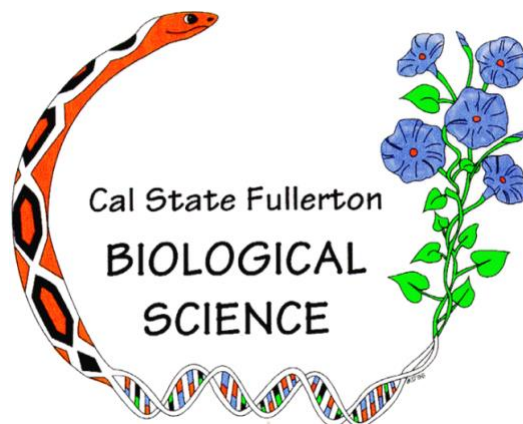


California State University, Fullerton

Department of Biological Science

Undergraduate Advising Handbook

Catalog Year FALL 2023



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Welcome to the Department of Biological Science at Cal State Fullerton! A Biology degree opens doors to many exciting careers and life experiences. You have likely chosen Biology as a major because of a strong interest in science and pursuing a biology-related career in biotechnology, environmental management and conservation, research, forensics, teaching, journalism, law or government or continuing to a health professions program or graduate school.

Biology is a challenging major, but your enthusiasm for science and your commitment to your long-term goals will see you through. Persistence is the key, and we will help you every step of the way toward graduation. The faculty and staff in the Department of Biological Science are dedicated to your success! Please let us know how we can help.

Success as a Biology Major ultimately depends on the choices you make. Your time in your classes and studying will take time and effort. There are many resources available that will help you be successful. Cal State Fullerton offers a wealth of resources that are available to you. You can find free academic support through [Supplemental Instruction](#) and at the [Student Success Center for Natural Sciences and Mathematics](#) and the [Writing Center](#). Support can be found at a wide variety of campus Resource Centers (www.fullerton.edu/sa/ and www.fullerton.edu/dirc/), including health and well-being ([ASI Food Pantry](#), [Tuffy's Basic Needs](#), [Disability Support Services](#), [YOU@ Fullerton](#), and [Health Services](#)). In addition, there are resources available to help you explore your career options through the [Career Center](#) and the [Center for Internships & Community Engagement](#). Most important, choose to become involved with the campus [through clubs and organizations](#). Joining student organizations, volunteering, and participating in undergraduate research with [a faculty mentor](#) or as a member of a [research program](#) are all great ways to form supportive connections with the campus, the department, and your fellow students.

This handbook is intended to help you plan and navigate the requirements for your bachelor's degree in Biological Science. Please review its contents from the first page to the last page. You can find information on your degree requirements, the biology concentrations, planning your classes, faculty research interests, [scholarships](#), and more.

The Department of Biological Science provides academic advising to help you make progress towards graduation. We offer group advising during the semesters you are taking lower division biology core courses and one-on-one advising with a faculty advisor as you transition to your upper division electives. If you need additional assistance at any time, please stop by the Department office (McCarthy Hall 205) or email bioladvising@fullerton.edu and ask for help.

We look forward to meeting and working with you.

Sincerely,



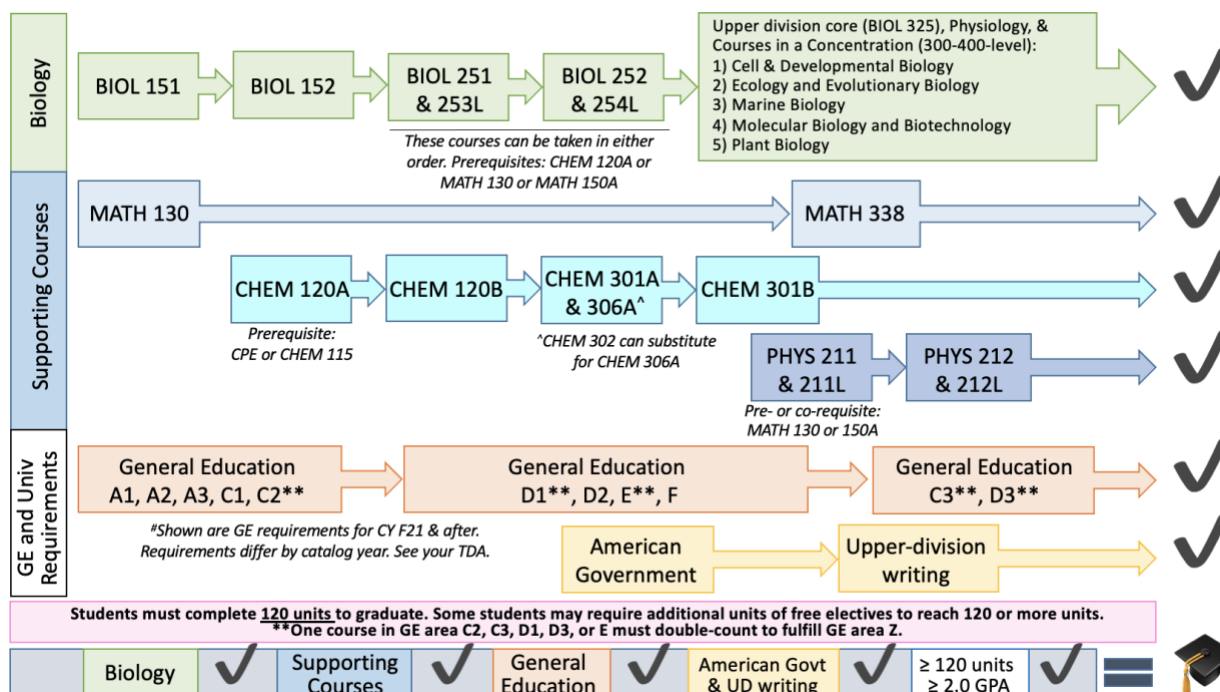
Amybeth Cohen, Ph.D.
Professor and Chair
Department of Biological Science

TABLE OF CONTENTS

BACHELOR OF SCIENCE DEGREE IN BIOLOGY.....	1
BACHELOR’S DEGREE REQUIREMENTS	2
UNDERSTANDING YOUR CATALOG YEAR.....	4
PLANNING YOUR COURSEWORK	5
BIOLOGY CORE AND SUPPORTING COURSES WORKSHEET	6
CELL AND DEVELOPMENTAL BIOLOGY CONCENTRATION (C&D)	7
ECOLOGY & EVOLUTIONARY BIOLOGY CONCENTRATION (EEB)	10
MARINE BIOLOGY CONCENTRATION (MB)	12
MOLECULAR BIOLOGY AND BIOTECHNOLOGY CONCENTRATION (MB&B)	15
PLANT BIOLOGY CONCENTRATION (PB)	18
UPPER-DIVISION BIOLOGY MAJORS ELECTIVES	20
CSUF UNDERGRADUATE REPEAT POLICY AND WITHDRAWAL POLICY	22
ACADEMIC NOTICE (formerly Academic Probation) AND DISQUALIFICATION	23
MINORS IN BIOLOGY	24
MINORS ASSOCIATED WITH BIOLOGY	26
RESEARCH AND OTHER OPPORTUNITIES FOR UNDERGRADUATE BIOLOGY MAJORS	27
GENERAL EDUCATION INFORMATION	29
BIOLOGICAL INTERNSHIP (BIOL 495) INFORMATION.....	30
WHAT CAN I DO WITH MY BACHELORS DEGREE IN BIOLOGY?	31
HEALTH PROFESSIONS AS A BIOLOGY MAJOR	32
TEACH SCIENCE AND IMPACT THE FUTURE	34
DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER	35
ADMINISTRATIVE OFFICES	40
RESOURCES FOR BIOLOGY MAJORS	41

BACHELOR OF SCIENCE DEGREE IN BIOLOGY

Catalog Year Fall 2023



- Declare your concentration during the semester you are taking your last lower-division BIOL Core course
- Complete 40 units of Biology major's courses (BIOL Core and upper division courses to fulfill a concentration), grade of C or higher in each, BIOL GPA ≥ 2.0
- Complete Supporting Courses (MATH, CHEM, PHYS), grade of C or higher in each
- Complete General Education Requirements
- Complete American Government Graduation Requirement
- Complete Upper-division Writing Requirement
- Apply for Graduation through your Student Center at least 2 semesters before anticipated graduation

BACHELOR'S DEGREE REQUIREMENTS

Use your Titan Degree Audit to track your progress toward completion of your degree

A. Major requirements: (minimum grade of C in each course)

- 40 units of Biology courses, including:
 - The Biology Core courses (BIOL 151, 152, 251, 253L, 252, 254L, and 325)
 - At least 21 units of upper division Biology electives fulfilling a concentration (excludes Biology courses in GE Area B.5)
 - 6 of the 21 units of upper division Biology must be laboratory/fieldwork
 - Minimum GPA of 2.0 in all attempted Biology courses
- 34 units of supporting courses – Minimum grade of C (2.0) in each

B. University requirements:

- 120 units for the Bachelor of Science. Students must complete 120 units to graduate. Some students may require additional units of free electives to reach 120 or more units.
 - CSUF GPA and Cumulative GPA must be 2.0 or higher
 - At least 40 units must be upper-division (300-400 level) coursework. (Note: Completion of the major and 9 required units of upper division GE usually fulfills this requirement, if O-Chem is taken at CSUF. If O-Chem is taken at a community college, additional units may be required to reach the 40 unit upper-division coursework requirement).
 - Complete at least 30 units in “residence” at CSUF
 - At least 24 of the 30 units must be upper division
 - At least 12 of the 24 upper division units must be in your major
 - General education requirements (at least 48 GE units) including:
 - At least **9** units of upper division GE (300-400 level courses): B5, C3, D3
 - At least **3** units of Cultural Diversity (Z) coursework (Take a GE area C, D, or E course that double-counts for Z)
 - 3 units in Area F
 - An American Government course is required for student with catalog year 2021 and beyond
 - Satisfy the University upper-division writing requirement (ENGL 301, ENGL 363, or 3 units of BIOL 498), minimum grade of C
 - Satisfy the American Government Graduation requirement (POSC 100 or HONR 201B)
 - Special unit totals: No more than...
 - ... 70 units from a community college
 - ... 90 units from a 4-year university
 - ... 30 units from credit by examination
 - ... 36 “credit/no credit” units
 - ... 24 units taken through Extended Education
 - ... 6 units of internship (495 courses in any department)
 - ... 9 units from independent study courses
 - ... 3 units from tutorial courses
- Apply for a **graduation** (i.e., grad check) one year (two semesters) before graduation, but only **AFTER** completing all lower-division (100-200 level) Biology Core courses **AND** declaring your concentration. The Biology department will then review your requirements for graduation.
 - Log into your student portal, click on “student home page”, then click on “academic records”. Click and view the “Academic Records” tile. View

“Undergraduate Program” and choose “Apply for Graduation”; select the term that you believe you will be completing your degree. “Apply for Graduation” allows the Biol department to begin the grad check review of your TDA (you may pay the fee later, up to the CSUF graduation fee deadline). You can change your graduation date by contacting your Graduation Specialist.

- Be careful to choose the correct anticipated graduation term; choosing an incorrect term can have negative consequences on advising, enrollment, and financial aid. If you are unsure about what is a realistic graduation date, discuss with your adviser or the CNSM Graduation Specialist (see last page of this Handbook) before applying for graduation.
- To advance to “Candidate” status, your grad check must be approved by the Biology Department, and you must pay a \$115 graduation fee to CSUF. Complete information about the graduation check process for undergraduates is available at <http://records.fullerton.edu/academics/graduation.php>

Understanding Your Catalog Year

What is my catalog year and why is it important?



The CSU and CSUF occasionally modify graduation requirements. If you have been in continuous attendance, you may choose to meet the CSUF campus graduation requirements in the CSUF catalog that was in effect in any of the three following instances:

1. at the time you began continuous attendance at CSUF, OR if you are an upper division transfer student, at the time you began continuous attendance at the California Community College,
2. at the time you transferred to the CSU campus, or
3. at the time you graduate from the CSU campus.

By maintaining continuous attendance and selecting option (1) or (2), you can be assured that your CSU campus graduation requirements will not change. Your right to choose one of these options is called "catalog rights."

Tip: If you are a new, first-time freshman in the fall of

2018, then your assigned catalog year is 2018 (2018-19). If you are a new transfer student in the fall of 2018 continuously enrolled in community college since fall 2015 or spring 2016, then your appropriate catalog year is 2015 (2015-16) or 2018 (2018-19).

May I choose a catalog year other than what I was assigned when I first enrolled here?




Yes, as long as it aligns with one of the three circumstances listed above. Normally, it is in your best interest to commit to the catalog year, that is, the *General Education, major and minor requirements*, that were in effect when you first enrolled at CSUF or when you first began uninterrupted enrollment at a community college on your pathway to junior transfer to CSUF. This is because that is the catalog that holds the requirements that you anticipated at the time that you prepared to apply for admission.

Your catalog year's requirements come as a package. For example, you *may not* elect to fulfill the major requirements of one year's catalog, and the General Education requirements of a different year.

How will I know which catalog year suits my needs the best?



You may run a "what if" inquiry on your Titan Degree Audit (TDA) under a different catalog year. Your TDA displays your official catalog year of record at the top of the first page when you log in:

PREPARED: 04/10/18 - 12:19	CWID - 123456789
Last, First	ANTICIP GRAD DATE: 05/25/18
PROGRAM CODE: BS EGCE	CATALOG YEAR: <u>FA2011</u> 
BACHELOR OF SCIENCE	Semester and Year
CIVIL ENGINEERING	
*****AT LEAST ONE REQUIREMENT HAS NOT BEEN SATISFIED*****	

Visit your retention specialist, graduation specialist or major advisor to discuss your options if you have further questions. Find these individuals through your Student Success Center, listed at success.fullerton.edu click on "Student Success Teams."

Remember to seek *major advising in your college*, and *General Education advising in the Academic Advisement Center, UH-123*. (Exception: MCBE students may seek GE advising in their college.)

from <http://www.fullerton.edu/aac>

PLANNING YOUR COURSEWORK

Many CSUF students work and/or have family commitments, long drives to CSUF and back, as well as other important obligations that take up their time. To be successful as a biology major, we recommend the following based on a 60-hour work week (school + commitments) and the need to study 25 – 35 h per week. Keep in mind that lecture classes generally meet for 3 h per week and labs meet for 3-6 h per week (3 hours per unit of lab; Biology core class labs meet for 3 h per week, and some upper division Biology courses have labs that meet for 6 h per week). **Every week, you should create time in your schedule to allow you to study 3 h for every unit of lecture and 2 h for every unit of lab.** Demands on your time will vary over the semester. Time management is a critical skill for success.

Hours for Work/Family/Commuting per week	Maximum Number of Units Per Semester
0 – 9	14 - 16
10 – 19	13 – 14
20 – 29	9 – 12
30 – 39	6 – 9

PLANNING TIME TO GRADUATION

→ Since 120 units are required for a Bachelor's degree...

If You Complete:

You Will Graduate In:

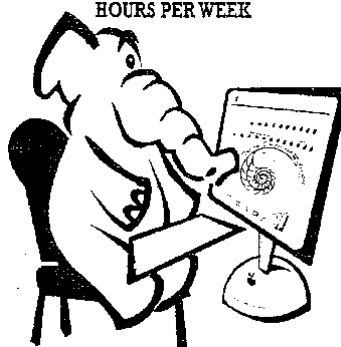
30 units per year 4 years
 24 units per year 5 years
 20 units per year 6 years

To reach your goal for graduation, you'll need to balance your time, your course load, and make a plan indicating how you will fulfill all of your degree requirements. When making this plan, consider how much you need to work, how much time you need to be successful in your courses (for most students, this means getting A's and B's; not C's), and the consequences of how you arrange your schedule (i.e., it is generally not a good idea to take Calculus, Chemistry, Physics, Biology, and History in a single semester).

TO BE A SUCCESSFUL TITAN

STUDY 25 - 35

HOURS PER WEEK



BIOLOGY CORE AND SUPPORTING COURSES WORKSHEET

(This version applies to Catalog Year Fall 2018 and later)

Required Biology Core Courses must be passed with a C or better:

Course	Title (units)	When passed	Grade
BIOL 151	Cellular and Molecular Biology (4)		
BIOL 152	Evolution and Organismal Biology (4)		
BIOL 251 <u>and</u> BIOL 253L	Genetics (3) <u>and</u> Cell/Molecular Skills Lab (1)		
BIOL 252 <u>and</u> BIOL 254L	Principles of Ecology (3) <u>and</u> Research Skills for Ecology/Organismal Biology (1)		
BIOL 325	Principles of Evolution (3)		

→ After completion of the 19 units of Biology Core Courses, 21 units (6 units must be lab/field) of Upper Division Biology electives in a concentration of your choice must be taken to reach a total of 40 units of Biology courses.

Required Supporting Courses must be passed with a C or better (34 units):

Course	Title (units)	When passed	Grade
MATH 130 <u>and</u> MATH 338 OR	Calculus (4) <u>and</u> Statistics (4)		
MATH 150A <u>and</u> MATH 150B	Calculus (4) <u>and</u> Calculus (4)		
CHEM 120A	General Chemistry (5)		
CHEM 120B	General Chemistry (5)		
CHEM 301A	Organic Chemistry (3)		
CHEM 301B	Organic Chemistry (3)		
CHEM 306A	Organic Chemistry Lab (2)		
PHYS 211	Elementary Physics (3)		
PHYS 211L	Elementary Physics Lab (1)		
PHYS 212	Elementary Physics (3)		
PHYS 212L	Elementary Physics Lab (1)		

Required University Upper-Division Writing (Must pass with a C or better)

ENGL 301* Advanced College Writing (3) OR ENGL 363* Scientific Writing (3) OR 3 units BIOL 498		
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<u>Course</u>	<u>Prerequisites (co-requisites noted in parenthesis)</u>
BIOL 151	none
BIOL 152	BIOL 151
BIOL 251	BIOL 151 and BIOL 152 and CHEM 120A or MATH 130 or MATH 150A
BIOL 253L	BIOL 251 (co-req)
BIOL 252	BIOL 151 and BIOL 152 and CHEM 120A or MATH 130 or MATH 150A
BIOL 254L	BIOL 252 (co-req)
BIOL 325	BIOL 251/253L and BIOL 252/254L
MATH 130/150A	passing score on ALEKS, MQE, or exemption
MATH 150B	MATH 150A
MATH 338	MATH 130 or MATH 150B or consent of instructor
CHEM 120A	Passing score on CPE or CHEM 115
CHEM 120B	CHEM 120A
CHEM 301A	CHEM 120A and 120B
CHEM 301B	CHEM 301A
CHEM 306A	CHEM 120B; CHEM 301A (co-req)
PHYS 211	MATH 125 or MATH 130 or 150A; PHYS 211L (co-req)
PHYS 211L	PHYS 211 (co-req)
PHYS 212	PHYS 211; PHYS 212L (co-req)
PHYS 212L	PHYS 212 (co-req)

* Students interested in health professions careers should take ENGL 301 or ENGL 363.

College of Natural Sciences and Mathematics
DEPARTMENT OF BIOLOGICAL SCIENCE
BIOLOGY BACHELOR OF SCIENCE
CATALOG YEAR FALL 2023
CONCENTRATION IN CELL & DEVELOPMENTAL BIOLOGY

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
BIOL 151 (GE B2 and B3) 4 units	BIOL 152 4 units	BIOL 251 3 units	BIOL 252 3 units	BIOL 303 3 units	BIOL 325 3 units	Upper Division Biology Elective 3-4 units	Biology Capstone 2-3 units
CNSM 101 (GE A3) 3 units		BIOL 253L 1 unit	BIOL 254L 1 unit	BIOL 302 5 units	Upper Division Biology Elective 3 units	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective(s) to complete required units
MATH 130 or MATH 150B* (GE B4) 4 units	CHEM 120A (GE B1) 5 units	CHEM 120B 5 units	CHEM 301A 3 units	CHEM 301B 3 units	MATH 338 (GE B5) 4 units	PHYS 212 3 units	
GE A1 or A2 3 units	GE A1 or A2 3 units	GE D1** 3 units	CHEM 306A 2 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211 3 units	PHYS 212L 1 unit	
GE C1 or C2** 3 units	GE C1 or C2** 3 units	GE D2 3 units	GE F 3 units		PHYS 211L 1 unit	Upper Division GE C3** 3 units	Upper Division GE D3** 3 units
			American Government 3 units		GE E** 3 units		Electives to complete 120 units
17 units	15 units	15 units	15 units	14 units	17 units	13-15 units	12-14 units

* only if you have AP credit for MATH 150A

** One GE course in C, D, or E must double-count as GE Z

27	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Writing Requirement: Upper division
3	Graduation Requirement: American Government
7	Electives
120	TOTAL UNITS

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

- Attend Biology major advising each semester to plan and review your academic progress.
- Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
- All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
- Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 17 units in GE area B with a C or higher since these are part of the major. To fulfill GE area Z, one course from GE area C, D, or E must double-count as GE area Z. Check your Titan Degree Audit for courses that appear in both categories. Complete GE area F with a C- or better.
- Declare your concentration during the semester you are taking your last lower-division Biol Core course.
- Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE Cell and Developmental Biology Concentration

The Biology Major is for students who are preparing to (1) enter biology graduate and health professional schools, (2) seek biology-related careers in industry or government agencies, or (3) teach in secondary school.

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

Course	Course Title
BIOL 151	Cellular & Molecular Biology (GE B2 and B3)
BIOL 152	Evolution & Organismal Biology
BIOL 251	Genetics
BIOL 252	Principles of Ecology
BIOL 253L	Cell & Molecular Biology Skills Laboratory
BIOL 254L	Research Skills for Ecology and Organismal Biology
BIOL 325	Principles of Evolution
CHEM 120A	General Chemistry (GE B1)
CHEM 120B	General Chemistry
CHEM 301A	Organic Chemistry
CHEM 301B	Organic Chemistry
CHEM 306A	Organic Chemistry Laboratory
MATH 130 or 150A+150B*	A Short Course in Calculus/ Calculus (GE B4)
MATH 338	Statistics Applied to Natural Sciences (GE B5)
PHYS 211	Elementary Physics
PHYS 211L	Elementary Physics: Laboratory
PHYS 212	Elementary Physics
PHYS 212L	Elementary Physics: Laboratory

*only if you have AP credit for MATH 150A, then take MATH 150B

Cell & Developmental Concentration Requirements (15 units total)

Units are shown as total units / lab-field units, e.g. (4/2)

Cell and Developmental Biology Required Courses (8 units)

BIOL 302	General Microbiology (5/2)
BIOL 303	Intermediate Cell Biology (3)

Cell and Developmental Biology Elective Courses (5 units)

Course	Course Title	Course	Course Title
BIOL 329	Essential Tech. Cell Biol. (3/2)	BIOL 429	Tech. Stem Cell Biol. (3/2)
BIOL 362	Mammalian Physiology (4/1)	BIOL 431	Adv. Microbiol. Lab (3/2)
BIOL 405	Developmental Biology (3)	BIOL 438	Pub. Health Microbiol. (4/2)
BIOL 410	Evolutionary Genetics (4/2)	BIOL 445	Plant Cell Physiology (3)
BIOL 417	Adv. Cell Biology (3)	BIOL 454L	Microscopy Imaging Biol. (2/2)
BIOL 418L	Adv. Cell Biology Lab (2)	BIOL 462	General Parasitology (4/2)
BIOL 424	Immunology (5/2)	BIOL 465	Int. Biol. of Spider Silk (3)
BIOL 427	Stem Cell Biology (3)	BIOL 470	Cellular Neurobiology (3)
BIOL 428	Biology of Cancer (3)	BIOL 490T	Clinical Microbiol. (3/2)

Cell and Developmental Biology Capstone Courses (2 units)

Course	Course Title	Course	Course Title
BIOL 400	Sem. in Biology Education (3)	BIOL 465	Int. Biol. of Spider Silk (3)
BIOL 424	Immunology (5/2)	BIOL 470	Cellular Neurobiology (3)
BIOL 427	Stem Cell Biology (3)	BIOL 482	Capstone Studies in Biology (2)
BIOL 428	Biology of Cancer (3)	BIOL 490T	Clinical Microbiol. (3/2)
BIOL 429	Tech. Stem Cell Biol. (3/2)	BIOL 495	Internship (3/2)
BIOL 431	Adv Microbiol Lab (3/2)	BIOL 498	Thesis (1-3)
BIOL 438	Pub. Health Microbiol (4/2)	BIOL 499L	Independent Lab Study (1-3)
BIOL 462	General Parasitology (4/2)		

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

Physiology: One course in physiology is required. This can be taken as part of the concentration electives (if allowed) or separately. (3 units)

Course	Course Title	Course	Course Title
BIOL 302	General Microbiology (5/2)	BIOL 445	Plant Cell Physiology (3)
BIOL 362	General Human Physiology (4/1)	BIOL 468	Comp. Animal Physiology (4/1)
BIOL 444	Plant Physiological Ecology (4/2)		

As part of their Biology Requirements students must complete:

- 6 units of 400-level biology courses
- 6 units of laboratory/field courses, 3 units of which must be taken within the concentration

UNIVERSITY & GE REQUIREMENTS

• Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301, ENGL 363, or BIOL 498 (3 units).

• Graduation requirement

Students must complete an American Government course: POSC 100 or HONR 201B.

GENERAL EDUCATION REQUIREMENTS

- **Area A Core Competencies.** Complete one course in each sub-area for a total of 9 units. Area A1 and A2 must be completed during your first year; one should be taken in the fall and one should be taken in the spring. You should not take both A1 and A2 your first semester. Take CNSM 101 (GE A3) during the fall semester of your first year.

A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

- **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. B5 includes 3 upper division units.

B1	Physical Science (CHEM 120A)
B2	Life Science (BIOL 151)
B3	Laboratory Experience (BIOL 151)
B4	Mathematics/Quantitative Reasoning (MATH 130 or MATH 150A from AP credit)
B5	Implications & Explorations NSM (MATH 338)

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 and one upper division course from C3.

C1	Introduction to the Arts
C2**	Introduction to the Humanities
C3**	Explorations in the Arts or Humanities

D1**	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3**	Explorations in the Social Sciences

- **Area D Social Sciences.** Complete one course each in D1 and D2 and one upper division course from D3.
- **Area E** Lifelong Learning and Self Development.** Complete one course in this area.
- **Area F Ethnic Studies.** Complete one course in this area.
- ****Area Z Cultural Diversity.** One GE course from area C, D, or E must double-count as area.

College of Natural Sciences and Mathematics
DEPARTMENT OF BIOLOGICAL SCIENCE
BIOLOGY BACHELOR OF SCIENCE
CATALOG YEAR FALL 2023
CONCENTRATION IN ECOLOGY & EVOLUTIONARY
BIOLOGY

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
BIOL 151 (GE B2 and B3) 4 units	BIOL 152 4 units	BIOL 252 3 units	BIOL 251 3 units	BIOL 325 3 units	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective 3-4 units	Biology Capstone 2-3 units
CNSM 101 (GE A3) 3 units		BIOL 254L 1 unit	BIOL 253L 1 unit	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective 3 units	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective(s) to complete required units
MATH 130 or MATH 150B* (GE B4) 4 units	CHEM 120A (GE B1) 5 units	CHEM 120B 5 units	CHEM 301A 3 units	CHEM 301B 3 units	MATH 338 (GE B5) 4 units	PHYS 212 3 units	
GE A1 or A2 3 units	GE A1 or A2 3 units	GE D1** 3 units	CHEM 306A 2 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211 3 units	PHYS 212L 1 unit	
GE C1 or C2** 3 units	GE C1 or C2** 3 units	GE D2 3 units	GE F 3 units	GE E** 3 units	PHYS 211L 1 unit	Upper Division GE C3** 3 units	Upper Division GE D3** 3 units
			American Government 3 units				Electives to complete 120 units
17 units	15 units	15 units	15 units	15-16 units	14-15 units	13-15 units	12-16 units

* only if you have AP credit for MATH 150A

** One GE course in C, D, or E must double-count as GE Z

27	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Writing Requirement: Upper division
3	Graduation Requirement: American Government
7	Electives
120	TOTAL UNITS

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

- Attend Biology major advising each semester to plan and review your academic progress.
- Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
- All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
- Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 17 units in GE area B with a C or higher since these are part of the major. To fulfill GE area Z, one course from GE area C, D, or E must double-count as GE area Z. Check your Titan Degree Audit for courses that appear in both categories. Complete GE area F with a C- or better.
- Declare your concentration during the semester you are taking your last lower-division Biol Core course.
- Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE**Ecology & Evolutionary Biology Concentration**

The Biology Major is for students who are preparing to (1) enter biology graduate and health professional schools, (2) seek biology-related careers in industry or government agencies, or (3) teach in secondary school.

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

Course	Course Title
BIOL 151	Cellular & Molecular Biology (GE B2 and B3)
BIOL 152	Evolution & Organismal Biology
BIOL 251	Genetics
BIOL 252	Principles of Ecology
BIOL 253L	Cell & Molecular Biology Skills Laboratory
BIOL 254L	Research Skills for Ecology and Organismal Biology
BIOL 325	Principles of Evolution
CHEM 120A	General Chemistry (GE B1)
CHEM 120B	General Chemistry
CHEM 301A	Organic Chemistry
CHEM 301B	Organic Chemistry
CHEM 306A	Organic Chemistry Laboratory
MATH 130 or 150A+150B*	A Short Course in Calculus/ Calculus (GE B4)
MATH 338	Statistics Applied to Natural Sciences (GE B5)
PHYS 211	Elementary Physics
PHYS 211L	Elementary Physics: Laboratory
PHYS 212	Elementary Physics
PHYS 212L	Elementary Physics: Laboratory

*only if you have AP credit for MATH 150A, then take MATH 150B

EEB CONCENTRATION REQUIREMENTS (14 units total)

Units are shown as total units / lab-field units, e.g. (4/2)

EEB Organismal Biology Elective Courses (3-4 units)

Course	Course Title	Course	Course Title
BIOL 317	Field Marine Biology ¹ (4/2)	BIOL 461	Marine Invert. Biology ¹ (4/2)
BIOL 332	Biology of the Vertebrates (3)	BIOL 475	Ichthyology ¹ (4/2)
BIOL 340	Field Botany (3/2)	BIOL 476	Herpetology (4/2)
BIOL 345	Plant Biology (3/1)	BIOL 478	Mammalogy (4/2)
BIOL 441	Plant Taxonomy (4/2)	BIOL 479	Ornithology (4/2)
BIOL 446	Marine Phycology ¹ (4/2)		

EEB Ecology Elective Courses (3-4 units)

Course	Course Title	Course	Course Title
BIOL 301	Prob. Env. Biol. (3/2)	BIOL 443	Plant Ecology (4/2)
BIOL 419 and 419L	Marine Ecology ¹ (3) and Marine Ecology Lab ¹ (1)	BIOL 449	Desert Ecology (4/2)
BIOL 422	Coastal Ecology ¹ (4/2)	BIOL 466	Behavioral Ecology (3)

EEB Free Elective Courses (4-6 units) Any course listed below, or any course listed as an organismal biology elective, an ecology elective, or an EEB capstone course can be used to fulfill the 14 required units

Course	Course Title	Course	Course Title
BIOL 361	Human Anatomy (4/2)	BIOL 410	Evolutionary Genetics (4/2)
BIOL 402	Comp. Lab Molec. Systematics (3/1)	BIOL 444	Plant Physiol. Ecology (4/2)
BIOL 407	Genes and Genomes (3)	BIOL 468	Comp. Animal Physiology (4/1)

EEB Capstone Courses (2 units)¹ only one of these courses may be counted towards the EEB concentration units

Course	Course Title	Course	Course Title
BIOL 400	Sem. in Biology Education (3)	BIOL 482	Capstone Studies in Biology (2)
BIOL 401	Biogeography (3)	BIOL 495	Internship (3/2)
BIOL 450	Conservation Biology (3)	BIOL 498	Thesis (1-3)
BIOL 465	Int. Biology of Spider Silk (3)	BIOL 499L	Independent Lab Study (1-3)
BIOL 481	Adv. Evolution and Ecology (3)		

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

Physiology: One course in physiology is required. This can be taken as part of the concentration electives (if allowed) or separately. (3 units)

Course	Course Title	Course	Course Title
BIOL 302	General Microbiology (5/2)	BIOL 445	Plant Cell Physiology (3)
BIOL 362	General Human Physiology (4/1)	BIOL 468	Comp. Animal Physiology (4/1)
BIOL 444	Plant Physiological Ecology (4/2)		

As part of their Biology Requirements students must complete:

- 6 units of 400-level biology courses
- 6 units of laboratory/field courses, 3 units of which must be taken within the concentration

UNIVERSITY & GE REQUIREMENTS

- Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301, ENGL 363, or BIOL 498 (3 units).

- Graduation requirement

Students must complete an American Government course: POSC 100 or HONR 201B.

GENERAL EDUCATION REQUIREMENTS

- **Area A Core Competencies.** Complete one course in each sub-area for a total of 9 units. Area A1 and A2 must be completed during your first year; one should be taken in the fall and one should be taken in the spring. You should not take both A1 and A2 your first semester. Take CNSM 101 (GE A3) during the fall semester of your first year.

A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

- **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. B5 includes 3 upper division units.

B1	Physical Science (CHEM 120A)
B2	Life Science (BIOL 151)
B3	Laboratory Experience (BIOL 151)
B4	Mathematics/Quantitative Reasoning (MATH 130 or MATH 150A from AP credit)
B5	Implications & Explorations NSM (MATH 338)

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 and one upper division course from C3.

C1	Introduction to the Arts
C2**	Introduction to the Humanities
C3**	Explorations in the Arts or Humanities

- **Area D Social Sciences.** Complete one course each in D1 and D2 and one upper division course from D3.

D1**	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3**	Explorations in the Social Sciences

- **Area E** Lifelong Learning and Self Development.** Complete one course in this area.

- **Area F Ethnic Studies.** Complete one course in this area.

- ****Area Z Cultural Diversity.** One GE course from area C, D, or E must double-count as area Z.

College of Natural Sciences and Mathematics
DEPARTMENT OF BIOLOGICAL SCIENCE
BIOLOGY BACHELOR OF SCIENCE
CATALOG YEAR FALL 2023
CONCENTRATION IN MARINE BIOLOGY

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
BIOL 151 (GE B2 and B3) 4 units	BIOL 152 4 units	BIOL 252 3 units	BIOL 251 3 units	BIOL 325 3 units	BIOL 317 4 units	Upper Division Biology Elective 3-4 units	Biology Capstone 2-3 units
CNSM 101 (GE A3) 3 units		BIOL 254L 1 unit	BIOL 253L 1 unit	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective 3 units	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective(s) to complete required units
MATH 130 or MATH 150B* (GE B4) 4 units	CHEM 120A (GE B1) 5 units	CHEM 120B 5 units	CHEM 301A 3 units	CHEM 301B 3 units	MATH 338 (GE B5) 4 units	PHYS 212 3 units	
GE A1 or A2 3 units	GE A1 or A2 3 units	GE D1** 3 units	CHEM 306A 2 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211 3 units	PHYS 212L 1 unit	
GE C1 or C2** 3 units	GE C1 or C2** 3 units	GE D2 3 units	GE F 3 units	GE E** 3 units	PHYS 211L 1 unit	Upper Division GE C3** 3 units	Upper Division GE D3** 3 units
			American Government 3 units				Electives to complete 120 units
17 units	15 units	15 units	15 units	15-16 units	15 units	13-15 units	12-15 units

* only if you have AP credit for MATH 150A

** One GE course in C, D, or E must double-count as GE Z

27	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Writing Requirement: Upper division
3	Graduation Requirement: American Government
7	Electives
120	TOTAL UNITS

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

- Attend Biology major advising each semester to plan and review your academic progress.
- Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
- All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
- Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 17 units in GE area B with a C or higher since these are part of the major. To fulfill GE area Z, one course from GE area C, D, or E must double-count as GE area Z. Check your Titan Degree Audit for courses that appear in both categories. Complete GE area F with a C- or better.
- Declare your concentration during the semester you are taking your last lower-division Biol Core course.
- Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE**Marine Biology Concentration**

The Biology Major is for students who are preparing to (1) enter biology graduate and health professional schools, (2) seek biology-related careers in industry or government agencies, or (3) teach in secondary school.

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

Course	Course Title
BIOL 151	Cellular & Molecular Biology (GE B2 and B3)
BIOL 152	Evolution & Organismal Biology
BIOL 251	Genetics
BIOL 252	Principles of Ecology
BIOL 253L	Cell & Molecular Biology Skills Laboratory
BIOL 254L	Research Skills for Ecology and Organismal Biology
BIOL 325	Principles of Evolution
CHEM 120A	General Chemistry (GE B1)
CHEM 120B	General Chemistry
CHEM 301A	Organic Chemistry
CHEM 301B	Organic Chemistry
CHEM 306A	Organic Chemistry Laboratory
MATH 130 or 150A+150B*	A Short Course in Calculus/ Calculus (GE B4)
MATH 338	Statistics Applied to Natural Sciences (GE B5)
PHYS 211	Elementary Physics
PHYS 211L	Elementary Physics: Laboratory
PHYS 212	Elementary Physics
PHYS 212L	Elementary Physics: Laboratory

*only if you have AP credit for MATH 150A, then take MATH 150B

Marine Biology Concentration Requirements (14 units total)

Units are shown as total units / lab-field units, e.g. (4/2)

Marine Biology Required Course (4 units)

BIOL 317	Field Marine Biology (4/2)
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Marine Biology Organismal Biology Courses (4 units)

Course	Course Title	Course	Course Title
BIOL 446	Marine Phycology (4/2)	BIOL 475	Ichthyology (4/2)
BIOL 461	Marine Invertebrate Biology (4/2)		

Marine Biology Ecology Courses (4 units)

Course	Course Title
BIOL 419 & BIOL 419L	Marine Ecology (3) & Marine Ecology Lab (1)
BIOL 422	Coastal Ecology (4/2)

Marine Biology Capstone Courses (2 units)

Course	Course Title	Course	Course Title
BIOL 400	Sem. in Biology Education (3)	BIOL 482	Capstone Studies in Biology (2)
BIOL 401	Biogeography (3)	BIOL 495	Internship (3/2)
BIOL 422	Coastal Ecology (4/2)	BIOL 498	Thesis (1-3)
BIOL 450	Conservation Biology (3)	BIOL 499L	Independent Lab Study (1-3)
BIOL 481	Adv. in Evolution and Ecology (3)		

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

Physiology: One course in physiology is required. This can be taken as part of the concentration electives (if allowed) or separately. (3 units)

Course	Course Title	Course	Course Title
BIOL 302	General Microbiology (5/2)	BIOL 445	Plant Cell Physiology (3)
BIOL 362	General Human Physiology (4/1)	BIOL 468	Comp. Animal Physiology (4/1)
BIOL 444	Plant Physiological Ecology (4/2)		

As part of their Biology Requirements students must complete:

- 6 units of 400-level biology courses
- 6 units of laboratory/field courses, 3 units of which must be taken within the concentration

UNIVERSITY & GE REQUIREMENTS**• Upper Division Writing Requirement**

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301, ENGL 363, or BIOL 498 (3 units).

• Graduation requirement

Students must complete an American Government course: POSC 100 or HONR 201B.

GENERAL EDUCATION REQUIREMENTS

- **Area A Core Competencies.** Complete one course in each sub-area for a total of 9 units. Area A1 and A2 must be completed during your first year; one should be taken in the fall and one should be taken in the spring. You should not take both A1 and A2 your first semester. Take CNSM 101 (GE A3) during the fall semester of your first year.

A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

- **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. B5 includes 3 upper division units.

B1	Physical Science (CHEM 120A)
B2	Life Science (BIOL 151)
B3	Laboratory Experience (BIOL 151)
B4	Mathematics/Quantitative Reasoning (MATH 130 or MATH 150A from AP credit)
B5	Implications & Explorations NSM (MATH 338)

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 and one upper division course from C3.

C1	Introduction to the Arts
C2**	Introduction to the Humanities
C3**	Explorations in the Arts or Humanities

- **Area D Social Sciences.** Complete one course each in D1 and D2 and one upper division course from D3.

D1**	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3**	Explorations in the Social Sciences

- **Area E** Lifelong Learning and Self Development.** Complete one course in this area.

- **Area F Ethnic Studies.** Complete one course in this area.

- ****Area Z Cultural Diversity.** One GE course from area C, D, or E must double-count

College of Natural Sciences and Mathematics
DEPARTMENT OF BIOLOGICAL SCIENCE
BIOLOGY BACHELOR OF SCIENCE
CATALOG YEAR FALL 2023
CONCENTRATION IN MOLECULAR BIOLOGY &
BIOTECHNOLOGY

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
BIOL 151 (GE B2 and B3) 4 units	BIOL 152 4 units	BIOL 251 3 units	BIOL 252 3 units	BIOL 309 3 units	BIOL 325 3 units	Upper Division Biology Elective 3-4 units	Biology Capstone 2-3 units
CNSM 101 (GE A3) 3 units		BIOL 253L 1 unit	BIOL 254L 1 unit	BIOL 302 5 units	Upper Division Biology Elective 3 units	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective(s) to complete required units
MATH 130 or MATH 150B* (GE B4) 4 units	CHEM 120A (GE B1) 5 units	CHEM 120B 5 units	CHEM 301A 3 units	CHEM 301B 3 units	MATH 338 (GE B5) 4 units	PHYS 212 3 units	
GE A1 or A2 3 units	GE A1 or A2 3 units	GE D1** 3 units	CHEM 306A 2 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211 3 units	PHYS 212L 1 unit	
GE C1 or C2** 3 units	GE C1 or C2** 3 units	GE D2 3 units	GE F 3 units		PHYS 211L 1 unit	Upper Division GE C3** 3 units	Upper Division GE D3** 3 units
			American Government 3 units		GE E** 3 units		Electives to complete 120 units
17 units	15 units	15 units	15 units	14 units	17 units	13-15 units	12-14 units

* only if you have AP credit for MATH 150A

** One GE course in C, D, or E must double-count as GE Z

27	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Writing Requirement: Upper division
3	Graduation Requirement: American Government
7	Electives
120	TOTAL UNITS

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

- Attend Biology major advising each semester to plan and review your academic progress.
- Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
- All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
- Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 17 units in GE area B with a C or higher since these are part of the major. To fulfill GE area Z, one course from GE area C, D, or E must double-count as GE area Z. Check your Titan Degree Audit for courses that appear in both categories. Complete GE area F with a C- or better.
- Declare your concentration during the semester you are taking your last lower-division Biol Core course.
- Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE Molecular Biology & Biotechnology Concentration

The Biology Major is for students who are preparing to (1) enter biology graduate and health professional schools, (2) seek biology-related careers in industry or government agencies, or (3) teach in secondary school.

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

Course	Course Title
BIOL 151	Cellular & Molecular Biology (GE B2 and B3)
BIOL 152	Evolution & Organismal Biology
BIOL 251	Genetics
BIOL 252	Principles of Ecology
BIOL 253L	Cell & Molecular Biology Skills Laboratory
BIOL 254L	Research Skills for Ecology and Organismal Biology
BIOL 325	Principles of Evolution
CHEM 120A	General Chemistry (GE B1)
CHEM 120B	General Chemistry
CHEM 301A	Organic Chemistry
CHEM 301B	Organic Chemistry
CHEM 306A	Organic Chemistry Laboratory
MATH 130 or 150A+150B*	A Short Course in Calculus/ Calculus (GE B4)
MATH 338	Statistics Applied to Natural Sciences (GE B5)
PHYS 211	Elementary Physics
PHYS 211L	Elementary Physics: Laboratory
PHYS 212	Elementary Physics
PHYS 212L	Elementary Physics: Laboratory

*only if you have AP credit for MATH 150A, then take MATH 150B

Molecular Biology & Biotechnology Concentration Requirements

Units are shown as total units / lab-field units, e.g. (4/2)

Molecular Biology and Biotechnology Required Courses (6-8 units)

BIOL 309	Intermediate Molecular Biology (3)
BIOL 302 OR CHEM 421	General Microbiology (5/2) OR Biological Chemistry (3)

Molecular Biology and Biotechnology Elective Courses (6-7 units)

Course	Course Title	Course	Course Title
BIOL 402	Comp. Lab in Mol. Systematics (3/1)	BIOL 431	Advanced Micro Lab (3/2)
BIOL 405	Developmental Biology (3)	BIOL 438	Public Health Microbiol (4/2)
BIOL 407	Genes & Genomes (3)	BIOL 445	Plant Cell Physiology (3)
BIOL 410	Evolutionary Genetics (4/2)	BIOL 448	Plant Molecular Biology (4/1)
BIOL 411	Medical Genetics & Syst. Biology (3)	BIOL 462	General Parasitology (4/2)
BIOL 412	Principles Gene Manipulation (3)	BIOL 472A	Adv. Biotech. Lab (3/2)
BIOL 413	Adv. Molecular Genetics (3)	BIOL 472B	Adv. Biotech. Lab (3/2)
BIOL 414	Microbial Genetics (3)	BIOL 473	Bioinformatics (3/1)
BIOL 426	Molecular Virology (3)	BIOL 490T	Clinical Microbiol. (3/2)
BIOL 430	Advances in Microbiology (3)	CHEM 421	Biological Chemistry (3)

Molecular Biology and Biotechnology Capstone Courses (2 units)

Course	Course Title	Course	Course Title
BIOL 400	Sem. In Biology Education (3)	BIOL 472A	Adv. Biotech. Lab (3/2)
BIOL 412	Principles Gene Manipulation (3)	BIOL 472B	Adv. Biotech. Lab (3/2)
BIOL 426	Molecular Virology (3)	BIOL 482	Capstone Studies in Biology (2)
BIOL 429	Tech. Stem Cell Biology (3/2)	BIOL 490T	Clinical Microbiol. (3/2)
BIOL 430	Adv. Microbiol (3)	BIOL 495	Internship (3/2)
BIOL 431	Adv. Microbiology lab (3/2)	BIOL 498	Thesis (1-3)
BIOL 438	Public Health Microbiol (4/2)	BIOL 499L	Independent Lab Study (1-3)
BIOL 462	General Parasitology (4/2)		

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

Physiology: One course in physiology is required. This can be taken as part of the concentration electives (if allowed) or separately. (3 units)

Course	Course Title	Course	Course Title
BIOL 302	General Microbiology (5/2)	BIOL 445	Plant Cell Physiology (3)
BIOL 362	General Human Physiology (4/1)	BIOL 468	Comp. Animal Physiology (4/1)
BIOL 444	Plant Physiological Ecology (4/2)		

As part of their Biology Requirements students must complete:

- 6 units of 400-level biology courses
- 6 units of laboratory/field courses, 3 of which must be taken within the concentration

UNIVERSITY & GE REQUIREMENTS

- Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301, ENGL 363, or BIOL 498 (3 units).

- Graduation requirement

Students must complete an American Government course: POSC 100 or HONR 201B.

GENERAL EDUCATION REQUIREMENTS

- **Area A Core Competencies.** Complete one course in each sub-area for a total of 9 units. Area A1 and A2 must be completed during your first year; one should be taken in the fall and one should be taken in the spring. You should not take both A1 and A2 your first semester. Take CNSM 101 (GE A3) during the fall semester of your first year.

A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

- **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. B5 includes 3 upper division units.

B1	Physical Science (CHEM 120A)
B2	Life Science (BIOL 151)
B3	Laboratory Experience (BIOL 151)
B4	Mathematics/Quantitative Reasoning (MATH 130 or MATH 150A from AP credit)
B5	Implications & Explorations NSM (MATH 338)

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 and one upper division course from C3.

C1	Introduction to the Arts
C2**	Introduction to the Humanities
C3**	Explorations in the Arts or Humanities

- **Area D Social Sciences.** Complete one course each in D1 and D2 and one upper division course from D3.

D1**	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3**	Explorations in the Social Sciences

- ****Area Z Cultural Diversity.** One GE course from area C, D, or E must double-count as area Z.
- **Area E** Lifelong Learning and Self Development.** Complete one course in this area.
- **Area F Ethnic Studies.** Complete one course in this area.

College of Natural Sciences and Mathematics
DEPARTMENT OF BIOLOGICAL SCIENCE
BIOLOGY BACHELOR OF SCIENCE
CATALOG YEAR FALL 2023
CONCENTRATION IN PLANT BIOLOGY

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
BIOL 151 (GE B2 and B3) 4 units	BIOL 152 4 units	BIOL 252 3 units	BIOL 251 3 units	BIOL 345 3 units	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective 3-4 units	Biology Capstone 2-3 units
CNSM 101 (GE A3) 3 units		BIOL 254L 1 unit	BIOL 253L 1 unit	BIOL 325 3 units	Upper Division Biology Elective 3 units	Upper Division Biology Elective 3-4 units	Upper Division Biology Elective(s) to complete required units
MATH 130 or MATH 150B* (GE B4) 4 units	CHEM 120A (GE B1) 5 units	CHEM 120B 5 units	CHEM 301A 3 units	CHEM 301B 3 units	MATH 338 (GE B5) 4 units	PHYS 212 3 units	
GE A1 or A2 3 units	GE A1 or A2 3 units	GE D1** 3 units	CHEM 306A 2 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211 3 units	PHYS 212L 1 unit	
GE C1 or C2** 3 units	GE C1 or C2** 3 units	GE D2 3 units	GE F 3 units	GE E** 3 units	PHYS 211L 1 unit	Upper Division GE C3** 3 units	Upper Division GE D3** 3 units
			American Government 3 units				Electives to complete 120 units
17 units	15 units	15 units	15 units	15 units	14-15 units	13-15 units	13-16 units

* only if you have AP credit for MATH 150A

** One GE course in C, D, or E must double-count as GE Z

27	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Writing Requirement: Upper division
3	Graduation Requirement: American Government
7	Electives
120	TOTAL UNITS

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

- Attend Biology major advising each semester to plan and review your academic progress.
- Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
- All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
- Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 17 units in GE area B with a C or higher since these are part of the major. To fulfill GE area Z, one course from GE area C, D, or E must double-count as GE area Z. Check your Titan Degree Audit for courses that appear in both categories. Complete GE area F with a C- or better.
- Declare your concentration during the semester you are taking your last lower-division Biol Core course.
- Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE

Plant Biology Concentration

The Biology Major is for students who are preparing to (1) enter biology graduate and health professional schools, (2) seek biology-related careers in industry or government agencies, or (3) teach in secondary school.

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

Course	Course Title
BIOL 151	Cellular & Molecular Biology (GE B2 and B3)
BIOL 152	Evolution & Organismal Biology
BIOL 251	Genetics
BIOL 252	Principles of Ecology
BIOL 253L	Cell & Molecular Biology Skills Laboratory
BIOL 254L	Research Skills for Ecology and Organismal Biology
BIOL 325	Principles of Evolution
CHEM 120A	General Chemistry (GE B1)
CHEM 120B	General Chemistry
CHEM 301A	Organic Chemistry
CHEM 301B	Organic Chemistry
CHEM 306A	Organic Chemistry Laboratory
MATH 130 or 150A+150B*	A Short Course in Calculus/ Calculus (GE B4)
MATH 338	Statistics Applied to Natural Sciences (GE B5)
PHYS 211	Elementary Physics
PHYS 211L	Elementary Physics: Laboratory
PHYS 212	Elementary Physics
PHYS 212L	Elementary Physics: Laboratory

*only if you have AP credit for MATH 150A, then take MATH 150B

Plant Biology Concentration Requirements (12 units total) Units are shown as total units / lab-field units, e.g. (4/2)

Plant Biology Required Course (3 units)

BIOL 345	Plant Biology (3/1)
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Plant Biology Elective Courses (7 units)

Course	Course Title	Course	Course Title
BIOL 340	Field Botany (3/2)	BIOL 446	Marine Phycology (4/2)
BIOL 441	Plant Taxonomy (4/2)	BIOL 448	Plant Molecular Biology (4/1)
BIOL 443	Plant Ecology (4/2)	BIOL 449	Desert Ecology (4/2)
BIOL 444	Plant Physiological Ecology (4/2)	GEOG 313	Natural Vegetation (3)
BIOL 445	Plant Cell Physiology (3)		

Plant Biology Capstone Courses (at least 2 units)

Course	Course Title
BIOL 450	Conservation Biology (3)
BIOL 482	Capstone Studies in Biology (2)
BIOL 495	Internship (3/2)
BIOL 498	Thesis (1-3)
BIOL 499L	Independent Lab Study (1-3)

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

Physiology: One course in physiology is required. This can be taken as part of the concentration electives (if allowed) or separately. (3 units)

Course	Course Title	Course	Course Title
BIOL 302	General Microbiology (5/2)	BIOL 445	Plant Cell Physiology (3)
BIOL 362	General Human Physiology (4/1)	BIOL 468	Comp. Animal Physiology (4/1)
BIOL 444	Plant Physiological Ecology (4/2)		

As part of their Biology Requirements students must complete:

- 6 units of 400-level biology courses
- 6 units of laboratory courses, 3 units of which must be taken within the concentration.

UNIVERSITY & GE REQUIREMENTS

• Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301, ENGL 363, or BIOL 498 (3 units).

• Graduation requirement

Students must complete an American Government course: POSC 100 or HONR 201B.

GENERAL EDUCATION REQUIREMENTS

- **Area A Core Competencies.** Complete one course in each sub-area for a total of 9 units. Area A1 and A2 must be completed during your first year; one should be taken in the fall and one should be taken in the spring. You should not take both A1 and A2 your first semester. Take CNSM 101 (GE A3) during the fall semester of your first year.

A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

- **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. B5 includes 3 upper division units.

B1	Physical Science (CHEM 120A)
B2	Life Science (BIOL 151)
B3	Laboratory Experience (BIOL 151)
B4	Mathematics/Quantitative Reasoning (MATH 130 or MATH 150A from AP credit)
B5	Implications & Explorations NSM (MATH 338)

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 and one upper division course from C3.

C1	Introduction to the Arts
C2**	Introduction to the Humanities
C3**	Explorations in the Arts or Humanities

- **Area D Social Sciences.** Complete one course each in D1 and D2 and one upper division course from D3.

D1**	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3**	Explorations in the Social Sciences

- **Area E** Lifelong Learning and Self Development.** Complete one course in this area.

- **Area F Ethnic Studies.** Complete one course in this area.

- ****Area Z Cultural Diversity.** One GE course from area C, D, or E must double-count as area Z.

UPPER DIVISION (300-400 Level) BIOLOGY MAJORS ELECTIVES

BIOL	Course name	Units	Offered	Prerequisites
301	Problems in Environmental Biology	3/2	SU	SCERP scholars only
302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
303	Intermediate Cell Biology	3	F, S, SU	BIOL 251/253L, 252/254L, and CHEM 120B
309	Intermediate Molecular Biology	3	F, S, SU	BIOL 251/253L, 252/254L, and CHEM 120B
317	Field Marine Biology	4/2	S	BIOL 251/253L and 252/254L
329	Essential Techniques in Cell Biology	3/2	SU	BSCR scholars only; BIOL 302; and BIOL 303 or 309
332	Biology of the Vertebrates	3	F / O	BIOL 251/253L and 252/254L
340	Field Botany	3/2	S / E	BIOL 251/253L and 252/254L
345	Plant Biology	3/1	F	BIOL 251/253L and 252/254L
361	Human Anatomy	4/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
362	General Human Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
398	Scientific Communication Workshop	1	F, S	BIOL 299L or BIOL 499L, junior or senior standing
400	Seminar in Biology Education	3	F	BIOL 302, 303, 309, or 325
401	Biogeography	3	F / E	BIOL 325
402	Computer Lab in Molecular Systematics	3/1	F / O	BIOL 303, 309, or 325
405	Developmental Biology	3	S	BIOL 303 or 309
407	Genes & Genomes	3	S / E	BIOL 303, 309, or 325
410	Evolutionary Genetics	4/2	F	BIOL 251/253L and 252/254L
411	Medical Genetics	3	SU	BIOL 302 or 309, or CHEM 421 or 423A
412	Principles of Gene Manipulation	3	F	BIOL 309 and CHEM 301B; or CHEM 423A
413	Advances in Molecular Genetics	3	S	BIOL 309 and CHEM 301B; or CHEM 423A
414	Microbial Genetics	3	W	BIOL 302 or 309, or CHEM 421 or 423A
417	Advances in Cell Biology	3	F, S	BIOL 303
418L	Advances in Cell Biology Lab	2/2		BIOL 303
419	Marine Ecology	3	F / O	BIOL 325
419L	Marine Ecology Lab	1/1	F / O	Corequisite: BIOL 419
422	Coastal Ecology	4/2	F / E	BIOL 325
424	Immunology	5/2	S	BIOL 302; and BIOL 303 or 309
426	Molecular Virology	3	S	BIOL 302, 303, or 309, or CHEM 421
427	Stem Cell Biology	3	F, S	BIOL 303 or 309. BIOL 405 or 424 recommended
428	Biology of Cancer	3	F, SU	BIOL 303, 309, or 325. BIOL 424 recommended
429	Techniques in Stem Cell Biology	3/2	F	BIOL 302; and BIOL 303 or 309
430	Advances in Microbiology	3	F, S	BIOL 302
431	Advanced Microbiology Lab	3/2	F	BIOL 302
438	Public Health Microbiology	4/2	F, S	BIOL 302
441	Plant Taxonomy	4/2	S / O	BIOL 325, 340, 344, or 345
443	Plant Ecology	4/2	S / E	BIOL 325, or 345
444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
446	Marine Phycology	4/2	F / O	BIOL 251/253L and 252/254L
448	Plant Molecular Biology	4/1	P	BIOL 302, 303, 309, or 345, or CHEM 421 or 423A

(Continued next page)

KEY Units listed are shown as “total number of units for the course/lab units in the course”. **Offered** lists when the course is usually offered: F = Fall; S = Spring; SU = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic.

*A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major;

** Maximum of 3 units (total) may be applied to Biology major requirements; # See Mathematics, Anthropology, or Chemistry Schedules

BIOL	Course name	Units	Offered	Prerequisites
449	Desert Ecology	4/2	S / O	BIOL 325
450	Conservation Biology	3	S	BIOL 325
454L	Microscopy and Imaging in Biology	2/2	S	BIOL 302, 303, 309 or 325
461	Marine Invertebrate Biology	4/2	F / E	BIOL 251/253L and 252/254L
462	General Parasitology	4/2	F	BIOL 302
465	Integrative Biology of Spider Silk	3	S / O	BIOL 303, 309, or 325
466	Behavioral Ecology	3	F / O	BIOL 251/253L and 252/254L
468	Comparative Animal Physiology	4/1	S / E	BIOL 251/253L, 252/254L, and CHEM 120B
470	Cellular Neurobiology	3	P	BIOL 362; and BIOL 303 or 309
472A	Advances in Biotechnology Laboratory (CHEM 472A)	3/2	F	BIOL 302; and BIOL 309, CHEM 421, or CHEM 423A; Coreq: BIOL 412
472B	Advances in Biotechnology Laboratory (CHEM 472B)	3/2	S #	CHEM 421 or 423A, and consent of instructor
473	Bioinformatics (CHEM 473)	3/1	S	BIOL 309, 303, or 325, or CHEM 423A
475	Ichthyology	4/2	S / O	BIOL 251/253L and 252/254L
476	Herpetology	4/2	S / E	BIOL 251/253L and 252/254L
478	Mammalogy	4/2	F / E	BIOL 251/253L and 252/254L
479	Ornithology	4/2	S / O	BIOL 251/253L and 252/254L
480*	Advanced Topics in Undergrad Biology	1-3	F, S	Consent of instructor
480C*	Stem Cell Proseminar	2	F	BSCR Scholars only; BIOL 329
480D*	Colloquium: Diverse Topics in Biology	1	F, S	Pre- or Co-requisite: a 300-400-level Biology course
480P*	COMPASS Proseminar	1	F, S	COMPASS Scholars only
480U*	Undergraduate Research Student Enhancement Proseminar	1	F, S	U-RISE Scholars only
481	Advances in Evolution & Ecology	3	S / E	BIOL 325
482*	Capstone Studies in Biology (Study Abroad)	2/2	W	Consent of instructor; ≥90 units completed
490T	Clinical Microbiology (Study Abroad)	3/2	W	Consent of instructor
495	Biological Internship	3/2	F, S, SU	≥90 units completed including BIOL 302, 303, 309, 317, 325, or 345
498*	Senior Thesis	1-3	F, S	Consent of instructor. Co-req: BIOL 499L
499L*	Independent Laboratory Study	1-3	F, S	Consent of instructor; junior or senior standing
CHEM 421**	Biological Chemistry (for Biology majors)	3	F, S #	CHEM 301B
CHEM 423A**	General Biochemistry (for Biochemistry majors)	3	F, S #	CHEM 301B. Corequisite: CHEM 315

KEY Units listed are shown as “total number of units for the course/lab units in the course”. **Offered** lists when the course is usually offered: F = Fall; S = Spring; SU = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic.

* A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; see your TDA. ** Maximum of 3 units (total) may be applied to Biology major requirements; # See Mathematics, Anthropology, or Chemistry Schedules

NON-MAJORS COURSES. If you are a Biology Major, DO NOT take the following courses! These DO NOT count toward the major: BIOL 300 Environmental Biology and Sustainability; BIOL 305 Human Heredity and Development, BIOL 306 Biology of Aging; BIOL 310 Human Physiology; BIOL 310L Human Physiology Lab; BIOL 311 Nutrition and Disease (CHEM 311); BIOL 318 Wildlife Conservation; BIOL 319 Marine Biology; BIOL 322 Human Behavioral Ecology (ANTH 322); BIOL 327 Stem Cells and Regenerative Medicine; BIOL 330 Sustainability Ecology American Indian Models; BIOL 352 Plants and Life; BIOL 360 Biology of Human Sexuality; BIOL 453 Life Science Concepts; BIOL 496 Biology Tutorials.

CSUF Undergraduate Repeat Policy and Withdrawal Policy

Students can check their “Repeated” or “W” units at CSUF by choosing “Withdrawals/Repeats” in the dropdown menu of their Student Center in Titan Online.

CSUF Repeat policy

- A student can repeat a maximum of 16 units at CSUF (for the entire CSUF record) with “Grade forgiveness.” **Grade forgiveness** means that the GPA calculation is adjusted to remove the effect of the initial grade, and the GPA will include only the repeated grade (but BOTH grades remain listed on transcripts). Grade forgiveness is applied to the first 16 units that a student repeats at CSUF.
- A student can repeat a maximum of 12 units at CSUF (from Fall 2009 onward) with “Grades averaged.” **Grades averaged** means that the GPA calculation includes the grades of both the initial attempt and the repeat of the class (and BOTH grades remain listed on transcripts).
- A single class may be taken a maximum of 3 times. (Does not apply to classes noted in the University Catalog “may be repeated for credit.)
- The “Repeat policy” is applied automatically at the end of each term.
- Petitions to exceed the repeated unit limits can be filed at the Admissions and Records Office, but are rarely granted. For example, petitions to repeat a course are denied if the equivalent course can be taken at a community college. For the College of NSM, students must have a letter of support from the Department Chair.
- Detailed FAQ on the CSUF repeat policy can be found by scrolling down to “REPEAT POLICY- Undergraduate” and clicking on the “frequently asked questions” link at <http://records.fullerton.edu/academics/regulations.php>

CSUF Withdrawal policy

- An undergraduate student can have a maximum of 18 “W” (Withdrawal) units at CSUF, from Fall 2009 onward.
 - During the first 2 weeks of class, drop via Titan Online (no “W” on transcript); after 2 weeks, a “Request for Withdrawal” form (from Admissions and Records) must be signed by instructor and Department to withdraw with “W”.
 - After 2 weeks and prior to the last 3 weeks of instruction, withdrawals with a “W” are possible only for documented serious and compelling reasons. Requests to withdraw may be non-medical or medical in nature. For more information go to: <http://records.fullerton.edu/services/withdrawal.php>
 - Petitions for Retroactive Withdrawals can only be filed for courses with WU (Withdrawal Unauthorized), I (Incomplete), IC (Incomplete charged), and NC* (No Credit) grades.
- Detailed information on withdrawals can be found in the registration guide for the semester in which you are enrolled on the Admissions and Records website (<http://records.fullerton.edu/registration/registration.php>).

Academic Notice* and Disqualification

- Undergraduate students are placed on Academic Notice when their **CSUF grade point average (GPA) or Cumulative GPA** (GPA for all college work attempted) falls below 2.0 (a “C” average).
- Biology majors on Academic Notice have a Hold placed by the College of Natural Sciences and Math (CNSM) and must be advised by a member of the CNSM Student Success team (see below) to release this hold. The CNSM Academic Notice hold is SEPARATE from the Biology department advising hold.
- Undergraduates on Academic Notice are subject to disqualification if their **CSUF or cumulative GPA** falls below the following levels:

Class Level	Units	GPA Level
Seniors	90 or more	1.95
Juniors	60 - 89	1.85
Sophomores	30 - 59	1.70
Freshmen	0 - 29	1.50

For example, if you are junior on Academic Notice (60-89 units) and your GPA falls below 1.85 at the end of the semester, you will be dismissed from the university.

- Online resources for students on Academic Notice and disqualification:
 - Academic Notice and Disqualification tutorials <http://www.fullerton.edu/aac/>
 - GPA calculator to help you determine your GPA (before and after grade forgiveness) http://www.fullerton.edu/aac/resources/gpa_calculator.php
- Tutoring and other campus resources are listed on the last page of this handbook.
- Students with an Academic Notice Hold from the College of NSM must meet with one of the following members of the **CNSM Student Success Team** to release their hold:

Axis Avalos, Graduation Specialist

657-278-2301 axavalos@fullerton.edu
 - Junior/Senior Advising (> 60 units)
 - Academic Notice, Academic Planning, GE, TDA
 - Graduation Candidates & Requirements

Abraham Roldan, Retention Specialist

657-278-7217 aroldan@fullerton.edu
 - Freshmen, all continuing students
 - Academic Notice, Academic Planning, GE, TDA

Natalie Mir, College Advisor

657-278-8750 namir@fullerton.edu
 - Freshmen, all continuing students
 - Academic Notice, Academic Planning, GE
 TDA, Registration

Tanya Kim, Asst. Director Advising

657-278-3275 takim@fullerton.edu
 - Freshmen, Transfer Students
 - Athletes, Fullerton Finish, Honors,
 Vetrans
 - Academic Notice, Academic Planning, GE

*Academic Notice was previously called Academic Probation

MINORS IN BIOLOGY

Biology Minor Requirements:

- All students must complete Biology 151 and 152
- We have two minors – Cell & Molecular Biology and Environmental Biology
- Students will complete a third CORE Biology course aligned with their chosen minor (i.e. either Biol 251/253L or Biol 252/254L)
- Students will complete three upper-division courses specific to their chosen minor (see below)
- Upper-division coursework should be chosen in consultation with the Biology Minor advisor and with careful consideration of prerequisites
- NOTE: While CHEM 120A and 120B are not required for the minor, they are prerequisites for many upper division BIOL courses

LOWER-DIVISION CORE Courses Required for All Students

Cell and Molecular Biology Minor

Total # of units required: 22 - 23 units

Lower-Division CORE Requirement (4 units)

- Biol 251 – Genetics AND
- Biol 253L Cell & Molec. Biol Skills Lab

Upper-Division Required Course (3 units)

- Biol 303 – Intermediate Cell Biology (3 units) OR
- Biol 309 – Intermediate Molecular Biology (3 units)

Upper-Division Electives:

Students should choose two courses. At least one must have a laboratory: ^L = lab course.

- Biol 302 – General Microbiology (5) ^L
- Biol 362 – Mammalian Physiology (4) ^L
- Biol 402 – Computer Lab in Molecular Systematics (3) ^L
- Biol 405 – Developmental Biology (3)
- Biol 410 – Evolutionary Genetics (4) ^L
- Biol 411 – Medical Genetics and Systems Biology (3)
- Biol 412 – Principles of Gene Manipulation (3)
- Biol 413 – Advances in Molecular Genetics (3)
- Biol 414 – Microbial Genetics (3)
- Biol 417 – Advances in Cell Biology (3)
- Biol 424 – Immunology (5) ^L
- Biol 426 – Molecular Virology (3)
- Biol 427 – Stem Cell Biology (3)
- Biol 428 – Biology of Cancer (3)
- Biol 430 – Advances in Microbiology (3)
- Biol 431 – Advanced Microbiology Lab (3) ^L
- Biol 438 – Public Health Microbiology (4) ^L
- Biol 445 – Plant Cell Physiology (3)
- Biol 448 – Plant Molecular Biology (4) ^L
- Biol 454L – Microscopy and Imaging in Biology (2) ^L
- Biol 462 – General Parasitology (4) ^L
- Biol 465 – Integrative Biology of Spider Silk (3)
- Biol 470 – Cellular Neurobiology (3)
- Biol 472A or B – Advances in Biotechnology Lab (3) ^L
- Biol 473 – Bioinformatics (3) ^L
- Biol 490T – Clinical Microbiology Study Abroad (3) ^L
- Chem 421 – Biological Chemistry (3) OR Chem 423A – General Biochemistry (3)

Environmental Biology Minor

Total # of units required: 21 - 22 units

Lower-Division CORE Requirement (4 units)

- Biol 252 – Ecology AND
- Biol 254L Research Skills for Ecology and Organismal Biology

Upper-Division Required Course (3 units)

- Biol 325 – Principles of Evolution (3 units)

Upper-Division Electives¹

Students should choose two courses. At least one must have a laboratory: ^L = lab course.

- Biol 317 – Field Marine Biology (4) ^L
- Biol 332 – Biology of the Vertebrates (3)
- Biol 340 – Field Botany (3) ^L
- Biol 345 – Plant Biology (3) ^L
- Biol 401 – Biogeography (3)
- Biol 410 – Evolutionary Genomics (4) ^L
- Biol 419/Biol 419L – Marine Ecology (3) and Lab (1) ^L
- Biol 422 – Coastal Ecology (4) ^L
- Biol 441 – Plant Taxonomy (4) ^L
- Biol 443 – Plant Ecology (4) ^L
- Biol 444 – Plant Physiological Ecology (4) ^L
- Biol 446 – Marine Phycology (4) ^L
- Biol 449 – Desert Ecology (4) ^L
- Biol 450 – Conservation Biology (3)
- Biol 461 – Marine Invertebrate Biology (4) ^L
- Biol 465 – Integrative Biology of Spider Silk (3)
- Biol 466 – Behavioral Ecology (3)
- Biol 475 – Ichthyology (4) ^L
- Biol 476 – Herpetology (4) ^L
- Biol 478 – Mammalogy (4) ^L
- Biol 479 – Ornithology (4) ^L
- Biol 481 – Advances in Evolution and Ecology (3)

¹*One Upper-Division Elective course can be chosen outside of Biology in consultation with the Biology Minor Advisor.*

Advisor Approval is REQUIRED to count one of the following courses for the Environmental Biology minor:

Chemistry Courses

- Chem 436 – Atmospheric Chemistry (3)
- Chem 437 – Environmental Water Chemistry (3)
- Chem 438 – Environmental Biochemistry (3)
- Chem 448 – Environmental Biochemistry (3)
- Chem 313A and Chem 313B and Chem 313C – Environmental Pollution and Its Solutions (1 unit each)

Geography Courses

- Geog 323 – Weather and Climate (3)
- Geog 450 – Human Response to Environmental Hazards (3)
- Geog 481 – Geographic Information Systems: Introduction (3)

Geology Courses

- Geol 333 – General Oceanography (3)
- Geol 335 – Hydrology and Surface Processes (3)
- Geol 380 – Geologic Field Techniques (3)
- Geol 201 – Earth History (3)

Other Outside Courses

- Econ 362 – Environmental Economics (3)
- Hesc 415 – Environmental Health
- Phil 313 – Environmental Ethics (3)

MINORS ASSOCIATED WITH BIOLOGY

Interested in Chemistry and Biochemistry? Minor in Chemistry

A minor in Chemistry requires a minimum of 24 acceptable units of Chemistry, including General Chemistry (CHEM 120A, B), Organic Chemistry (CHEM 301A, B), Quantitative Chemistry (CHEM 315), plus 5 units of additional upper-division CHEM courses. Each course must be completed with a grade of “C” or better.

- **For a Biology major, a typical path to the minor is: CHEM 120A/B (10), CHEM 301A/B (6), CHEM 306A (2), CHEM 315 (3), and CHEM 421 (3).**

A complete list of acceptable CHEM Upper Division Courses is found in the catalog <http://catalog.fullerton.edu> or http://www.fullerton.edu/chemistry/programs/undergraduate/minors_chemistry.php

Interested in Forensics? Minor in Criminal Justice

The Minor in Criminal Justice (18 units) includes 9 units of required courses [Foundation of Criminal Justice (CRJU 300), Criminal Law: Substantive (CRJU 310A), and Theories of Crime and Delinquency (CRJU 330)] and 9 units of CRJU electives. For more information, go to: <http://catalog.fullerton.edu> or contact the Division of Politics, Administration, and Justice office (657) 278-3521 or GH-511.

Interested in Public Health? Minor in Public Health

The Public Health Minor (21 units) focuses on understanding and promoting health in diverse populations. Required courses include Introduction to Environmental Health and Safety (PUBH 115) and Introduction to Public Health (PUBH 201). For more information, go to: <http://catalog.fullerton.edu> or contact the PUBH Department office (657) 278-3316 or KHS-121.

Interested in working with the Elderly? Minor in Aging Studies

The growth of the older population has fueled demand for professionals that understand the aging process. Aging Studies is a multi-disciplinary field that examines the aging process from multiple aspects. The Aging Studies Minor (21 units) begins with the lower-division required course Introduction to Aging Studies (AGNG 133). For more information, go to: <http://catalog.fullerton.edu> or contact the Aging Studies Program (657) 278-7057 agingstudies@fullerton.edu or Humanities building 424.

Interested in running a Biotech company? Minor in Business Administration

Biology majors that are also interested in business may sign up for a minor in Business Administration. A student who completes this minor and meets all other entrance requirements will be poised to apply to the Master of Business Administration (MBA) degree program and will then only need to take the second year (33 units) of coursework to complete the MBA. For more information, see <https://business.fullerton.edu/programs/undergraduate/Minors>. To sign up for the minor, see the Business Advising Center in SGMH-1201; phone (657) 278-2212.

RESEARCH AND OTHER OPPORTUNITIES FOR BIOLOGY MAJORS

Research Courses

Undergraduate Research with Faculty (BIOL 299L, 499L). The Department offers undergraduate research courses that provide opportunities to progress from closely directed research (BIOL 299L, usually performed at the freshman or sophomore level) to more independent work (BIOL 499L, usually performed at the junior or senior level). Student-faculty collaborations are created by mutual interest. The Faculty roster near the end of this handbook briefly summarizes faculty research interests but you can also learn about individual faculty research interests on the Biology web page and the abstracts posted outside of the Biology Department office. Limited funding is available from the Department to support this student research.

Marine Biology Semester at Catalina. This semester-long program, offered through the California State University Ocean Studies Institute (OSI) and the Southern California Marine Institute (SCMI), provides an intensive undergraduate exposure to marine biology, and is designed for students with a serious commitment to environmental and marine science. The program is based at the University of Southern California (USC) Wrigley Institute for Environmental Studies, situated on Santa Catalina Island, 26 miles from Los Angeles, CA. <http://www.scmi.net/csu-marine-biology-catalina-semester/>

Research Programs

BSCR. Bridges to Stem Cell Research Program (BSCR), funded by the California Institute for Regenerative Medicine (CIRM) provides an excellent opportunity for students aspiring to incorporate stem cell biology into their careers. Stem Cell Biology is one of the fastest growing areas in biomedicine and biotechnology. The BSCR program requires a full-time commitment for 19 months (from June through the following December), which includes 7 months of pre-internship training at CSUF during the summer and fall semester (required coursework and research experience), followed by a 12-month full-time internship at a collaborating institution (Stanford University, UC Irvine, or USC). Financial benefits during the 12-month internship are as follows: a tuition waiver up to \$3,500 for the spring and fall semesters and stipend of \$3,000 per month for a total of \$36,000 for the internship year. Applications are due in early April. Information is available from the director, Dr. Nilay Patel (657) 278 2483. <http://biology.fullerton.edu/stemcells/>

CREP. The **Cancer Research Education** is the educational component of the CSUF/UCI-CFCCC Cancer Health Equity Research Partnership (CHERP), whose goal it is to increase the quality of cancer-related research and training that address the diverse health needs of populations in Orange County and California.

COMPASS. Creating Opportunities through Mentorship and Partnership Across Stem Cell Science is an undergraduate research and internship program funded through a grant from the California Institute of Regenerative Medicine (CIRM). The aim of the program is to train a diverse cadre of undergraduates to enter the booming field of regenerative medicine directly after earning their bachelor's degree in biological science at CSUF. The two-year training program includes coursework, research summer internships, and mentorship from faculty and recent alumni. Financial support is provided to make these year-round activities possible for the students accepted into the program. Contact Dr. Alison Miyamoto at almiyamotot@fullerton.edu for more information.

LSAMP. The **CSU Louis Stokes Alliance for Minority Participation** program is supported by the National Science Foundation (NSF), the CSU Office of the Chancellor, and the 22 participating CSU campuses. The goal of this program is to increase the number graduates in sciences, technology, engineering, or math (STEM) from among students who have faced or face social, educational, or economic barriers to careers in STEM. CSU-LSAMP Research Scholars have a research commitment (minimum of 8-10 hours per week) during the academic year and can receive a research scholarship up to \$4,000. <http://lsamp.fullerton.edu/>

McNair Scholars Program. The Ronald McNair Scholars Program is a year-round program open to full-time students majoring in natural sciences, mathematics and engineering, and is designed to prepare students to pursue

doctoral studies. Applicants must be members of a group underrepresented in graduate education and/or a first-generation college student. Applicants must have completed at least 59 semester units and have a minimum GPA of 3.0. Applications are available at the beginning of the spring semester at McNair Scholars Office, GH-179 (657) 278-7315. <http://www.fullerton.edu/mcnair/>

MHRT. The **Minority Health & Health Disparities Research Training program** is a National Institutes of Health (NIH) sponsored program that provides students belonging to underrepresented minorities or health disparities groups with the opportunity to carry out research during the summer (ten weeks) at laboratories in the U.S. (Charles Drew University, George Washington University, Florida International University), Thailand (Chiang Mai University), or Argentina (Institute for Research on Retroviruses and AIDS), under the direction of world-renowned biochemists and molecular biologists. Fact sheets are available from the director, Dr. Marcelo Tolmasky (657) 278-5263. <http://biology.fullerton.edu/people/faculty/marcelo-tolmasky/MHIRT%20website/index.html>

NAARE Program. The NIH-funded **Neurocognitive Aging & Analytics Research Education** program is open to full-time Biological Science majors. The NAARE program goals include teaching students about the human brain aging and providing mentored-research experiences with a focus on brain aging and etiology of certain neurodegenerative diseases such as Alzheimer's disease and related disorders. The program will also allow students to explore, engage, and analyze population-based studies and data related to brain aging. All participants are expected to undertake summer research experience at the University of Southern California. The program plans to recruit students in the Fall semester. For more information, please visit the website (<http://naare.fullerton.edu/>) or email the NAARE Coordinator at naare@fullerton.edu

RCP. Research Careers Preparatory Program is a one-year program that provides freshman, sophomore/junior, and transfer students the opportunity to explore research as a career through a specially designed pro-seminar course, laboratory techniques class, and associated field or laboratory research activities. The main goals of the RCP program are to: 1) raise student awareness of research opportunities at CSUF and elsewhere, 2) provide students with the skill sets they need to be successful in a research career, and 3) move more CSUF graduates into research-based graduate programs in the U.S., or into the workforce within Orange County and throughout California. Participants in the program receive extensive academic and research mentoring through the three required courses, BIOL 280R, BIOL 280S, and BIOL 299L, CHEM 295/395, or PSYC 498. These courses will prepare and train students to be successful in their majors as future scientists (B.S., M.S., Ph.D., M.D./Ph.D.) and more broadly as responsible citizens. Participants will carry out undergraduate research with a faculty member in the Departments of Biological Science, Chemistry/Biochemistry, or Psychology. Upon successful completion of the one-year program, students are awarded a certificate of completion and are competitive applicants for research intensive two-year programs and other research scholar programs. For more information, please visit the RCP website at: <http://biology.fullerton.edu/rcp>

SCERP. The **Southern California Ecosystems Research Program** (SCERP) at CSUF, is a research training program for undergraduates focused on learning through discovery in environmental biology. This program strives to attract primarily underrepresented students to environmental biology early in their academic careers, typically at the end of the sophomore or junior year. Scholars participate in a summer field course followed by up to two years of independent research with a faculty mentor. Scholars receive stipends (approximately \$2,000). Information is available from Dr. Bill Hoese, (657) 278-2476 or the Biology Dept. Office, (657) 278-3614. <http://biology.fullerton.edu/scerp/>

U-RISE Program. The NIH-funded **Undergraduate Research Training Initiative for Student Enhancement** program at Cal State Fullerton aims to recruit, retain, and prepare promising undergraduate students to successfully pursue a career in Biomedical Science research. The program seeks applications from underrepresented (ethnicity, race, LGBTQ+) or economically-disadvantaged backgrounds, and those who are neurodiverse or with physical disability. For more information, please visit the website (www.fullerton.edu/u-rise) or email the program at urise@fullerton.edu

Scholarships and Research Funding

STEER Scholarships. The **CSUF Scholarships to Enhance Excellence in the Chemical and Biological Research-Based Workforce** Program recruits and supports students to become highly qualified members of the Science, Technology, Engineering, and Mathematics (STEM) workforce. Students must have a minimum GPA of 2.75, have completed a FAFSA, and be eligible for financial aid. Students selected for the STEER program receive annual stipends of \$6,500 and may receive additional support to take classes in summer and/or intersession, so they may devote full time to learning science and preparing to enter the biotechnological industry. STEER scholars experience a support system that includes science faculty, peers, and CSUF Alumni.

<http://www.fullerton.edu/biology/steer/>

College of Natural Sciences and Mathematics and Cal State Fullerton Scholarships. A variety of scholarships – nearly \$2 million annually at Cal State Fullerton – are awarded for outstanding achievement. In addition to scholastic achievement, financial need and other factors may be considered in the selection process. Many scholarships for NSM use the standard University Scholarship and Award Application, and are usually due in early February. Full details at <http://www.fullerton.edu/financialaid/award/scholarships.php>

Intramural Research Funding. In addition to funding by the Department, there are other avenues for research support, including the ASI Research Grants, a student-operated committee that funds student research, and the Faculty Development Center Research and Creativity Awards that foster faculty-student collaborative research. Both require students to submit formal, competitive research proposals. For more information, students should ask their research mentors about these opportunities.

General Education Information

Your GE requirements depend on your Catalog Year. Please go to http://www.fullerton.edu/undergraduate/general_education/index.php for additional information about GE requirements and a current list of approved GE courses. For questions about GEs, contact the CNSM Student Success Center.

General Education provides breadth to your educational experience. Think about what other skills or perspectives will enhance your ability to be successful in a future career as you choose your GE classes. Alternatively, your GE courses can allow you to explore other interests or develop skills that will enrich you at a more personal level. Use your GE courses as a balance to the science courses that make up your major.

Biological Internship (BIOL 495) Information

Biological Internship (BIOL 495) is one of the accepted capstone courses for all concentrations. The course provides students with an opportunity to gain career experience in biology related fields, including Health/Medical, Research, Environmental and Education. BIOL 495 provides students an opportunity to develop professional documents (e.g., resumes and personal statements), to make realistic assessments of career choices, and to familiarize students with preparations necessary for career success. The major goals for Biological Internship are for students to develop professional skills, to gain first-hand experience in the area of their planned careers, and to network with other professionals.

PREREQUISITES: Students should have senior standing with the successful completion of 90 units (including all core requirements) and consent of instructor.

COURSE OVERVIEW AND REQUIREMENTS:

- Students must complete Ninety (90) hours of practical experience in the student's chosen field of interest. Internship hours must be completed within the semester of registration.
- Student interns are required to attend and participate in all weekly class meetings through the semester, which may include class and group discussions, mock interviews and other in-class activities.
- Students may be required to complete weekly writing assignments and journal entries.

WHAT YOU NEED TO KNOW:

- **Procure an Intern Position:**
 - Each student **MUST** arrange for their **OWN** internship with a cooperating office, laboratory clinic, hospital, business, or agency.
 - **START EARLY!** Internships must be registered and approved by the instructor on or before the second week of the semester.
 - Internships should be active positions whereby students participate in procedures, learn skills and apply techniques (i.e. "shadowing" is not considered an active position).
 - Internships may be a volunteer or paid position under the supervision of a professional within the organization.
 - An existing internship position must be approved by the instructor or Dr. Tommerup to count for BIOL 495.
- **Register Your Internship Site:**
 - Biological Internship Registration forms must be completed and approved by the instructor.
 - Internship Sites must be registered with the Center for Internships and Community Engagement (CICE). LH-209, 278-3746; www.fullerton.edu/cice
 - For additional help or leads, contact the Career Center (LH-208, 278-3121; www.fullerton.edu/career) or the Health Professions Advising Office (GH-223, 278-3980).

If you have any questions, please contact:

Dr. Megan Tommerup, Biology Internship Coordinator at mtommerup@fullerton.edu

What can I do with my Bachelor's Degree in Biology?

Career info from CSUF Biology

- <http://www.fullerton.edu/biology/careers/index.php>

Careers in biology (general listings)

- American Institute of Biological Sciences (AIBS) <http://www.aibs.org/careers/>
- College Grad <https://collegegrad.com/careers/life-physical-and-social-science>

Careers in cell and molecular biology (if you are interested in the Cell and Development and Molecular Biology and Biotechnology concentrations):

- Nature <http://www.nature.com/scitable/ebooks/guide-to-life-science-careers-14053951>

Careers in organismal, ecology, or marine biology (if you are interested in the Ecology and Evolutionary Biology, Plant Biology, and Marine Biology concentrations):

- Ecological Society of America (ESA) <http://www.esa.org/esa/careers-and-certification/explore-ecology-as-a-career/>
- The Society for Integrative and Comparative Biology (SICB) <http://www.sicb.org/careers/>
- The Wildlife Society (TWS) <http://wildlife.org/career-development>

Careers in teaching

- See the 'Teach Science -- Impact the Future' section of this handbook.

Careers in health care

- See the 'Health Professions as a Biology Major' section of this handbook.

Careers in scientific research

- See the 'Research and Other Opportunities for Biology Majors' section.

Interested in exploring other careers?

- Visit the CSUF Career Center <http://www.fullerton.edu/career>
- Chanda Ishisaka is the College Career Specialist for NSM: LH 208 (657)278-2020
cishisaka@fullerton.edu

HEALTH PROFESSIONS AS A BIOLOGY MAJOR

The basic requirements for most Health Professions Programs (e.g. Pharmacy, Medicine, Dentistry, Optometry, Veterinary Medicine, Physical Therapy, and Physician Assistant programs) are a year of biology with lab, a year of general chemistry with lab, a year of organic chemistry with lab, a semester of statistics and a semester of calculus - all of which you will receive as a biology major at CSUF. There are few upper-division *required* courses but often specific courses are recommended, and these can vary depending on the field you'd like to go into and the schools to which you plan to apply. The best place for you to get this information is to go to the Health Professions Advising Office (see below) on campus and look at the information available for the schools you'd like to attend (see links below). **Every concentration in the Biology major can prepare you to go into a health profession.** You should choose your concentration based on what you are passionate about because that will help you to be motivated to achieve the high level of academic performance needed to obtain entrance into a professional program (see next page).

You can find more information about requirements, exams, etc. for various health professions at the:

CSUF Health Professions Advising Office: <http://www.fullerton.edu/healthprofessions/>

Association of American Medical Colleges: <http://www.aamc.org>

American Association of Colleges of Osteopathic Medicine: <http://www.aacom.org>

American Association of Colleges of Pharmacy: <http://www.aacp.org>

Association of Schools and Colleges of Optometry: <https://optometriceducation.org/>

American Dental Education Association: <http://www.adea.org>

Physician Assistant Education Association: <http://www.paeaonline.org/>

American Physical Therapy Association: <http://www.apta.org/Default.aspx>

Association of American Veterinary Medical Colleges: <http://www.aavmc.org/>

Professional schools have specific course requirements and activities that students should be aware of. For instance, basic science research, clinical work, and extra-curricular and community service are very important in building a strong application. A health professions advisor will be able to point out appropriate courses and activities and, in many cases, recommend specific programs that students should participate in.

Students may use the facilities of the Health Professions Advising Office as needed. Starting in their sophomore year students should seek advising at least once a semester prior to registration. Meeting with a health professions advisor does not take the place of mandatory advising through the Biological Science Department.

Other services that the Health Professions Advising Office provides include helping students select appropriate clinical career paths and the professional schools appropriate for their needs. An advisor will make suggestions on how students might improve their applications and personal statements and provide advice related to letters of recommendation and the interview process. When requested, mock interviews can be arranged through the Career Development Center. The Health Professions Advising Office also supervises on-campus clubs, such as the Student Health Professions Association. A complete listing of Student Organizations affiliated with the Health Professions Office can be found on their website (link below). In addition, the Health Professions Advising Office evaluates files prepared by students who submit applications and, where appropriate, will prepare committee letters of support for qualified students. **The Health Professions Advising Office is in GH-223 (657-278-3980).**

<http://www.fullerton.edu/healthprofessions/>



CONSIDERING HEALTH PROFESSIONAL SCHOOL BUT INTERESTED IN ECOLOGY, ORGANISMAL, OR MARINE BIOLOGY?

Odds are you will perform best in courses that you enjoy and are interested in. After finishing your 19 units of Biol Core, you can choose a Concentration in Ecology and Evolutionary Biology (EEB) or Marine Biology (MB) and still take the courses you will need to do well on entrance exams (e.g., MCAT, DAT, GRE) and apply to health professional schools. Both the EEB and MB Concentrations require 14 units; free elective units for the BIOL major can be used to take BIOL 302 (Microbiology) or CHEM 421 (Biochemistry). BIOL 361 (Human Anatomy) is an EEB Free Elective course that can count toward the 14 required EEB units, and BIOL 362 (General Human Physiology) can be taken for the Physiology requirement for the Biology major; these are upper-division courses that you may need to be prepared to apply to professional programs (whether you need BIOL 302, BIOL 361, BIOL 362, or CHEM 421 will depend upon the type of programs you are interested in; consult the Health Professions Office). Either Concentration will also give you broad training in biology that will help you should you decide to change your career path to teaching or another general biology field. Here's how to fulfill the requirements for each concentration.

Ecology & Evolutionary Biology (EEB)

Marine Biology (MB)

course	units	course	units
BIOL Core courses	19	BIOL Core courses	19
EEB Organismal Biology Elective Course	3-4	BIOL 317	4/2
EEB Ecology Elective Course	3-4	MB Organismal Biology Course	4
EEB Capstone Course	2-3	MB Ecology Course	4
EEB Free Electives (BIOL 361 counts here)	To reach 14 EEB units	MB Capstone Course	2-4
Physiology requirement (BIOL 362 or 302 counts here)	3-4	Physiology requirement (BIOL 362 or 302 counts here)	3-4
<i>Free electives for BIOL major</i> (CHEM 421 counts here)	To reach 40 BIOL major units	<i>Free electives for BIOL major</i> (BIOL 361 or CHEM 421 counts here)	To reach 40 BIOL major units

When planning courses, remember that Biology majors must complete:

- 6 units of 400-level biology courses and
- 6 units of lab/field courses, 3 units of which must be taken within the concentration.



Teach Science -- Impact the Future!



Steps to Earning a Teaching Credential in Science

STEP 1: Make an Appointment!

- Make an appointment with the Science Credential Preparation Advisor - Dr. Megan Tommerup mtommerup@fullerton.edu
- Design an academic plan, discuss prerequisites for the Credential Program and explore resources to help you prepare for a career in teaching.
- Additional advising is available at the Center for Careers in Teaching: <http://ed.fullerton.edu/cct/>

STEP 2: Work on your Biology Major Requisites

- Any of the Biology Concentrations provide support for demonstrating *subject matter competence* in the fields of Biology and General Science appropriate for Middle and High School Science teaching (grades 7-12).

STEP 3: Take Secondary Education (EDSC) Prerequisite coursework

- Coursework may be completed during your undergraduate education or as a post baccalaureate.
- Some courses may count as GE or electives.
- Prerequisite coursework includes:
 - EDSC 310: The Teaching Experience – Participation
 - EDSC 320: Adolescent Development
 - EDSC 330: Developing Literacy in Secondary Schools
 - EDSC 340: Diversity in Secondary Schools

STEP 4: Attend a Secondary Education Credential Program Overview

- Attend a Single Subject Credential Program overview <http://ed.fullerton.edu/seced/>
 - Learn about the application process and specific requirements for the program
 - Additional information about the Secondary Education Credential program <http://ed.fullerton.edu/seced/admissions/cred-sec-ed.php>
- Prepare Application Materials
 - Demonstrate basic skills by passing the CBEST – <http://www.ctcexams.nesinc.com>
 - Demonstrate subject matter competency by passing the appropriate California Subject Examination (CSET) subtests - <http://www.ctcexams.nesinc.com>
 - Additional application materials may include fingerprinting, CPR training and English Language proficiency. See also <http://ed.fullerton.edu/seced/admissions/cred-sec-ed.php>

STEP 5: Explore Resources for Teaching Candidates

- Example financial opportunities to support students while they are earning their credential:
 - The **Intern/Professional Track Program** allows science teachers to earn their credential while employed. http://ed.fullerton.edu/seced/sscphandbook/program-design/intern_program.php
- STEM Scholarships and Internships are available for undergraduates, including:
 - The Math and Science Teacher Initiative (MSTI) scholarships program: <http://ed.fullerton.edu/msti/>
 - Science Ambassadors Program <http://ed.fullerton.edu/msti/resources/scholarships-stipends.php>
 - Promoting Resources in Informal Science Education (PRISE) internships: <http://ed.fullerton.edu/msti/resources/scholarships-stipends.php>

For more information, please contact Dr. Megan Tommerup, Science Credential Preparation Program Coordinator, mtommerup@fullerton.edu

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

* Year joined faculty at CSUF

- ABRAHAM, Joel K.** *(2011) Professor; Ph.D., UC Berkeley
 Teaches: Evolution and Organismal Biology, Seminar in Biology Education, Plant Ecology, Professional Aspects of Biology: Teaching Effectiveness
 Research Interests: Biology education; student learning; educational technology; plant ecology
 Office: MH 224B Phone: (657) 278-3138 jkabraham@fullerton.edu
- BRENNAN, Catherine** *(2013) Associate Professor; Ph.D., University of Southern California
 Teaches: Immunology, Intermediate Cell Biology, Cellular and Molecular Biology
 Research Interests: Mechanisms of innate immune detection and signaling; phagosome biology; cell biology and genetics
 Office: DBH 112A Phone: (657) 278-3637 cbrennan@fullerton.edu
- BURNAFORD, Jennifer** *(2009) Professor; Ph.D., Oregon State University
Co-Director, Southern California Ecosystems Research Program (SCERP), Faculty Advisor, CSUF Chapter of the SACNAS Diversity in STEM society
 Teaches: Coastal Ecology, Marine Phycology, Scientific Communication Workshop
 Research Interests: Marine intertidal community ecology; marine algae and herbivory; habitat modification; interactions between invasive and native species
 Office: MH 211E Phone: (657) 278-2382 jburnaford@fullerton.edu
- CHEN, Esther J.** *(2006) Professor; Ph.D., Massachusetts Institute of Technology
 Teaches: Genetics, General Microbiology, Advances in Molecular Genetics
 Research Interests: Molecular biology of microbe-host interactions; genes and signals in a nitrogen-fixing symbiosis between bacteria and plants
 Office: MH 224C Phone: (657) 278-2543 echen@fullerton.edu
- COHEN, Amybeth** *(1997) Professor; Ph.D., UC Riverside
DEPARTMENT CHAIR
 Teaches: Genetics, Principles of Gene Manipulation, Plant Cell Physiology
 Research Interests: Regulation of photosynthetic gene expression in plant cells, nuclear-chloroplast interactions, expression of foreign therapeutic proteins in the unicellular green alga, *Chlamydomonas reinhardtii*
 Office: MH 205B Phone: (657) 278-2178 acohen@fullerton.edu

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

- CUAJUNGO, Math P.** *(2007) Professor; Ph.D., University of Auckland, New Zealand
Director of Undergraduate Research Training Initiative for Student Enhancement (U-RISE) Program, Co-Investigator for Neurocognitive Aging Analytics Research and Education (NAARE) Program
- Teaches: Cellular and Molecular Biology; Cellular Neurobiology; MARC Proseminar
 Research Interests: Molecular, structural, and cellular biology of transient receptor potential (TRP) ion channels; zinc neurobiology; metallobiology of Alzheimer's disease; stem cell biology
 Office: MH 224E Phone: (657) 278-8522 mcajungco@fullerton.edu
- DER, Joshua** *(2015) Associate Professor; Ph.D., Utah State University
- Teaches: Principles of Evolution, Population Genetics, Plant Biology, Plant Taxonomy
 Research Interests: Plant evolutionary genomics, plant systematics, bioinformatics, and molecular evolution; evolution of life history transitions in parasitic plants (esp. mistletoes) and land plants (esp. ferns)
 Office: MH 640A Phone: (657) 278-4115 jder@fullerton.edu
- EERNISSE, Douglas J.** *(1994) Professor; Ph.D., UC Santa Cruz
- Teaches: Evolution, Field Marine Biology, Molecular Systematics, Invertebrate Zoology
 Research Interests: Animal phylogeny; evolution of Mollusca; marine zoology; systematics; population genetics; bioinformatics
 Office: MH 636A Phone: (657) 278-3749 deernisse@fullerton.edu
- FORSGREN, Kristy** *(2012) Professor; Ph.D., University of Washington
- Teaches: Mammalian Physiology, Human Physiology, Marine Biology
 Research Interests: Gonadal development and reproductive dysfunction due to exposure to endocrine disrupting compounds in fishes; comparative reproductive physiology
 Office: MH 319A Phone: (657) 278-4573 kforsgren@fullerton.edu
- HOESE, William J.** *(2000) Professor; Ph.D., Duke University
- Teaches: Elements of Biology, Evolution and Organismal Biology, Principles of Evolution, Professional Aspects of Biology; Teaching, Problems in Environmental Biology, Ornithology
 Research Interests: Biology education; student learning; animal communication; functional morphology
 Office: MH 301B Phone: (657) 278-2476 bhoese@fullerton.edu
- JIMENEZ ORTIZ, Veronica** *(2013) Associate Professor; Ph.D., University of Chile
- Teaches: Advances in Cell Biology, Intermediate Cell Biology, Mammalian Physiology, General Parasitology
 Research Interests: Mechanisms of stress adaptation in protozoans, ion channels, cellular physiology
 Office: MH 307 Phone: (657) 278-2477 vjimenezortiz @fullerton.edu
- JOHNSON, Hope A.** *(2008) Professor; Ph.D., Stanford University
- Teaches: Genetics, General Microbiology, Advances in Microbiology, Advanced Microbiology Lab
 Research Interests: Microbial metal oxidation and reduction - the formation and dissolution of rocks; identifying the function of bacterial proteins with no known function; water quality and bioremediation
 Office: MH 211F Phone: (657) 278-4529 hajohnson@fullerton.edu

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

- MIYAMOTO, Alison** *(2008) Associate Professor; Ph.D., Stanford University
Director of Creating Opportunities through Mentorship and Partnership Across Stem Cell Science (COMPASS)
 Teaches: Cellular and Molecular Biology, Intermediate Cell Biology, Developmental Biology, Stem Cell Biology, Microscopy and Imaging in Biology
 Research Interests: Molecular mechanisms of Notch receptor signaling by typical and atypical ligands; developmental and cell biology of elastic fiber proteins; cell-matrix interactions in ovarian follicular angiogenesis
 Office: DBH 114A Phone: (657) 278-2540 almiyamoto@fullerton.edu
- NIKOLAIDIS, Nikolas** *(2008) Professor; Ph.D., Aristotle University of Thessaloniki (Greece)
 Teaches: Genetics, Bioinformatics, Medical Genetics
 Research Interests: Comparative genomics; bioinformatics; phylogenetics; molecular evolution and biochemistry of proteins involved in the innate and adaptive immune systems and stress responses
 Office: MH 317A Phone: (657) 278-4526 nnikolaidis@fullerton.edu
- OLBERDING, Jeffrey** *(2021) Assistant Professor; Ph.D., University of South Florida
 Teaches: Human Physiology, Human Physiology Lab, Integrated Human Anatomy and Physiology
 Research Interests: Muscle physiology, biomechanics, the evolution and ecology of animal movement
 Office: MH 225C Phone: (657) 278-7294 jolberding@fullerton.edu
- PAIG-TRAN, Erin (Misty)** *(2014) Associate Professor; Ph.D., University of Washington
 Teaches: Ichthyology, Human Anatomy, Human Anatomy and Physiology, Field Marine Biology
 Research Interests: Comparative biomechanics, functional morphology, biomaterials, and biomimetics; emphasis on marine systems
 Office: DBH 249 Phone: (657) 278-5921 empaig-tran@fullerton.edu
- PATEL, Nilay V.** *(2006) Associate Professor; Ph.D., State University of New York at Stony Brook
Director, CIRM Bridges to Stem Cell Research Program, Co-PI MSTEM STAR
 Teaches: Cellular and Molecular Biology, Intermediate Cell Biology, Techniques in Stem Cell Biology
 Research Interests: Role of apolipoprotein-E in Alzheimer Disease; apolipoprotein-E gene regulation
 Office: DBH 111A Phone: (657) 278-2483 npatel@fullerton.edu
- RAMIREZ, Maria Soledad** *(2014) Professor; Ph.D., University of Buenos Aires
 Teaches: Advances in Microbiology, General Microbiology, Clinical Microbiology, Public Health Microbiology
 Research Interests: Antibiotic resistance, mechanisms of antibiotic resistance, mobile elements, infectious diseases, mechanisms of horizontal gene transfer, whole genome comparison of bacterial genomes, molecular techniques for species identification, emerging pathogens
 Office: DBH 117A Phone: (657) 278-4562 msramirez@fullerton.edu
- SACCO, Melanie** *(2008) Professor; Ph.D., University of London
 Teaches: Genetics, Intermediate Molecular Biology, Molecular Virology, Principles of Gene Manipulation, Plant Molecular Biology, Scientific Communication Workshop
 Research Interests: Molecular biology of plant-pathogen interactions, protein-protein interactions and signaling in disease resistance
 Office: MH 685A Phone: (657) 278-2539 msacco@fullerton.edu

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

- SANDQUIST, Darren R.** *(1999) Professor; Ph.D., University of Utah
 Teaches: Principles of Ecology, Plant Biology, Plant Physiological Ecology, Field Botany, Plant Ecology, Desert Ecology
 Research Interests: Desert plant ecology; evolution and ecology of plant physiology; biogeochemistry; applications of stable isotopes in ecological research; invasive species
 Office: MH 313 Phone: (657) 278-2606 dsandquist@fullerton.edu
- SCHENK, H. Jochen** *(2002) Professor; Ph.D., UC Santa Barbara
 Teaches: Principles of Ecology, Plant Biology, Field Botany, Plant Physiological Ecology, Evolutionary Ecology, Ecosystem Ecology, Professional Aspects of Biology
 Research Interests: Plant ecology, especially ecology of plant roots; spatial ecology of plant populations, communities, and ecosystems; desert ecology; plant taxonomy.
 Office: MH 224D Phone: (657) 278-3678 jschenk@fullerton.edu
- SHAHRESTANI, Parvin** *(2015) Associate Professor; Ph.D., UC Irvine
 Teaches: Genetics, Principles of Evolution, Biology of Aging, Elements of Biology
 Research Interests: Evolutionary genomics, experimental evolution, population genetics, aging and immunity in *Drosophila*.
 Office: MH 224F Phone: (657) 278-4233 pshahrestani@fullerton.edu
- STAPP, Paul** *(2002) Professor; Ph.D., Colorado State University
Graduate Studies Adviser, MS Biology
 Teaches: Principles of Ecology, Conservation Biology, Mammalogy, Professional Aspects of Biology
 Research Interests: Vertebrate population and community ecology; food webs; wildlife-habitat relationships; invasive species; ecology of insular, desert and grassland ecosystems; conservation biology
 Office: MH 224G Phone: (657) 278-2849 pstapp@fullerton.edu
- TOLMASKY, Marcelo E.** *(1995) Professor; Ph.D., University of Buenos Aires
Director, Center for Applied Biotechnology Studies (CABS), Director, Minority Health & Health Disparities Research Training Program (MHRT), Director, Cancer Research Education Program (CREP)
 Teaches: Advances in Microbiology, Microbial Genetics, Advances in Biotechnology Laboratory
 Research Interests: Molecular genetics of mechanisms that contribute to the virulence of pathogenic bacteria
 Office: MH 382 Phone: (657) 278-5263 mtolmasky@fullerton.edu
- WALTER, Ryan** *(2015) Associate Professor; Ph.D., University of Windsor
 Teaches: Genetics, Principles of Ecology, Evolutionary Genetics, Ichthyology
 Research Interests: Molecular ecology, hybridization and speciation, phylogeography, organismal dispersal and population connectivity, population genetics, evolution of fishes
 Office: MH 689A Phone: (657) 278-4812 rwalter@fullerton.edu
- ZACHERL, Danielle C.** *(2003) Professor; Ph.D., UC Santa Barbara
 Teaches: Think Like Einstein, Marine Biology, Invertebrate Zoology, Marine Ecology, Evolution and Organismal Biology, Principles of Ecology
 Research Interests: Effects of larval dispersal and recruitment on the population ecology and biogeography of marine invertebrates
 Office: MH 225D Phone: (657) 278-7510 dzacherl@fullerton.edu

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

FULL-TIME LECTURERS

CHAFFEE, Carol

Biol 101 Coordinator

Teaches:

Office:

*(2015) Full-time Lecturer; Ph.D., University of Florida

Elements of Biology

MH 221D

Phone: (657) 278-7098

cchaffee@fullerton.edu

TOMMERUP, Megan

*Teaching Credential and
Biology Minor Adviser*

Teaches:

Office:

*(2007) Full-time Lecturer; Ph.D., Claremont Graduate University

Biology for Future Teachers, Life Science Concepts, Environmental Biology, Elements of Biology

MH 211C

Phone: (657) 278-5283

mtommerup@fullerton.edu

ADMINISTRATIVE OFFICES

Area Code 657

	Phone #	Room #
California State University, Fullerton, General Information	278-2011	
Biological Science Department Office (BiolSci@fullerton.edu)	278-3614	MH 205
○ Advising questions: email bioladvising@fullerton.edu		
○ Chair – Dr. Amybeth Cohen	278-3614	MH 205B
○ Administrative Support Coordinator – Karen Lau	278-3614	MH 205A
○ Teaching Credential Advisor – Dr. Megan Tommerup Advises Biology majors seeking admission to the Single-Subject Credential Program.	278-5283	MH 211C
○ Biology Minor Advisor – Dr. Megan Tommerup (mtommerup@fullerton.edu)	278-5283	MH 211C
CNSM Student Success Team http://www.fullerton.edu/nsm/student_success/NSM_Student_Success_Center.php		MH 488
○ Asst. Director Academic Advising – Tanya Kim (takim@fullerton.edu)	278-4158	MH 488
○ Graduation Specialist – Sam Barrozo (sbarrozo@fullerton.edu)	278-7062	MH 488
○ Graduation Specialist – Axis Avalos (axavalos@fullerton.edu)	278-2301	MH 488
○ College Advisor – Natalie Mir (namir@fullerton.edu)	278-8750	MH 488
○ College Advisor – Abraham Roldan (aroldan@fullerton.edu)	278-7217	MH 488
○ Career Specialist – Chanda Ishisaka (cishisaka@fullerton.edu)	278-2020	LH 208
Academic Advisement Center Provides guidance in the selection of elective and general education courses, advises, and is the center for undeclared majors. No appointment is necessary.	278-3606	GH 123
Admission and Records Maintains students' matriculation and grade records and processes graduation checks to verify degree completion. Students are required to submit official transcripts of all work to this office. "Change of Academic Objective" forms for changing major and "Withdrawal" forms are available here.	278-2300	LH 114
Career Planning and Placement Center Offers personal and career counseling. Offers a career resources library, part-time job listings, career bank, and programs on a variety of career-oriented subjects.	278-3121	LH 208
Center for Careers in Teaching Resource center for those interested in teaching in middle or high school.	278-7130	EC 379
College of Natural Sciences and Mathematics Dean's Office	278-2638	MH 166
Counseling and Psychological Services (CAPS) Student Health and Counseling Center East, across from Ruby Gerontology. For Biology majors, our counselor contact is Christina Carroll-Pavia, Ph.D.	278-3040	SHCC
Dean of Students Students are encouraged to resolve grade disputes informally through the instructor, Department Chair, and Assistant Dean of the College. If informal resolution is not possible, the Dean of Students will provide information and clarification about University policies and will work to resolve the dispute.	278-4436	TSU 243
Disability Support Services Provides assistance and services to students with physical and learning disabilities.	278-3117	GH 101
Financial Aid	278-3125	GH 146
Health Professions Advising Office NOTE: Advisement through the Health Professions Office does not replace mandatory advisement through the Department.	278-3980	GH 223
Library Houses over 1.2 million books and periodicals and one and a half million other resource items. May access collections of the 19 CSU libraries, UCI, UCR, & Fullerton College. Tours are available.	278-2714	Pollak Library
Student Health Center Provides medical care for illness and injury, family planning, health education, and immunization programs.	278-2800	SHCC
Testing Center University testing services, including ELM, EPT, MQE, and CPE.	278-2288	GH 143
Transfer Resource Center Peer mentors and study area for recent Transfer students.	278-8398	MH 525
Tutoring NSM Student Success Center provides tutoring, computers, and photocopy machine.	278-7082	MH 488

University Learning Center Offers academic support and tools to assist students in mastering test taking and exam preparation skills. Lab and strategies classes are available.	278-2738	PLN 1st floor
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Resources for Biology Majors

College of Natural Sciences and Mathematics (CNSM) Student Success Team

http://www.fullerton.edu/nsm/student_success/NSM_Student_Success_Center.php

Asst. Director Academic Advising, Tanya Kim

(MH-488) 657-278-4158

- Focus on Freshmen, Transfer Students
- Athletes, Fullerton Finish, Honors, Veterans

College Advisor, Abraham Roldan

(MH-488) 657-278-7217 aroldan@fullerton.edu

- Focus on Freshman
- GE advising, TDA, registration help

Career Specialist, Chanda Ishisaka

(LH-208) 657-278-2020 cishisaka@fullerton.edu

- Career exploration, Internship/Job search
- Graduate/Professional school advising

Graduation Specialist, Axis Avalos

(MH-488) 657-278-2301 axavalos@fullerton.edu

- Focus on Transfer Students
- Junior/Senior Advising

College Advisor, Natalie Mir

(MH-488) 657-278-8750 namir@fullerton.edu

- Focus on Freshmen
- GE advising, TDA, registration help

Tutoring

- **NSM Student Success Center** for Biology, Chemistry and Biochemistry, and Physics (MH-488) 657-278-7082 http://www.fullerton.edu/nsm/student_success/NSM_Student_Success_Center.php
- **Math Tutoring Center** (MH-488) 657-278-3631
- **Supplemental Instruction** <http://www.fullerton.edu/si/>
- **University Learning Center** (PLN 1st floor) 657-278-2738 <http://www.fullerton.edu/ulc/>
- **Writing Center** (PLN 100) 657-278-3650 http://english.fullerton.edu/writing_center/

Career Resources

- **Career Center** (LH-208) 657-278-3121 <http://www.fullerton.edu/career>
- **Center for Internships and Community Engagement** (LH-206) 657-278-3746 <http://www.fullerton.edu/cice/>
- **Center for Careers in Teaching** (EC 379) 657-278-7130 <http://ed.fullerton.edu/cct/>
- **Health Professions Advising Office** (GH 223) 657-278-3980 <http://www.fullerton.edu/healthprofessions>

Other Resources (for complete listing see the Student Affairs website <http://www.fullerton.edu/sa/>)

- **Scholarships** <http://www.fullerton.edu/financialaid/award/scholarships.php>
- **Directory of CSUF student clubs** <https://fullerton.campuslabs.com/engage/>
- **Student Health Center** (SHCC West) 657-278-2800. Provides medical care for illness and injury, family planning, health education, and immunizations.
- **Counseling and Psychological Services (CAPS)** (SHCC East) 657-278-3040. For Biology students, our counselor contact is Christina Carroll-Pavia, Ph.D.
- **Tuffy's Basic Needs Services** (MH 143) 657-278-3583 http://www.fullerton.edu/deanofstudents/basic_needs/
- **Disability Support Services** (GH 101) 657-278-3112 <http://www.fullerton.edu/dss/>
- **African American Resource Center** (PLS 180, Rm 182) 657-278-3230 <http://www.fullerton.edu/aarc/>
- **Asian Pacific American Resource Center** (PLS 180, Rm 187) 657-278-3742 <https://www.fullerton.edu/aparc/>
- **Latinx Resource Center** (PLS 180, Rm 184) 657-278-2537 <http://www.fullerton.edu/crc/>

- **LGBT Queer Resource Center** (PLS180, Rm 189) 657-278-4218 <https://www.fullerton.edu/lgbtq/>
- **Titan Dreamers Resource Center** (PLS 180, Rm 185) 657-278-3234 <https://www.fullerton.edu/tdrc/>
- **Women's Resource Center** (LH 556) <https://www.fullerton.edu/dirc/resource-centers/Womens Resource Center.php>
- **Adult Re-Entry and Parenting Student Programs** (GH 205) 657-278-3928
<http://www.fullerton.edu/adultreentry/>
- **Veterans Student Services** (GH-230) 657-278-8660 <http://www.fullerton.edu/veterans/>