

# BIOLOGICAL SCIENCES, BACHELOR OF SCIENCE

College of Biological Sciences

## The Biological Sciences Major

Departments of Evolution & Ecology; Microbiology & Molecular Genetics; Molecular & Cellular Biology; Neurobiology, Physiology, & Behavior; and Plant Biology

### The Program

The Biological Sciences major is broad in concept, spanning the numerous core disciplines of biology. The Bachelor of Science (B.S.) program includes preparatory work in mathematics, general and organic chemistry, physics, and introductory level biology, as well as upper division core classes emphasizing the breadth of biological sciences. Students in the B.S. degree program complete additional upper division biology coursework, for which they can choose classes from a variety of different areas such as molecular biology and genetics, animal behavior, plant growth and development, bioinformatics, marine biology, forensics, and microbiology research and internships are encouraged.

### Career Alternatives

The degree program prepares students for admission to graduate schools or professional schools, leading to either a variety of professional health careers or further study in basic and applied areas of biology. They provide suitable preparation for careers in teaching, biological and biotechnological research with various governmental agencies or private companies, government regulatory agencies, environmental consulting, biological illustration and writing, pharmaceutical sales, biological/environmental law, and biomedical engineering.

### Faculty Advisor

Lesilee Rose, Ph.D.

### Advising

Biology Academic Success Center (BASC) (<http://basc.ucdavis.edu/>) in 1023 Katherine Esau Science Hall (formerly Sciences Laboratory Building); 530-752-0410.

### Teaching Credential Subject Representative

Associate Director of Teacher Education (School of Education); see the Teaching Credential/M.A. Program (<https://education.ucdavis.edu/teaching-credentialma/>).

### Bodega Marine Laboratory Program

Students interested in Marine Biology should visit Marine & Coastal Science Major (<https://catalog.ucdavis.edu/departments-programs-degrees/earth-planetary-sciences/marine-coastal-science-bs/>) & Bodega Marine Laboratory (<http://bml.ucdavis.edu/>).

Code	Title	Units
<b>Preparatory Subject Matter</b>		
<i>Biological Science</i>		15

BIS 002A & BIS 002B & BIS 002C	Introduction to Biology: Essentials of Life on Earth and Introduction to Biology: Principles of Ecology & Evolution and Introduction to Biology: Biodiversity & the Tree of Life
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<i>Chemistry</i>		
Choose the 002 or 004 series: <sup>1</sup>		15
CHE 002A & CHE 002B & CHE 002C	General Chemistry and General Chemistry and General Chemistry	
CHE 004A & CHE 004B & CHE 004C	General Chemistry for the Physical Sciences & Engineering and General Chemistry for the Physical Sciences & Engineering and General Chemistry for the Physical Sciences & Engineering	
Choose the 008 or 118 series: <sup>2</sup>		6-12
CHE 008A & CHE 008B	Organic Chemistry: Brief Course and Organic Chemistry: Brief Course	
CHE 118A & CHE 118B & CHE 118C	Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences	
<i>Mathematics</i>		
Choose the 017 or 021 series: <sup>3</sup>		8-12
MAT 017A & MAT 017B & MAT 017C	Calculus for Biology & Medicine and Calculus for Biology & Medicine and Calculus for Biology & Medicine	
MAT 021A & MAT 021B & MAT 021C	Calculus and Calculus and Calculus (Recommended)	
<i>Physics</i>		12
PHY 007A & PHY 007B & PHY 007C	General Physics and General Physics and General Physics	
Preparatory Subject Matter Subtotal		56-66
<b>Depth Subject Matter</b>		
<i>Section 1: Core Curriculum</i>		
BIS 101	Genes & Gene Expression	4
BIS 104	Cell Biology	3
BIS 105 or BIS 102 & BIS 103	Biomolecules & Metabolism Structure & Function of Biomolecules and Bioenergetics & Metabolism	3-6
<i>Section 2: Depth Subject Topics</i>		
Choose one from each topic:		21-26
<i>Statistics</i>		
STA 100	Applied Statistics for Biological Sciences	
<i>Evolution</i>		
EVE 100	Introduction to Evolution	
<i>Ecology</i>		
EVE 101	Introduction to Ecology	
ESP 100	General Ecology	
<i>Microbiology</i>		

MIC 102	Introductory Microbiology
MIC 162	General Virology
MIC 170	Yeast Molecular Genetics
Plant Physiology or Development	
PLB 105	Developmental Plant Anatomy
PLB 111	Plant Physiology
PLB 112	Plant Growth & Development
PLB 113	Molecular & Cellular Biology of Plants
PLB/PLS 116	Plant Morphology & Evolution
PLB/MCB 126	Plant Biochemistry
Animal Physiology, Behavior or Development	
NPB 100	Neurobiology
NPB 101	Systemic Physiology
NPB 102	Animal Behavior
NPB 107	Cell Signaling in Health & Disease
NPB 141	(Discontinued)
MCB 150	Developmental Biology
<i>Section 3: Laboratory Requirement</i>	
Course(s) selected to fulfill the laboratory requirement may also satisfy restricted elective or depth subject matter units (but not both).	
Choose course(s) for a minimum total of six hours/week of laboratory or field work from the list of courses below:	
Choose two with three hours lab or field work/week:	
EVE 110	Running, Swimming & Flying
EVE 140	Paleobotany
EVE/ENT 180A	Experimental Ecology & Evolution in the Field
EVE/ENT 180B	Experimental Ecology & Evolution in the Field
MCB 185	Computer Programming for Biologists
MIC 103L	Introductory Microbiology Laboratory
NPB 100L	Neurobiology Laboratory
NPB 101L	Systemic Physiology Laboratory
NPB 121L	Physiology of Reproduction Laboratory
NPB 123/APC 100	Comparative Vertebrate Organology
PLB/EVE 117	Plant Ecology
PLB/EVE 119	Population Biology of Invasive Plants & Weeds
Other courses with approval of Faculty Advisor.	
Choose one course with six hours lab or field work/week:	
BIS 180L	Genomics Laboratory
EVE 105	Phylogenetic Analysis of Vertebrate Structure
EVE 106	Mechanical Design in Organisms
EVE/PLB 108	Systematics & Evolution of Angiosperms (Discontinued)
EVE 112L	Biology of Invertebrates Laboratory
EVE 114	Experimental Invertebrate Biology
EXB 106L/ CHA 101L	Human Gross Anatomy Laboratory
MIC 104L	General Microbiology Laboratory
MIC 105L	Microbial Diversity Laboratory

MCB 120L	Molecular Biology & Biochemistry Laboratory
MCB 140L	Cell Biology Laboratory
MCB 160L	Principles of Genetics Laboratory
NPB 141P	(Discontinued)
PLB/PLS 102	California Floristics (Discontinued)
PLB 105	Developmental Plant Anatomy
PLB/EVE 108	Systematics & Evolution of Angiosperms (Discontinued)
PLB/PLS 116	Plant Morphology & Evolution
PLB/PLP 148	Introductory Mycology
Other courses with approval of the Faculty Advisor.	

**Section 4: Restricted Electives**

Choose at least three or more courses for a minimum of 11 units from the list of Approved Upper Division Restrictive Electives and/or laboratory courses. No class or laboratory used to satisfy a Section 1 or a Section 2 course requirement may be used as a restricted elective.

Students may choose any combination of approved courses that align with their academic or career objectives. Up to three of the 11 units may be fulfilled by approved seminar or research courses.

Approved Seminar/Research Courses (p. 2)

Approved Upper Division Restricted Electives (p. 3)

**Total Units** **98-116**

<sup>1</sup> With BASC advisor approval, these combinations also satisfy the Chemistry requirement: CHE 004A-CHE 002A (3 units w/no lab)-CHE 002B-CHE 002C; CHE 004A-CHE 004B-CHE 002C.

<sup>2</sup> With BASC advisor approval, this combination also satisfies the Organic Chemistry requirement: CHE 118A-CHE 008B.

<sup>3</sup> With BASC advisor approval, this combination also satisfies the Mathematics requirement: MAT 021A-MAT 017B-MAT 017C; MAT 017A-MAT 021B.

**Approved Seminar/Research Courses**

Code	Title	Units
Courses numbered 189, 190/190C, 192, 194H, and 199 in ABI, ANS, BIS, BIT, ENH, ENT, ETX, EVE, MCB, MIC, MMG, NPB, PLB, PLP, PLS, VEN, WFC, as well as:		
BIS 122P	Population Biology & Ecology/Advanced Laboratory Topics	5
BIS 123	Undergraduate Colloquium in Marine Science	1
BIS 133	Collaborative Studies in Mathematical Biology	3
EVE/ESP 111	Marine Environmental Issues or MMG 191 (PENDING APPROVAL)	1
MCB 138	Undergraduate Seminar in Biochemistry	1
MCB 139	Undergraduate Seminar in Biochemistry	2
MCB 148	Undergraduate Seminar in Cell Biology	2
MCB 158	Undergraduate Seminar in Developmental Biology	2
MCB 178	Undergraduate Seminar in Molecular Genetics	1

MCB 191	Introduction to Research	1
MCB 193	Advanced Research	3
NPB 139	Frontiers in Physiology	3
NPB 159	Frontiers in Behavior	3
NPB 169	Frontiers in Neurobiology	3

## Approved Upper Division Restricted Electives

Code	Title	Units
ANG 105	Horse Genetics	3
ANG 107	Genetics & Animal Breeding	5
ANS 104	Principles & Applications of Domestic Animal Behavior	4
ANS 123	Animal Growth & Development	4
ANS 170	Ethics of Animal Use	4
ANT 151	Primate Evolution	4
ANT 152	Human Evolution	5
ANT 153	Human Genetics: Mutation & Migration	5
ANT 154A	The Evolution of Primate Behavior	5
ANT 154B	Primate Evolutionary Ecology	5
ANT 155	Primate Conservation Biology	4
ANT 157	Advanced Human Genetics	2
ANT 157L	Advanced Human Genetics Lab	4
AVS 100	Avian Biology	3
AVS 103	Avian Development & Genomics	3
AVS 115	Raptor Biology	3
BIM 140	Protein Engineering	4
BIM 143	Biomolecular Systems Engineering: Synthetic Biology	4
Biological Sciences (BIS)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/bis/">https://catalog.ucdavis.edu/courses-subject-code/bis/</a> ) <sup>1</sup>		
BIT 150	Applied Bioinformatics	4
BIT 160	Principles of Plant Biotechnology	3
BIT 161A	Genetics & Biotechnology Laboratory	6
BIT 161B	Plant Genetics & Biotechnology Laboratory	4
CHE 107A	Physical Chemistry for the Life Sciences	3
CHE 107B	Physical Chemistry for the Life Sciences	3
CHE 108	Molecular Biochemistry	3
CHE 130A	Principles of Medicinal Chemistry	3
CHE 130B	Computational Drug Design	3
CHE 150	Chemistry of Natural Products	3
ECS 124	Theory & Practice of Bioinformatics	4
EDU 110	Educational Psychology: General	4
EDU/GEL 181	Teaching in Science & Mathematics	2
EDU/GEL 183	Teaching High School Mathematics & Science	3
ENH 105	Taxonomy & Ecology of Environmental Plant Families	4
ENH 150	Genetics & Plant Conservation: The Biodiversity Crisis	3
Entomology (ENT)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/ent/">https://catalog.ucdavis.edu/courses-subject-code/ent/</a> ) <sup>1</sup>		
ESP 106	Environmental Data Science	4

ESP 110	Principles of Environmental Science	4
ESP/GEL 116N	Oceanography	3
ESP 121	Population Ecology	4
ESP 123	Introduction to Field & Laboratory Methods in Ecology	4
ESP 124	Marine & Coastal Field Ecology	3
ESP 151	Limnology	4
ESP 151L	Limnology Laboratory	3
ESP 155	Wetland Ecology	4
Environmental Toxicology (ETX)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/etx/">https://catalog.ucdavis.edu/courses-subject-code/etx/</a> ) <sup>1</sup>		
Evolution & Ecology (EVE)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/eve/">https://catalog.ucdavis.edu/courses-subject-code/eve/</a> ) <sup>1</sup>		
Exercise Biology (EXB)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/exb/">https://catalog.ucdavis.edu/courses-subject-code/exb/</a> ) <sup>1</sup>		
FST 102A	Malting & Brewing Science	4
FST 104	Food Microbiology	3
GDB 101	Epidemiology	4
GDB 103	Microbiome of People, Animals, & Plants	3
GEL 107	Earth History: Paleobiology	3
GEL 107L	Earth History: Paleobiology Laboratory	2
GEL 108	Earth History: Paleoclimates	3
GEL/ESP 116N	Oceanography	3
GEL 141	Evolutionary History of Vertebrates	3
GEL 144	Historical Ecology	3
GEL/ESP 150A	Physical & Chemical Oceanography	4
GEL/ESP 150B	Geological Oceanography	3
GEL/ESP 150C	Biological Oceanography	4
HDE 100A	Infancy & Early Childhood	4
or HDE 100AV	Infancy & Early Childhood	
HDE 100C	Adulthood & Aging	4
HDE/ENT 117	Longevity	4
HPH 115	Cannabis & Cannabinoids in Physiology & Medicine	3
Molecular & Cellular Biology (MCB)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/mcb/">https://catalog.ucdavis.edu/courses-subject-code/mcb/</a> ) <sup>1</sup>		
Microbiology (MIC)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/mic/">https://catalog.ucdavis.edu/courses-subject-code/mic/</a> ) <sup>1</sup>		
Microbiology & Molecular Genetics (MMG)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/mmg/">https://catalog.ucdavis.edu/courses-subject-code/mmg/</a> ) <sup>1</sup>		
MMI 188A	Human Immunology	3
or MMI 188B	Human Immunology	
NEM 100	Plant Nematology	4
NEM 110	Introduction to Nematology	2
Neurobiology, Physiology, & Behavior (NPB)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/npb/">https://catalog.ucdavis.edu/courses-subject-code/npb/</a> ) <sup>1</sup>		
NUT/ETX 104	Environmental & Nutritional Factors in Cellular Regulation & Nutritional Toxicants	4
PHI 108	Philosophy of the Biological Sciences	4
Plant Biology (PLB)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/plb/">https://catalog.ucdavis.edu/courses-subject-code/plb/</a> ) <sup>1</sup>		
PLP 120	Introduction to Plant Pathology	4

PLP 130	Fungal Biology & Disease	3
PLS 100A	Metabolic Processes of Cultivated Plants	3
PLS 100B	Growth & Yield of Cultivated Plants	3
PLS 101	Agriculture & the Environment	3
PLS/ESM 144	Trees & Forests	4
PLS 147	California Plant Communities	3
PLS 150	Sustainability & Agroecosystem Management	4
PLS 152	Plant Genetics	4
PLS 154	Introduction to Plant Breeding	4
PLS 162	Urban Ecology	3
PLS 172	Biology and Quality of Harvested Crops	4
PMI 126	Fundamentals of Immunology	3
PMI 127	Medical Bacteria & Fungi	3
PMI 128	Biology of Animal Viruses	3
SAS/HIS 109	Environmental Change, Disease & Public Health	4
SAS 110	Applications of Evolution in Medicine, Human Behavior, & Agriculture	4
SOC 163	Population Health: Social Determinants & Disparities in Health	4
SSC 111	Soil Microbiology	4
STA 101	Advanced Applied Statistics for the Biological Sciences	4
STS/ANT 129	Health & Medicine in a Global Context	4
STS/ENL 164	Writing Science	4
UWP 111C	Specialized Topics in Journalism: Science Journalism	4
UWP 120	Rhetorical Approaches to Scientific & Technological Issues	4
UWP 121	History of Scientific Writing	4
VEN 110	Grapevine Growth & Physiology	3
VME 158	Infectious Disease in Ecology & Conservation	3
Wildlife, Fish, & Conservation Biology (WFC)—all upper division courses. ( <a href="https://catalog.ucdavis.edu/courses-subject-code/wfc/">https://catalog.ucdavis.edu/courses-subject-code/wfc/</a> ) <sup>1</sup>		3

<sup>1</sup> Courses numbered 198 do not fulfill restricted elective units without advisor approval. Discussion section courses, those noted with a "D" do not fulfill restricted elective units. Only 3 units of approved seminar or research courses can be applied to the restrictive electives.