

# Biological Sciences B.S. Degree Program Requirements (Effective Fall, 2015)

|  |                     |
|--|---------------------|
| <b>Preparatory Subject Matter</b> .....  | <b><u>56-66</u></b> |
| Biological Sciences 2A-2B-2C.....  | 15                  |
| Chemistry 2A-2B-2C.....  | 15                  |
| Chemistry 8A-8B or 118A-118B-118C.....   | 6-12                |
| Mathematics 17A-17B-17C or 21A-21B (21C recommended).....  | 8-12                |
| Physics 7A-7B-7C.....  | 12                  |
| Recommended: one course in scientific terminology/ bioethics/ philosophy of science<br>Biotechnology 171; Classics 31; Philosophy 15, 30, 31, 32, 38, 108;<br>Science and Society 9, 13, 15, 20, 140 |                     |

|  |                     |
|--|---------------------|
| <b>Depth Subject Matter</b> .....  | <b><u>42-51</u></b> |
| Statistics 100.....  | 4                   |
| Genetics: Biological Sciences 101.....   | 4                   |
| Biochemistry: Biological Sciences 105 (or 102 + 103).....  | 3-6                 |
| Cell Biology: Biological Sciences 104.....   | 3                   |
| Evolution: Evolution and Ecology 100.....  | 4                   |
| Ecology: Evolution and Ecology 101 or Environmental Science Policy 100.....  | 4                   |
| Microbiology: one course from Food Science and Technology 104;<br>Microbiology 101*, 104, 162, 170 .....   | 3-5                 |
| Animal Physiology, Behavior or Development: One course from<br>Molecular and Cellular Biology 150; Neurobiology,<br>Physiology, and Behavior 100, 101, 102, 141..... | 3-5                 |
| Plant Physiology or Development: One course from Plant<br>Biology 105**, 111, 112, 113, 116** .....  | 3-5                 |

**Restricted electives**..... **11**

Select 3 or more courses from the list of approved electives and laboratory courses (below) for a minimum of 11 units.

Students may choose courses following a self-directed theme aligned with their academic or career objectives, or choose from a list of sample themes provided on the BASC website ([basc.ucdavis.edu](http://basc.ucdavis.edu)). Up to 3 of the 11 units may be fulfilled by approved seminar or research courses#.

**Laboratory Requirement**

Select course(s) for a minimum total of 6 hours/week of laboratory or field work from the list of courses below. Course(s) selected to fulfill the laboratory requirement may also satisfy restricted elective or depth subject matter requirements (but not both).

\*Courses with 3 hours lab or field work/week (select two): Evolution and Ecology 110, 117, 119, 140, 180A, 180B; Exercise Biology 104L, 115; Microbiology 101; Neurobiology, Physiology, and Behavior 100L, 101L, 121L, 123; Plant Biology 117, 119; other courses with approval of the master adviser.

\*\*Courses with 6 hours lab or field work/week(select one): Biological Sciences 180L; Evolution and Ecology 105, 106, 108, 112L, 114; Exercise Biology 106L; Food Science and Technology 104L; Microbiology 104L, 105L; Molecular and Cellular Biology 120L, 140L,160L; Neurobiology, Physiology, and Behavior 111L, 141P; Plant Biology 102, 105, 108, 116, 148; other courses with approval of the master adviser.

#**Approved Seminar/Research courses** (these courses provide an opportunity to conduct research, carry out an internship, discuss scientific literature, or otherwise apply biological concepts to real-world problems) Courses numbered 189, 190/190C, 192, 194H, 199, as well as Biological Sciences 122P, 123, 133; Evolution and Ecology 111; Microbiology 191; Molecular and Cellular Biology 138, 139, 148, 158, 178, 191, 193; Neurobiology, Physiology, and Behavior 139, 159, 169.

**Total Units for Major 98 - 117**

## Approved Upper Division Restricted Electives:

|   |     |  |
|---|-----|--|
| Animal Genetics   | ANG | 105, 107   |
| Animal Science  | ANS | 104, 119, 123, 131, 142, 170   |
| Anthropology  | ANT | 129, 151, 152, 153, 154A, 154BN, 157   |
| Avian Sciences  | AVS | 100, 150   |
| Biological Sciences   | BIS | all upper division courses   |
| Biotechnology   | BIT | 150, 160, 161A, 161B, 171  |
| Chemistry   | CHE | 104, 107A, 107B, 108, 130A, 130B, 150  |
| Education   | EDU | 100, 181   |
| Engineering: Biomedical   | BIM | 117, 140   |
| Engineering: Computer Science                                   | ECS | 124  |
| English   | ENL | 164  |
| Entomology  | ENT | all upper division courses   |
| Environmental Horticulture                                      | ENH | 102, 105   |
| Environmental Science and<br>Management                         | ESM | 144  |
| Environmental Science and Policy                                | ESP | 110, 111, 116N, 121, 123, 124, 150A, 150B, 150C, 151, 151L, 155                                      |
| Environmental Toxicology  | ETX | 101, 102B, 103A, 104   |
| Evolution and Ecology   | EVE | all upper division courses   |
| Exercise Biology  | EXB | 101, 103, 106, 106L, 110, 111, 124   |
| Food Science and Technology                                     | FST | 102A, 104  |
| Geology   | GEL | 107, 107L, 108, 116N, 141, 141L, 144, 150A, 150B, 150C, 181  |
| Human Development   | HDE | 117  |
| Mathematics   | MAT | 124  |
| Medicine: Cell Biology and Human<br>Anatomy                     | CHA | 101, 101L  |
| Medicine: Medical Microbiology                                  | MMI | 188  |
| Microbiology  | MIC | all upper division courses   |
| Molecular and Cellular Biology                                  | MCB | all upper division courses   |
| Neurobiology, Physiology, and<br>Behavior                       | NPB | all upper division courses   |
| Nutrition   | NUT | 104  |
| Philosophy  | PHI | 108  |
| Plant Biology   | PLB | all upper division courses   |
| Plant Pathology   | PLP | 120, 123, 130, 148   |
| Plant Sciences  | PLS | 102, 130, 131, 135, 142, 144, 150, 153, 154, 157, 158  |
| Psychology  | PSC | 121, 122, 123, 124   |
| Science and Technology Studies                                  | STS | 108, 129, 130A, 131, 164, 180  |
| Sociology   | SOC | 154  |
| Soil Science  | SSC | 111  |
| University Writing Program                                      | UWP | 102B, 104T, 111C, 112A   |
| Veterinary Medicine: Anatomy,<br>Physiology and Cell Biology    | APC | 100  |
| Veterinary Medicine: Pathology,<br>Microbiology, and Immunology | PMI | 126, 126L, 128   |
| Wildlife, Fish, and Conservation Biology                        | WFC | 100, 101, 110, 110L, 111, 111L, 120, 120L, 121, 122, 130, 134, 134L,<br>136, 140, 141, 151, 154, 157 |

## **BACHELOR OF SCIENCE IN BIOLOGICAL SCIENCES (Effective Fall 2015)**

### **Sample Integrative Elective Course Themes**

The themes serve as a guide. Restricted electives may be chosen from within these themes or restricted electives may be chosen from multiple theme groups.

#### **Forensics:**

CHE 104 Forensic Applications of Analytical Chemistry (3)  
ENT 158 Forensic Entomology (3)  
ETX 102B Quantitative Analysis of Environmental Toxicants (5)  
MCB 120L Molecular Biology and Biochemistry Laboratory (6)  
MCB 162 Human Genetics and Genomics (3)

#### **Health Professions:**

CHE 130A/130B Pharmaceutical Chemistry (3,3)  
ENT 153 Medical Entomology (3)  
ETX 104 Environmental and Nutritional Factors in Cellular Regulation and Nutritional Toxicants (4)  
EVE 131 Human Genetic Variation and Evolution (3)  
EXB 106/106L Human Gross Anatomy/Human Gross Anatomy Laboratory (4,3)  
MCB 150 Developmental Biology (4)  
MCB 162 Human Genetics and Genomics (3)  
MIC 101 Introductory Microbiology (5)  
MIC 104/104L General Microbiology/General Microbiology Laboratory (4,3)  
MIC 150 Genomes of Pathogenic Bacteria (3)  
MIC 162 General Virology (4)  
NPB 101/101L Systemic Physiology/Systemic Physiology Laboratory (5,3)  
NPB 107 Cell Signaling in Health and Disease (3)  
PMI 126/126L Fundamentals of Immunology/Immunology Laboratory (3,2)  
PMI 128 Biology of Animal Viruses (3)

#### **Marine Biology:**

(can incorporate Spring quarter in residence or summer sessions at Bodega Marine Laboratory)

ANS 119 Invertebrate Aquaculture (4)  
ANS 131 Reproduction and Early Development in Aquatic Animals (4)  
BIS 122/122P Population Biology and Ecology // Population Biology and Ecology/Advanced Laboratory Topics (3,5)  
BIS 123 Undergraduate Colloquium in Marine Science (1)  
BIS 124 Coastal Marine Research (3)  
ESP 116N Oceanography (3)  
ESP 124 Marine and Coastal Field Ecology (3)  
ESP 150C Biological Oceanography (4)  
EVE 112 Biology of Invertebrates (3)  
EVE 114 Experimental Invertebrate Biology (3)  
EVE 115 Marine Ecology (4)  
NPB 141 Physiological Adaptation of Marine Organisms (3)  
WFC 120 Biology and Conservation of Fishes (3)  
WFC 121 Physiology of Fishes (4)  
WFC 157 Coastal Ecosystems (4)

#### **Bioethics/Philosophy of Science:**

BIT 171 Professionalism and Ethics in Genomics and Biotechnology (3)  
PHI 108 Philosophy of the Biological Sciences (4)  
STS 131 Darwin (4)

#### **Science Teaching:**

BIS 195A/B Science Teaching Internship Program (2/2)  
EDU 100 Introduction to Schools (4)  
EDU 181 Teaching in Science and Math (2)

#### **Science Writing and Publishing:**

UWP 102B Writing in the Disciplines: Biology (4)  
UWP 104T Writing in the Professions: Technical Writing (4)  
UWP 111C Specialized topics in Journalism: Science Journalism (4)  
UWP 112A Introduction to Professional Editing (4)

**Developmental Biology:**

EVE 150 Evolution of Animal Development (3)  
MCB 150 Developmental Biology (4)  
MCB 163 Developmental Genetics (3)  
NPB 121 Physiology of Reproduction (4)  
NPB 122 Developmental Endocrinology (3)  
NPB 161 Developmental Neurobiology (3)  
PLB 112 Plant Growth and Development (3)

**Quantitative Biology and Modeling:**

BIM 117 Analysis of Molecular and Cellular Networks (4)  
BIS 132 Introduction to Dynamic Models in Modern Biology (4)  
BIS 133 Collaborative Studies in Mathematical Biology (3)  
EVE 175 Computational Genetics (3)  
MAT 124 Mathematical Biology (4)  
MCB 143 Cell Biophysics (3)  
NPB 105 Introduction to Computer Models (4)  
NPB 163 Systems Neuroscience (4)

**Quantitative and Evolutionary Genetics:**

ANG 107 Genetics and Animal Breeding (5)  
EVE 102 Population and Quantitative Genetics (4)  
EVE 103 Phylogeny, Speciation and Macroevolution (4)  
EVE 131 Human Genetic Variation and Evolution (3)  
EVE 150 Evolution of Animal Development (3)  
EVE 175 Computational Genetics (3)  
GEL 107/107L Earth History: Paleobiology/Earth History: Paleobiology Laboratory (3,2)  
GEL 141/141L Evolutionary History of Vertebrates/Evolutionary History of Vertebrates Laboratory (3,1)

**Agricultural Biology:**

ANG 105 Horse Genetics (2)  
ANG 107 Genetics and Animal Breeding (5)  
ANS 123 Animal Growth and Development (4)  
BIT 160 Principles of Plant Biotechnology (3)  
BIT 161A/B Genetics/Plant Genetics and Biotechnology Lab (6,6)  
MCB 126/PLB 126 Plant Biochemistry (3)  
PLB 111 Plant Physiology (3)  
PLB 112 Plant Growth and Development (3)  
PLB 113 Molecular and Cellular Biology of Plants (3)  
PLB 123 Plant-Virus-Vector interaction (3)  
PLB 143 Evolution of Crop Plants (4)  
PLS 154 Introduction to Plant Breeding (4)

**Bioinformatics and Genomics:**

BIS 134 Systems Biology: From Biological Circuits to Biological Systems (2)  
BIS 180L Genomics Laboratory (5)  
BIS 181 Comparative Genomics (3)  
BIS 183 Functional Genomics (3)  
BIT 150 Applied Bioinformatics (4)  
BIT 171 Professionalism and Ethics in Genomics and Biotechnology (3)  
ECS 124 Theory and Practice of Bioinformatics (4)  
MCB 162 Human Genetics and Genomics (3)  
MCB 182 Principles of Genomics (3)

**Human Genetics/Genetic Counseling/Public Health:**

ANT 152 Human Evolution (5)  
ANT 153 Human Biological Variation (5)  
BIT 171 Professionalism and Ethics in Genomics and Biotechnology (3)  
EVE 131 Human Genetic Variation and Evolution (3)  
MCB 162 Human Genetics and Genomics (3)  
NPB 132 Nature vs Nurture: Physiological Interactions Among Genes, Nutrients and Health (3)

**Environmental and Conservation Biology:**

ETX 101 Principles of Environmental Toxicology (4)  
ETX 104 Environmental and Nutritional Factors in Cellular Regulation and Nutritional Toxicants (4)  
EVE 101Q Introduction to Computer Models in Ecology (1)  
EVE 104 Community Ecology (4)  
EVE 115 Marine Ecology (4)  
EVE 117 Plant Ecology (4)  
EVE 120 Global Change Ecology (3)  
EVE 138 Ecology of Tropical Latitudes (5)  
EVE 147 Biogeography (4)  
MIC 105 Microbial Diversity (3)  
MIC 120 Microbial Ecology (3)  
WFC 154 Conservation Biology (4)  
WFC 157 Coastal Ecosystems (4)

**Animal Behavior and Communication:**

ANS 104 Principles and Applications of Domestic Animal Behavior (4)  
ANS 142 Companion Animal Care and Management (4)  
ENT 104 Behavioral Ecology of Insects (3)  
EVE 107 Animal Communication (4)  
NPB 100 Neurobiology (4)  
NPB 102 Animal Behavior (3)  
NPB 102Q Quantitative Topics in Animal Behavior (1)  
NPB 150/PSC 122 Advanced Animal Behavior (4)  
NPB 152 Hormones and Behavior (3)  
NPB 162 Neural Mechanisms of Behavior (3)  
NPB 165 Neurobiology of Speech Perception (3)  
WFC 141 Behavioral Ecology (4)

**Biomechanics:**

EVE 106 Mechanical Design in Organisms (3)  
EVE 110 Running, Swimming and Flying (3)  
EXB 103 Analysis and Control of Human Movement (4)

**Human/Microbe Interactions:**

MIC 105 Microbial Diversity (3)  
MIC 150 Genomes of Pathogenic Bacteria (3)  
MIC 162 General Virology (4)  
PMI 126/126L Fundamentals of Immunology/Immunology Laboratory (3,2)  
PMI 128 Biology of Animal Viruses (3)