pathogenesis (3)
- PH 103: Drugs, Health & Society (2)
- PH 105: Policy, Planning, & Evaluation of Health Promotion in a College Setting (3)
- PH 114: Issues in Personal & Community Health Promotion (3)
- PH 116: Seminar on Social, Political & Health Issues in Health & Medicine (2)
- PH 150B: Introduction to Environmental Health Sciences (3)
- PH 196: Special Topics in Public Health \*\*\*Section 3 only (3)
- PSYCH 110: Introduction to Biological Psychology (3)

## INSECT BIOLOGY/ARTHROPOD SCIENCE

- Note: ESPM 140: General Entomology is required for this concentration.
- ESPM 105: Natural History Museums & Biodiversity Science (3) (*lab incl.*)
  - ESPM 113: Insect Ecology (2)
  - ESPM 132: Spider Biology (4) (*lab incl.*)
  - ESPM 134: Fire, Insects, & Diseases in Forest Ecosystems (3)
  - ESPM 140: General Entomology (4) (*lab incl.*)
  - ESPM 142: Insect Behavior (3)
  - ESPM 144: Insect Physiology (3)
  - ESPM 147: Field Entomology: "Ants," "Beetles," & "Spiders" (1 unit each) Taking all three courses = one lab course.
  - ESPM 148: Pesticide Chemistry & Toxicology (3)
  - ESPM 172: Photogrammetry & Remote Sensing (3)

## BIODIVERSITY

- ESPM C103 /IB C156: Principles of Conservation Biology (4)
- ESPM 105: Natural History Museums & Biodiversity Science (3) (*lab incl.*)
- ESPM 106: American Wildlife: Identification & Conservation (3) (*lab incl.*)
- ESPM 108A: Trees: Taxonomy, Growth & Structures (3) (*lab included*)
- ESPM 132: Spider Biology [4] (*lab incl.*)
- ESPM 140: General Entomology (4) (*lab incl.*)
- ESPM 147: Field Entomology: "Ants," "Beetles," & "Spiders" (1 each) SP. All three courses must be completed to equal one "lab course".
- IB 100B: Principles of Biodiversity (3)
- IB 102LF: Introduction to California Plant Life (4)
- IB 103LF: Invertebrate Zoology (5)
- IB 104LF: Natural History of the Vertebrates (5)
- IB 160: Evolution (4)
- IB 166: Evolutionary Biogeography (4)
- IB 168LF: Systematics of Vascular Plants (4)
- IB 173LF: Mammalogy (5)
- IB 174LF: Ornithology (4)
- IB 175LF: Herpetology (4)
- IB 183: Evolution of the Vertebrates (3)
- IB 183L: Laboratory in Vertebrate Evolution (1)
- PMB 110 & L: Biology of Fungi (2,2)
- PMB 113: California Mushrooms (3) (*lab included*)
- PMB C116 /MCB C116: Microbial Diversity (3)
- PMB 120 & L Biology of Algae (2,2)

For the Moorea Program (13-unit ESPM C107/IB C158/Geog C142: Biology & Geomorphology of Tropical Islands), a maximum of 4 units can be applied to an area of concentration. This course can also satisfy for one laboratory course. Students can petition for having some units fulfill additional requirements.