

**Bachelor of Science in Biology,  
Option in Organismal Biology (code BIOLBS16)  
Option in Molecular Cell Biology and Physiology (code BIOLBS17)**

This major program revision, combining five options into two, was recommended by the Academic Senate on March 21, 2013 and approved by the president on April 9, 2013.

### Option in Organismal Biology (120 units)

This option is designed primarily for those interested in careers that involve the biology of animals, plants and the study of organisms in relation to their environment. It is particularly appropriate for those seeking employment in private industry or government service as well as those students contemplating graduate work in these fields. This option requires approximately 81-84 units in the major, of which 39-41 units are in lower division and 42-43 are in upper division.

All students must achieve at least a 2.0 grade-point average in each of the following: 1. the entire college record, 2. all units attempted at CSULB, and 3. all courses in the major.

Lower Division:

Take all of the following courses:

BIOL 211 Introduction to Evolution and Diversity (4)

Prerequisite/Corequisite: CHEM 111A with a grade of "C" or better.

BIOL 212 Intro to Cell and Molecular Biology (4)

Prerequisites: Completion of BIOL 211 and CHEM 111A with grades of "C" or better.

Prerequisite/Corequisite: CHEM 111B with grade of "C" or better.

BIOL 213 Intro to Ecology and Physiology (4)

Prerequisites: BIOL 211, 212, CHEM 111B all with a grade of "C" or better.

BIOL 260 Biostatistics (3)

Prerequisites: BIOL 211 or BIOL 207 or MICR 200; MATH 111 or 113 or 119A or 122 all with a grade of "C" or better.

CHEM 111A General Chemistry (5)

Prerequisites: A passing score on the Chemistry Placement Examination . (Credit in Chem 101 does not substitute for a passing score on the Chemistry Placement Examination) and a "C" or better in MATH 113 or 117 or 119A or 122. One year of high school chemistry is strongly recommended. (Recommended for students who intend to pursue careers in science or engineering).

CHEM 111B General Chemistry (5)

Prerequisite: CHEM 111A with a grade of "C" or better.

NOTE: BIOL 111, 111L, 212, 212L, 213, 213L are required if courses were taken prior to catalog year 2010-11.

Take one of the following courses:

MATH 119A Survey of Calculus I (3)

Prerequisite: Appropriate MDPT placement or a grade of "C" or better in MATH 113.

MATH 122 Calculus I (4)

Prerequisite: Appropriate MDPT placement or a grade of "C" or better in MATH 111 and 113, or a grade of "C" or better in MATH 117.

Take one of the following courses:

MATH 119B Survey of Calculus II (3)

Prerequisite: MATH 119A or 122.

MATH 123 Calculus II (4)

Prerequisite: A grade of "C" or better in MATH 122.

Take one of the following courses:

PHYS 100A General Physics (4)

Prerequisite: MATH 109 or 113 or 117 or 119A or 120 or 122.

PHYS 151 Mechanics and Heat (4)

Prerequisite/Corequisite: MATH 122.

Take one of the following courses:

PHYS 100B General Physics (4)

Prerequisites: PHYS 100A.

PHYS 152 Electricity and Magnetism (4)

Prerequisite: PHYS 151; Prerequisite/Corequisite: MATH 123.

The following courses do not meet any specific or elective requirements for this major: BIOL 100, 153, 153L, 200, 200L, 205, 205L, 207, 208; MICR 101 and 200.

Upper Division:

Take a minimum of 42 upper division units to include the following:

Take one of the following course combinations in Organic Chemistry or Biochemistry (Groups A or B):

**Group A**

CHEM 322A Organic Chemistry (3)

Prerequisite: CHEM 111B with a grade of "C" or better. Concurrent enrollment in CHEM 323A required except for students who have previously earned a "C" or better in CHEM 323A.

CHEM 322B Organic Chemistry (3)

Prerequisites: CHEM 322A and CHEM 323A, both with a grade of "C" or better. Concurrent enrollment in CHEM 323B required except for students who have previously earned a "C" or better in CHEM 323B.

CHEM 323A Organic Chemistry Laboratory (1)

Prerequisite: CHEM 111B with a grade of "C" or better. Concurrent enrollment in CHEM 322A required except for students who have previously earned a "C" or better in CHEM 322A.

CHEM 323B Organic Chemistry Laboratory (1)

Prerequisites: CHEM 322A and CHEM 323A, both with a grade of "C" or better. Concurrent enrollment in CHEM 322B required except for students who have previously earned a "C" or better in CHEM 322B.

**Group B**

CHEM 327 Organic Chemistry (3)

Prerequisite: CHEM 111A with a grade of "C" or better; CHEM 111B is recommended.

CHEM 448 Fundamentals of Biological Chemistry (3)

Prerequisites: CHEM 327 or 322B either with a grade of "C" or better.

Few, if any, health-related professional schools (e.g. veterinary medicine) will accept CHEM 327. Some graduate programs with masters or doctorates in biology and/or ecology may also not accept CHEM 327. Students interested in these programs might consider taking CHEM 322A,B and 323A,B. CHEM 327 is not acceptable as a prerequisite for CHEM 441A. CHEM 327 is acceptable toward the Minor in Chemistry.

Take all of the following courses: (11 units)

BIOL 312 Evolutionary Biology (3)

Prerequisites: BIOL 211, 212, 213, 260 all with a grade of "C" or better.

BIOL 350 General Ecology (3)

Prerequisites: BIOL 211, 212, 213, 260; MATH 119A or 122 all with a grade of "C" or better. Chemistry and physics recommended.

BIOL 370 General Genetics (4)

Prerequisites: BIOL 211, 212 and either BIOL 260 or CHEM 251 all with a grade of "C" or better.

BIOL 480 Seminars (1)

Prerequisites: Consent of undergraduate [graduate] advisor. Undergraduates must have filed for graduation and be in their last semester. Classified post-baccalaureates must have been admitted to a second baccalaureate or a certificate.

Although BIOL 340 is not required for this option, it is a prerequisite for many 400-level courses and may be used as an elective.

Take at least one of the following courses/course pairs: 3-4 units

BIOL 345 Comparative Animal Physiology (3)

Prerequisites: BIOL 211, 212, 213 all with grade of "C" or better, and

BIOL 345L Lab in Comp Animal Physiology (1)

Prerequisite/Corequisite: BIOL 345 with a grade of "C" or better.

Or

BIOL 447 Molecular Plant Physiology (3)

Prerequisites: BIOL 340, 370, both with grade of "C" or better.

Take at least two of the following courses in organismal diversity, one of which must be BIOL 313, 316, 324, 427, or 439:

BIOL 313 Invertebrate Zoology (4)

Prerequisites: BIOL 211, 212, 213 all with a grade of "C" or better.

BIOL 316 General Entomology (4)

Prerequisites: BIOL 211, 212, 213 all with grade of "C" or better.

BIOL 324 Vertebrate Zoology (4)

Prerequisites: BIOL 211, 212, 213 all with grade of "C" or better.

BIOL 419, Ichthyology (3)

Prerequisites: BIOL 211, 212, 213, 260 and at least 6 additional units of upper division biological science, all with a grade of "C" or better. Recommended: BIOL 350, 353, and 370.

BIOL 421 Herpetology (3)

Prerequisites: BIOL 260, 350, and one additional upper division biology course, all with a grade of "C" or better. Recommended: BIOL 312, 324, or 370.

BIOL 423 Mammalogy (3)

Prerequisite: At least one of BIOL 312, 324, or 350, with a grade of "C" or better.

BIOL 424 Ornithology (3)

Prerequisites: BIOL 211, 212, 213, 260 and three units of upper division BIOL, all with a grade of "C" or better. Recommended: BIOL 350.

BIOL 427 Vascular Plant Systematics (4)

Prerequisite: BIOL 312 or 370 with a grade of "C" or better.

BIOL 439 Plant Morphology (4)

Prerequisite: BIOL 312 or 370 with a grade of "C" or better.

Select a minimum of two courses from the following (any combination of courses from the two groups is acceptable):

**Ecology and Evolution Courses**

BIOL/MICR 355 Microbial Ecology (3)

Prerequisites: MICR 211 or BIOL 211, 212, 213 all with a grade of "C" or better.

BIOL 412 Advanced Evolutionary Biology (3)

Prerequisite: BIOL 312 with a grade of "C" or better.

BIOL 450 Plant Ecology (3)

Prerequisites: BIOL 260, 350 with a grade of "C" or better. Recommended: BIOL 427, 447.

BIOL 451 Wetlands and Mangrove Ecology (3)

Prerequisites: BIOL 260, 350 both with a grade of "C" or better.

BIOL 452 Behavioral Ecology (3)

Prerequisites: BIOL 211, 212, 213, 260 all with a grade of "C" or better. Prerequisite/Corequisite: BIOL 312 or 350.

BIOL 453 Insect Ecology (3)

Prerequisite: BIOL 350 with a grade of "C" or better.

BIOL 454B Research in Tropical Terrestrial Ecology (3)

Prerequisites: BIOL 350; one of BIOL 316, 324, 421, 424, 427, or 439 all with a grade of "C" or better; and consent of instructor.

BIOL 456 Population Ecology (3)

Prerequisites: BIOL 350, MATH 119B or 123 all with a grade of "C" or better.

BIOL 457 Field Methods in Ecology (3)

Prerequisites: BIOL 260, 350 both all with a grade of "C" or better.

BIOL 459 Conservation Biology (3)

Prerequisites: BIOL 260, 350 both with a grade of "C" or better. Recommended: BIOL 370.

BIOL 472 Molecular Evolution (3)

Prerequisite: BIOL 370 with a grade of "C" or better. Recommended: BIOL 312.

**Physiology Courses**

BIOL 442 Physiology at the Limit (3)

Prerequisites: BIOL 342 or 345 with a grade of "C" or better.

BIOL 443 Endocrinology (3)

Prerequisites: BIOL 340 or CHEM 441B; CHEM 320A or 322A or 327; and one of BIOL 341, 342, 345, 445, 448; CHEM 441A or 448, all with a grade of "C" or better.

BIOL 444 Reproductive Biology (3)

Prerequisite: BIOL 342 or 345 with a grade of "C" or better.

BIOL 449 Fish Physio and Endocrinology (3)

Prerequisite: BIOL 345 with grade of "C" or better.

BIOL 464 Aquatic Toxicology (3)

Prerequisites: BIOL 211, 212, 213, 340; CHEM 320A or 322A or 327, all with a grade of "C" or better. Recommended: BIOL 353 and CHEM 448 or 441A,B.

Take 2-3 additional upper division courses totaling 6-9 units in the Department of Biological Sciences so that a minimum number of 42 upper division units are completed. At least three of these units must be at the 400 level. Note that many 400 numbered courses require BIOL 340, which can also count as one of these elective courses.

Courses outside of BIOL that can also count toward these units include GEOG 481, CHEM 441A, and CHEM 448.

Courses that will not count towards these units are BIOL 301, 304, 305, 308, and MICR300I.

Students contemplating graduate or professional school should consider taking 1-3 units of BIOL 496 in addition to the requirements listed above. With prior permission of the advisor for this option, students may use 3 units of BIOL 496 as an elective.

**Option in Molecular Cell Biology and Physiology (120 units)**

This option is designed primarily for those interested in careers that involve biology at the cell, molecular and organ system levels and is particularly appropriate for those contemplating graduate work in these fields or entering one of the health professions, such as medicine and physical therapy. Students in this option might also want to pursue the Certificate in Biotechnology described elsewhere in this Catalog. This option requires approximately 79-83 units in the major, of which 39-41 are in lower division and 40-42 are in upper division.

All students must achieve at least a 2.0 grade-point average in each of the following: 1. the entire college record, 2. all units attempted at CSULB, and 3. all courses in the major.

Lower Division:

Take all of the following courses:

BIOL 211 Introduction to Evolution and Diversity (4)

Prerequisite/Corequisite: CHEM 111A with a grade of "C" or better.

BIOL 212 Intro to Cell and Molecular Biology (4)

Prerequisites: Completion of BIOL 211 and CHEM 111A with grades of "C" or better.

Prerequisite/Corequisite: CHEM 111B with grade of "C" or better.

BIOL 213 Intro to Ecology and Physiology (4)

Prerequisites: BIOL 211, 212, CHEM 111B all with a grade of "C" or better.

BIOL 260 Biostatistics (3)

Prerequisites: BIOL 211 or BIOL 207 or MICR 200; MATH 111 or 113 or 119A or 122 all with a grade of "C" or better.

**CHEM 111A General Chemistry (5)**

Prerequisites: A passing score on the Chemistry Placement Examination. (Credit in Chem 101 does not substitute for a passing score on the Chemistry Placement Examination) and a "C" or better in MATH 113 or 117 or 119A or 122. One year of high school chemistry is strongly recommended. (Recommended for students who intend to pursue careers in science or engineering).

**CHEM 111B General Chemistry (5)**

Prerequisite: CHEM 111A with a grade of "C" or better.

NOTE: BIOL 111, 111L, 212, 212L, 213, 213L are required if courses were taken prior to catalog year 2010-11.

Take one of the following courses:

**MATH 119A Survey of Calculus I (3)**

Prerequisite: Appropriate MDPT placement or a grade of "C" or better in MATH 113.

**MATH 122 Calculus I (4)**

Prerequisite: Appropriate MDPT placement or a grade of "C" or better in MATH 111 and 113, or a grade of "C" or better in MATH 117.

Take one of the following courses:

**MATH 119B Survey of Calculus II (3)**

Prerequisite: MATH 119A or 122.

**MATH 123 Calculus II (4)**

Prerequisite: A grade of "C" or better in MATH 122.

Take one of the following courses:

**PHYS 100A General Physics (4)**

Prerequisite: MATH 109 or 113 or 117 or 119A or 120 or 122.

**PHYS 151 Mechanics and Heat (4)**

Prerequisite/Corequisite: MATH 122.

Take one of the following courses:

**PHYS 100B General Physics (4)**

Prerequisites: PHYS 100A.

**PHYS 152 Electricity and Magnetism (4)**

Prerequisite: PHYS 151; Prerequisite/Corequisite: MATH 123.

Upper Division:

Take all of the following courses:

**CHEM 322A Organic Chemistry (3)**

Prerequisite: CHEM 111B with a grade of "C" or better. Concurrent enrollment in CHEM 323A required except for students who have previously earned a "C" or better in CHEM 323A.

**CHEM 322B Organic Chemistry (3)**

Prerequisites: CHEM 322A and CHEM 323A, both with a grade of "C" or better. Concurrent enrollment in CHEM 323B required except for students who have previously earned a "C" or better in CHEM 323B.

**CHEM 323A Organic Chemistry Laboratory (1)**

Prerequisite: CHEM 111B with a grade of "C" or better. Concurrent enrollment in CHEM 322A required except for students who have previously earned a "C" or better in CHEM 322A.

**CHEM 323B Organic Chemistry Laboratory (1)**

Prerequisites: CHEM 322A and CHEM 323A, both with a grade of "C" or better. Concurrent enrollment in CHEM 322B required except for students who have previously earned a "C" or better in CHEM 322B.

**CHEM 441A Biological Chemistry (3)**

Prerequisite: Either CHEM 320B or both CHEM 322B and 323B with a grade of "C" or better; a biology or microbiology course is recommended.

**CHEM 441B Biological Chemistry (3)**

Prerequisite: CHEM 441A with a grade of "C" or better.

Take all of the following courses:

**BIOL 340 Molecular Cell Biology (3)**

Prerequisites: BIOL 211, 212; CHEM 320A or 322A or 327 all with a grade of "C" or better.

**BIOL 370 General Genetics (4)**

Prerequisites: BIOL 211, 212 and either BIOL 260 or CHEM 251 all with a grade of "C" or better.

**BIOL 480 Seminars (1)**

Prerequisites: Consent of undergraduate [graduate] advisor. Undergraduates must have filed for graduation and be in their last semester. Classified post-baccalaureates must have been admitted to a second baccalaureate or a certificate.

Take one of the following:

**BIOL 312 Evolutionary Biology (3)**

Prerequisites: BIOL 211, 212, 213, 260 all with a grade of "C" or better.

**BIOL 350 General Ecology (3)**

Prerequisites: BIOL 211, 212, 213, 260; MATH 119A or 122 all with a grade of "C" or better. Chemistry and physics recommended.

Take at least one of the following courses/course pairs:

**BIOL 342 Human/Mammalian Phys (3)**

Prerequisites: BIOL 211, 212, 213 all with grade of "C" or better. Recommended: PHYS 100A,B

And

**BIOL 342L Lab in Human/Mammalian Phys (1)**

Prerequisite/Corequisite: BIOL 342 with a grade of "C" or better.

Or

**BIOL 345 Comparative Animal Physio (3)**

Prerequisites: BIOL 211, 212, 213 all with grade of "C" or better.

And

**BIOL 345L Lab in Comp Animal Phys (1)**

Prerequisite/Corequisite: BIOL 345 with a grade of "C" or better.

Or

**BIOL 440L Molecular Cell Biology Lab (3)**

Prerequisites: BIOL 340, 370, both with a grade of "C" or better, and consent of instructor.

If more than one is taken, the second course may count towards the electives below.

Take four courses totaling at least 12 units selected from the following:

**BIOL 431 Biology of Cancer (3)**

Prerequisites: BIOL 340, 370 with a grade of "C" or better.

**BIOL 432 Stem Cell Biology (3)**

Prerequisites: BIOL 433 with a grade of "C" or better.

**BIOL 433 Developmental Biology (3)**

Prerequisites: BIOL 340, and either BIOL 370 or MICR 371, both with a grade of "C" or better.

**BIOL 440L Molecular Cell Biology Lab (3)**

Prerequisites: BIOL 340, 370, both with a grade of "C" or better, and consent of instructor.

**BIOL 442 Physiology at the Limit (3)**

Prerequisites: BIOL 342 or 345 with a grade of "C" or better.

**BIOL 443 Endocrinology (3)**

Prerequisites: BIOL 340 or CHEM 441B; CHEM 320A or 322A or 327; and one of BIOL 341, 342, 345, 445, 448; CHEM 441A or 448, all with a grade of "C" or better.

**BIOL 444 Reproductive Biology (3)**

Prerequisite: BIOL 342 or 345 with a grade of "C" or better.

**BIOL 445 Metabolic Regulation (3)**

Prerequisites: BIOL 340, 342 or 345; CHEM 441A with grade of "C" or better.

**BIOL 447 Molecular Plant Physiology (3)**

Prerequisites: BIOL 340, 370, both with grade of "C" or better.

**BIOL 448 Principles of Neurobiology (3)**

Prerequisites: BIOL 340 or CHEM 441B and one of BIOL 341, 342, or 345 all with a grade of "C" or better.

**BIOL 449 Fish Physio and Endocrinology (3)**

Prerequisite: BIOL 345 with grade of "C" or better.

**BIOL 472 Molecular Evolution (3)**

Prerequisite: BIOL 370 with a grade of "C" or better.

**BIOL 473 Molecular Genetics (3)**

Prerequisites: BIOL 370 or MICR 371; CHEM 320A,B or 322A,B and 323A,B, or 327, all with a grade of "C" or better.

**BIOL 477 Biotechnology & Bioinformatics (4)**

Prerequisite: BIOL 340 or 370 or CHEM 441A,B; all with a grade of "C" or better.

**BIOL/MICR 416 Virology (3)**

Prerequisite: MICR 320 or BIOL 340 with a grade of "C" or better.

**BIOL/MICR 430 Immunology (3)**

Prerequisite: BIOL 340 with a grade of "C" or better.

With permission of the appropriate advisor, students may substitute one course in the biological sciences that is not on the above list for one of these four courses.

The following courses do not meet any specific or elective requirements for this major: BIOL 301, 304, 305, 308, 309I; MICR 300I; and NSCI 492.

Students contemplating graduate or professional school should consider taking 1-3 units of BIOL 496 in addition to the requirements listed above. With prior permission of the advisor for this option, students may use 3 units of BIOL 496 as an elective.

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EFFECTIVE: Fall 2013

Campus Code: Option in Organismal Biology (code BIOLBS16)

Option in Molecular Cell Biology and Physiology (code BIOLBS17)

College: 65

Career: UG

CSU Code: 4011

CIP Code: 26.0101

NOTE: With this policy statement, the following options are discontinued effective fall 2013:

BS in Biology, Option in Botany, Option in Ecology, Option in Zoology

BS in Biology, Option in Cell and Molecular Biology, Option in Physiology