California State University, Fullerton

Department of Biological Science

Undergraduate Advising Handbook

Catalog Year FALL 2019

McCarthy Hall-282, 800 N. State College Blvd., Fullerton, CA 92831
T 657-278-3614 / F 657-278-3426 / http://www.fullerton.edu/biology

CALIFORNIA STATE UNIVERSITY, FULLERTON

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College of Natural Sciences & Mathematics
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Welcome to the Department of Biological Science at Cal State Fullerton!

A Biology degree opens doors to many exciting career and life experiences. While many of you are planning on pursuing careers in health professions, it is important to recognize that your Biology degree can be the first step to a career in biotechnology, environmental management and conservation, research, teaching, journalism, or even government. What can't you do with your Biology degree?

The common foundation for all Biology Majors is a strong interest in (dare I say "love of") science. 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 at every step. The faculty and staff of the Department of Biological Science are dedicated to your success!

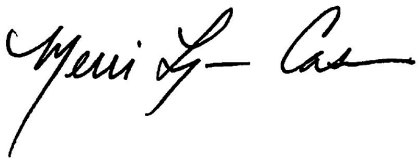
Success as a Biology Major, however, ultimately depends on the choices you make. Choose to give priority to your classes. Studying takes time and effort – likely more time and effort than you spent in high school. You may need to change the way you study or develop new study skills. Choose to take advantage of the resources provided to you. CSU Fullerton offers a wealth of resources both to support you as a student (for example: the Student Success Center for Science and Math (free drop-in tutoring), Supplemental Instruction, and the Writing Center), and as an individual (for example: Student Support Services, Dreamer's Resource Center, African American Resource Center, Asian Pacific American Resource Center, LGBT Queer Resource Center, Tuffy's Basic Needs, and the Health Center), and to help guide you in considering your career options (Career Center and Center for Internships & Community Engagement). Most important, choose to become involved with the campus. Joining student organizations, volunteering, and participating in research (yes, you can do that as an undergraduate!) 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. Write in it. Read about the scholarships and research programs available to you as a Biology major. Flip to the back to see the list of biology faculty and their research interests.

The Department of Biological Science requires that students participate in academic advising to ensure that you are making efficient progress towards graduation. You will participate in group advising during the semesters you are taking lower division biology core courses. Once you declare a concentration and begin upper division biology coursework, you will meet one-on-one with a faculty advisor. Be sure to pay attention to your CSUF email and student portal for advising announcements.

If you need additional assistance at any time, please stop by the Department office (McCarthy Hall 282) or email bioladvising@fullerton.edu to ask for help. We look forward to meeting you and working with you.

Sincerely,



Merri Lynn Casem, Ph.D.
Professor and Acting Chair
Department of Biological Science
June 11, 2019

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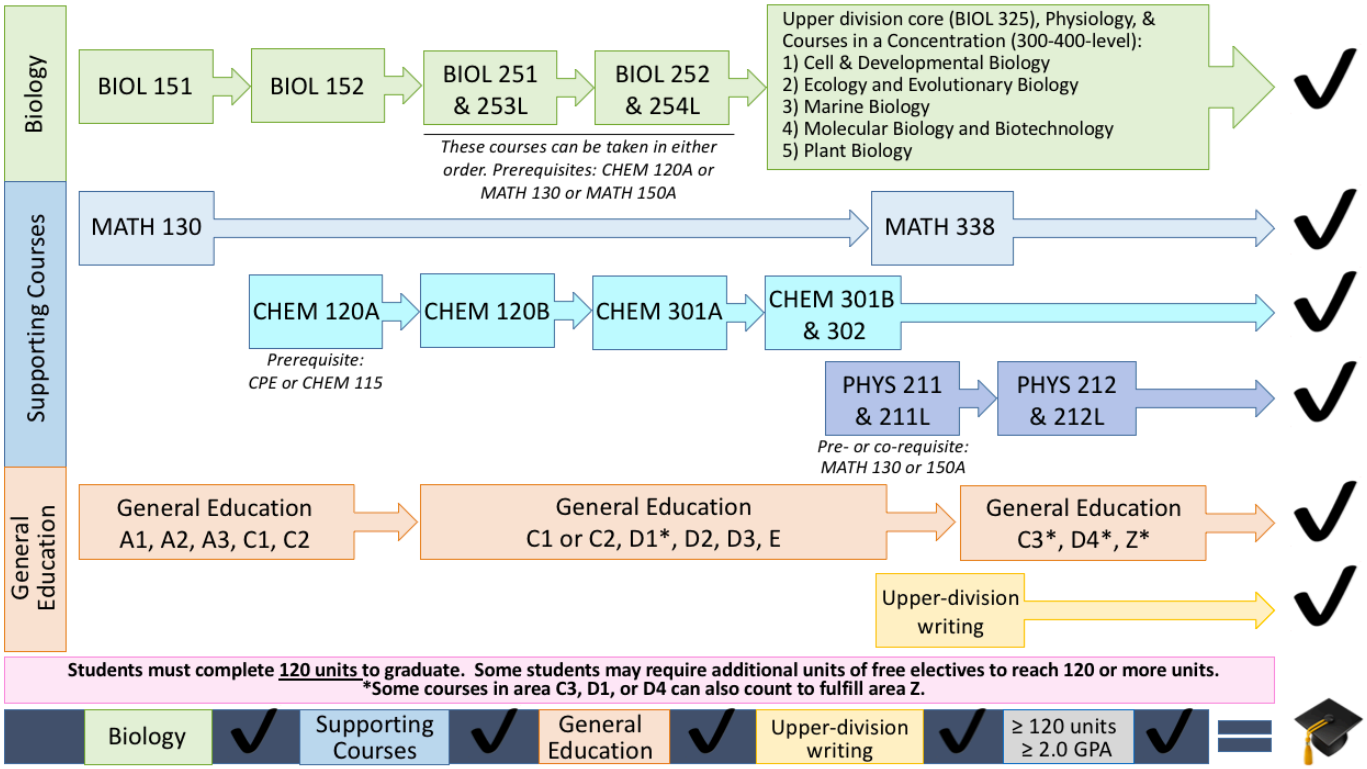
BACHELOR OF SCIENCE DEGREE IN BIOLOGY, Catalog Year Fall 2019



- ☐ Declare your concentration during the semester you are taking your last lower-division BIOL Core course
- ☐ Complete 40 units of Biology majors courses (BIOL Core and upper division courses to fulfill a concentration), C or higher in each, BIOL GPA ≥ 2.0
- ☐ Complete Supporting Courses (MATH, CHEM, PHYS), C or higher in each
- ☐ Complete General Education Requirements
- ☐ 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
  - ☐ 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

B. University requirements:

- ☐ 120 units for the Bachelor of Science
  - ☐ 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).
  - ☐ 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, D4
    - At least **3** units of Cultural Diversity (Z) coursework
    - Limited to either 9 units or 3 courses from a single department, excluding courses in GE Category A, Core Competencies
    - No units from the department of your major (except BIOL 151 for Life Science requirement)
  - ☐ Satisfy the University upper-division writing requirement (ENGL 301, ENGL 363, or 6 units of BIOL courses that meet this requirement), minimum grade of C
  - ☐ 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 check** approximately one year (two semesters) before graduation, but only **AFTER** completing all of the lower-division (100-200 level) Biology Core courses **AND** declaring your concentration.
  - In Titan Online, choose "Graduation:Apply/Pay Fee" from the dropdown menu in your Student Center to allow 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).
  - 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 the grad check.
  - 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://admissions.fullerton.edu > Current Students > Apply for Graduation

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).*

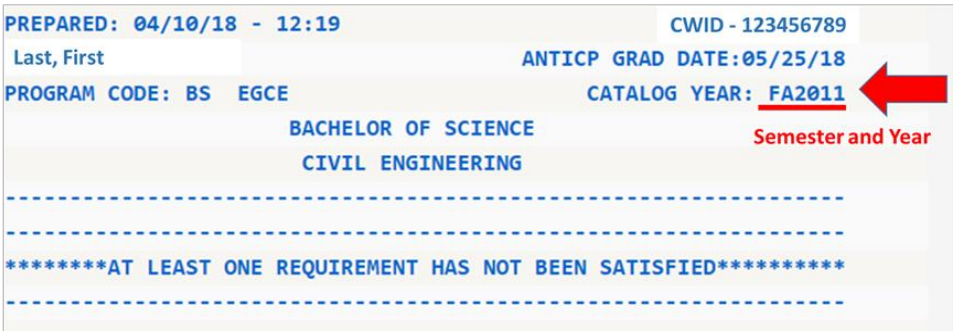
May I choose a catalog year other than what I was assigned when I first enrolled here?

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:



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.)

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 spend 3 h studying for every unit of lecture and 2 h studying for every unit of lab.***

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

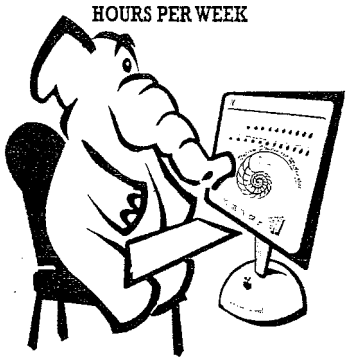
PLANNING TIME TO GRADUATION

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 Ttitan

STUDY 25 - 35



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 and BIOL 253L	Genetics (3) and Cell/Molecular Skills Lab (1)		
BIOL 252 and BIOL 254L	Principles of Ecology (3) and Research Skills for Ecology/Organismal Biology (1)		
BIOL 325	Principles of Evolution (3)		

→After completion of the Lower division Biology Core Courses, Upper Division Biology electives in a concentration must be taken (21 units, of which 6 units must be lab/field), 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 and MATH 338 **OR**	Calculus (4) and Statistics (4)		
MATH 150A and MATH 150B	Calculus (4) and Calculus (4)		
CHEM 120A	General Chemistry (5)		
CHEM 120B	General Chemistry (5)		
CHEM 301A	Organic Chemistry (3)		
CHEM 301B	Organic Chemistry (3)		
CHEM 302	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** 6 units of BIOL courses that meet the writing requirement †		

Course	Prerequisites (co-requisites noted in parenthesis)
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 120A, 120B, and 301A
CHEM 302	CHEM 301A; CHEM 301B (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)

† BIOL courses that meet the writing requirement: BIOL 410 (taken Sp18 or later), 411, 414, 417, 422, 426, 427, 446, 449, 465, 466, 468, 470, 495, and 498

* 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 2019

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 302 5 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 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/Z 3 units	GE C1 or C2 3 units	CHEM 302 2 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 D3 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C3/Z 3 units	Upper Division GE D4/Z 3 units
			GE E 3 units				Electives to complete 120 units
17 units	15 units	15 units	16 units	14 units	16 units	13-15 units	12-15 units

** only if you have AP credit for MATH 150A*

30	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Upper Division Writing
7	Electives
120	**TOTAL UNITS**

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. 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 302	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 you would 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 303	Intermediate Cell Biology (3)
BIOL 302	General Microbiology (5/2)

Cell and Developmental Biology Elective Courses (5 units)

Course	Course Title	Course	Course Title
BIOL 329	Essential Tech. Cell Biol. (3/2)	BIOL 428	Biology of Cancer (3)
BIOL 362	Mammalian Physiology (4/1)	BIOL 429	Tech. Stem Cell Biol. (3/2)
BIOL 405	Developmental Biology (3)	BIOL 438	Pub. Health Microbiology (4/2)
BIOL 417	Adv. Cell Biology (3)	BIOL 445	Plant Cell Physiology (3)
BIOL 418L	Adv. Cell Biology Lab (2/2)	BIOL 465	Int. Biol. of Spider Silk (3)
BIOL 424	Immunology (5/2)	BIOL 470	Cellular Neurobiology (3)
BIOL 427	Stem Cell Biology (3)		

Cell and Developmental Biology Capstone Courses (2 units)

Course	Course Title	Course	Course Title
BIOL 400	Sem. in Biology Education (2)	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 495	Internship (3/2)
BIOL 429	Tech. Stem Cell Biol. (3/2)	BIOL 498	Thesis (1-2)
BIOL 438	Pub. Health Microbiology (4/2)	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 362	Mammalian Physiology (4/1)	BIOL 445	Plant Cell Physiology (3)
BIOL 444	Plant Physiological Ecology (4/2)	BIOL 468	Comp. Animal Physiology (4/1)

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 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

• **Area A Core Competencies**. Complete one course in each subarea 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. Includes 3 upper division units (*).

Subarea	Title
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 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3*	Explorations in the Arts and Humanities

• **Area D Social Sciences**. Complete one course in each subarea for a total of 9 lower division and 3 upper division units (*).

Area	Title
D1	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3	American Government
D4*	Explorations in the Social Sciences

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

• **Area Z Cultural Diversity**. Area Z should be completed with a course that will fulfill both Area C3 and Area Z OR both Area D1 and Area Z OR both Area D4 and Area Z.

College of Natural Sciences and Mathematics

DEPARTMENT OF BIOLOGICAL SCIENCE

BIOLOGY BACHELOR OF SCIENCE

CATALOG YEAR FALL 2019

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 251 3 units	BIOL 252 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 253L 1 unit	BIOL 254L 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/Z 3 units	GE C1 or C2 3 units	CHEM 302 2 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 D3 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C3/Z 3 units	Upper Division GE D4/Z 3 units
			GE E 3 Units				Electives to complete 120 units
17 units	15 units	15 units	16 units	14-15 units	14-15 units	13-15 units	12-14 units

** only if you have AP credit for MATH 150A*

30	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Upper Division Writing
7	Electives
120	**TOTAL UNITS**

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. 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 302	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 you would 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 467	Entomology (4/2)
BIOL 340	Field Botany (3/2)	BIOL 474	Natural History Vertebrates (4/2)
BIOL 344	Survey of the Land Plants (4/2)	BIOL 475	Ichthyology[1] (4/2)
BIOL 345	Plant Biology (3/1)	BIOL 476	Herpetology (4/2)
BIOL 441	Plant Taxonomy (4/2)	BIOL 478	Mammalogy (4/2)
BIOL 446	Marine Phycology[1] (4/2)	BIOL 479	Ornithology (4/2)

EEB Ecology Elective Courses (3-4 units)

Course	Course Title	Course	Course Title
BIOL 301	Prob. Env. Biol. (3/2)	BIOL 442	Pollination Biology (3/1)
BIOL 314	Pop. and Comm. Ecology (3)	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 (4/1)
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)

[1] ***only one of these courses may be counted towards the EEB concentration units***

EEB Capstone Courses (2 units)

Course	Course Title	Course	Course Title
BIOL 400	Sem. in Biology Education (2)	BIOL 481	Adv. Evolution and Ecology (3)
BIOL 401	Biogeography (3)	BIOL 482	Capstone Studies in Biology (2)
BIOL 447	Ethnobotany (3/1)	BIOL 495	Internship (3/2)
BIOL 450	Conservation Biology (3)	BIOL 498	Thesis (1-2)
BIOL 465	Int. Biology of Spider Silk (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 362	Mammalian Physiology (4/1)	BIOL 445	Plant Cell Physiology (3)
BIOL 444	Plant Physiological Ecology (4/2)	BIOL 468	Comp. Animal Physiology (4/1)

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 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

• **Area A Core Competencies**. Complete one course in each subarea 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. Includes 3 upper division units (*).

Subarea	Title
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 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3 *	Explorations in the Arts and Humanities

• **Area D Social Sciences**. Complete one course in each subarea for a total of 9 lower division and 3 upper division units (*).

Area	Title
D1	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3	American Government
D4 *	Explorations in the Social Sciences

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

• **Area Z Cultural Diversity**. Area Z should be completed with a course that will fulfill both Area C3 and Area Z OR both Area D1 and Area Z OR both Area D4 and Area Z.

College of Natural Sciences and Mathematics

DEPARTMENT OF BIOLOGICAL SCIENCE

BIOLOGY BACHELOR OF SCIENCE

CATALOG YEAR FALL 2019

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 251 3 units	BIOL 252 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 253L 1 unit	BIOL 254L 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/Z 3 units	GE C1 or C2 3 units	CHEM 302 2 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 D3 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C3/Z 3 units	Upper Division GE D4/Z 3 units
			GE E 3 Units				Electives to complete 120 units
17 units	15 units	15 units	16 units	14-15 units	15 units	13-15 units	12-15 units

** only if you have AP credit for MATH 150A*

30	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Upper Division Writing
7	Electives
120	**TOTAL UNITS**

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. 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 302	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 you would 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)

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 (2)	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 (1-2)
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 362	Mammalian Physiology (4/1)	BIOL 445	Plant Cell Physiology (3)
BIOL 444	Plant Physiological Ecology (4/2)	BIOL 468	Comp. Animal Physiology (4/1)

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 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

• **Area A Core Competencies**. Complete one course in each subarea 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. Includes 3 upper division units (*).

Subarea	Title
B1	Physical Science (CHEM 120A)
B2	Life Science (BIOL 151)
B3	Laboratory Activity (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 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3 *	Explorations in the Arts and Humanities

• **Area D Social Sciences**. Complete one course in each subarea for a total of 9 lower division and 3 upper division units (*).

Area	Title
D1	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3	American Government
D4 *	Explorations in the Social Sciences (upper div)

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

• **Area Z Cultural Diversity**. **Area Z Cultural Diversity**. Area Z should be completed with a course that will fulfill both Area C3 and Area Z OR both Area D1 and Area Z OR both Area D4 and Area Z.

College of Natural Sciences and Mathematics

DEPARTMENT OF BIOLOGICAL SCIENCE

BIOLOGY BACHELOR OF SCIENCE

CATALOG YEAR FALL 2019

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 302 or CHEM 421 3-5 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 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/Z 3 units	GE C1 or C2 3 units	CHEM 302 2 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 D3 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C3/Z 3 units	Upper Division GE D4/Z 3 units
			GE E 3 units				Electives to complete 120 units
17 units	15 units	15 units	16 units	14 units	14-16 units	13-15 units	12-16 units

** only if you have AP credit for MATH 150A*

30	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Upper Division Writing
7	Electives
120	**TOTAL UNITS**

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these courses are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. 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 302	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 you would 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 (4/1)	BIOL 448	Plant Molecular Biology (4/1)
BIOL 411	Medical Genetics & Syst. Biology (3)	BIOL 472A	Adv. Biotech. Lab (3/2)
BIOL 412	Principles Gene Manipulation (3)	BIOL 472B	Adv. Biotech. Lab (3/2)
BIOL 413	Adv. Molecular Genetics (3)	BIOL 473	Bioinformatics (3/1)
BIOL 414	Microbial Genetics (3)	BIOL 490	Clinical Microbiol. (3/2)
BIOL 426	Molecular Virology (3)	CHEM 421	Biological Chemistry (3)
BIOL 430	Advances in Microbiology (3)		

Molecular Biology and Biotechnology Capstone Courses (2 units)

Course	Course Title	Course	Course Title
BIOL 400	Sem. In Biology Education (2)	BIOL 482	Capstone Studies in Biology (2)
BIOL 412	Principles Gene Manipulation (3)	BIOL 490	Clinical Microbiol. (3/2)
BIOL 426	Molecular Virology (3)	BIOL 495	Internship (3/2)
BIOL 430	Adv. Microbiol (3)	BIOL 498	Thesis (1-2)
BIOL 472A	Adv. Biotech. Lab (3/2)	BIOL 499L	Independent Lab Study (1-3)
BIOL 472B	Adv. Biotech. Lab (3/2)		

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 362	Mammalian Physiology (4/1)	BIOL 445	Plant Cell Physiology (3)
BIOL 444	Plant Physiological Ecology (4/2)	BIOL 468	Comp. Animal Physiology (4/1)

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 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

• **Area A Core Competencies**. Complete one course in each subarea 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. Includes 3 upper division units (*).

Subarea	Title
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 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3 *	Explorations in the Arts and Humanities

• **Area D Social Sciences**. Complete one course in each subarea for a total of 9 lower division and 3 upper division units (*).

Area	Title
D1	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3	American Government
D4 *	Explorations in the Social Sciences

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

• **Area Z Cultural Diversity**. Area Z should be completed with a course that will fulfill both Area C3 and Area Z OR both Area D1 and Area Z OR both Area D4 and Area Z.

College of Natural Sciences and Mathematics

DEPARTMENT OF BIOLOGICAL SCIENCE

BIOLOGY BACHELOR OF SCIENCE

CATALOG YEAR FALL 2019

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 251 3 units	BIOL 252 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 253L 1 unit	BIOL 254L 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/Z 3 units	GE C1 or C2 3 units	CHEM 302 2 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 D3 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C3/Z 3 units	Upper Division GE D4/Z 3 units
			GE E 3 Units				Electives to complete 120 units
17 units	15 units	15 units	16 units	14 units	14-15 units	13-15 units	13-16 units

** only if you have AP credit for MATH 150A*

30	GE lower division
6	GE upper division
40	Biology Required Courses
34	Biology Supporting Courses (includes 3 units GE upper division)
3	Upper Division Writing
7	Electives
120	**TOTAL UNITS**

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. 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 302	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 you would 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)

Plant Biology Elective Courses (7 units)

Course	Course Title	Course	Course Title
BIOL 340	Field Botany (3/2)	BIOL 445	Plant Cell Physiology (3)
BIOL 344	Survey of the Land Plants (4/2)	BIOL 446	Marine Phycology (4/2)
BIOL 441	Plant Taxonomy (4/2)	BIOL 447	Ethnobotany (3/1)
BIOL 442	Pollination Biology (3/1)	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)

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 (1-2)
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 362	Mammalian Physiology (4/1)	BIOL 445	Plant Cell Physiology (3)
BIOL 444	Plant Physiological Ecology (4/2)	BIOL 468	Comp. Animal Physiology (4/1)

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 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

• **Area A Core Competencies**. Complete one course in each subarea 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES. Includes 3 upper division units (*).

Subarea	Title
B1	Physical Science (CHEM 120A)
B2	Life Science (BIOL 151)
B3	Laboratory Activity (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 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3 *	Explorations in the Arts and Humanities

• **Area D Social Sciences.** Complete one course in each subarea for a total of 9 lower division and 3 upper division units (*).

Area	Title
D1	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3	American Government
D4 *	Explorations in the Social Sciences (upper div)

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

• **Area Z Cultural Diversity**. Area Z should be completed with a course that will fulfill both Area C3 and Area Z OR both Area D1 and Area Z OR both Area D4 and Area Z.

UPPER DIVISION (300-400 Level) BIOLOGY MAJORS ELECTIVES

BIOL	Course name	Units	Offered	Prerequisites
301	Problems in Environmental Biology	3/2	SS	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	BIOL 251/253L, 252/254L, and CHEM 120B
304	Supervised Biology Lab Instruction	2	P	BIOL 251/253L, 252/254L, and CHEM 120B
309	Intermediate Molecular Biology	3	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
314	Population and Community Ecology	3	F / E	BIOL 251/253L and 252/254L
317	Field Marine Biology	4/2	S	BIOL 251/253L and 252/254L
329	Essential Techniques in Cell Biology	3/2	SS	BSCR scholars only; BIOL 302; and BIOL 303 or 309
332	Biology of the Vertebrates	3	F / O	BIOL 251/253L and 252/254L
336	GEO/BIO Field Investigations	3/2	W	BIOL 252/254L or GEOL 335
340	Field Botany	3/2	S / E	BIOL 251/253L and 252/254L
344	Survey of Land Plants	4/2	P	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	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
398	Scientific Communication Workshop	1	F, S	MARC scholars only
400	Seminar in Biology Education	2	F	BIOL 302, 303, 309, 314, or 325
401	Biogeography	3	F / E	BIOL 314 or 325
402	Computer Lab in Molecular Systematics	3/1	F / O	BIOL 303, 309, 314, or 325
405	Developmental Biology	3	S	BIOL 303 or 309
407	Genes & Genomes	3	S / E	BIOL 303 or 309
409	Teaching Evolution: Online Course for Teachers	3	P	BIOL 251/253L, 252/254L, and GE Category B2
410†	Evolutionary Genetics	4/1	F	BIOL 251/253L and 252/254L
411†	Medical Genetics	3	SS	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 Laboratory	2/2	S	BIOL 303
419	Marine Ecology	3	F / O	BIOL 314 or 325
419L	Marine Ecology Lab	1/1	F / O	Corequisite: BIOL 419
422†	Coastal Ecology	4/2	F / E	BIOL 314 or 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	BIOL 303, 309, 314, 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
442	Pollination Biology	3/1	P	BIOL 251/253L and 252/254L
443	Plant Ecology	4/2	S / E	BIOL 314, 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, or 314, or CHEM 421 or 423A
446†	Marine Phycology	4/2	F / O	BIOL 251/253L and 252/254L

(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; SS = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic.

† courses that meet the upper division writing requirement (6 units required to meet the writing requirement). *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
447	Ethnobotany	3/1	P	BIOL 314 or 325
448	Plant Molecular Biology	4/1	P	BIOL 302, 303, 309, or 345, or CHEM 421 or 423A
449†	Desert Ecology	4/2	S / O	BIOL 314 or 325
450	Conservation Biology	3	S	BIOL 314 or 325
451	Advanced Evolutionary Anthropology (ANTH 451)	3	S #	ANTH 322, ANTH 344, or BIOL 274
456	Hormones and Behavior (ANTH 456)	3	F #	GE Category B5
461	Marine Invertebrate Biology	4/2	F / E	BIOL 251/253L and 252/254L
462	General Parasitology	4/1	P	BIOL 302
465†	Integrative Biology of Spider Silk	3	S / O	BIOL 303, 309, 314, or 325
466†	Behavioral Ecology	3	F / O	BIOL 251/253L and 252/254L
467	Entomology	4/2	S / 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	F / E	BIOL 362; and BIOL 303 or 309
472A	Advances in Biotechnology Laboratory (CHEM 472A)	3/2	F	BIOL 302 or 309, or CHEM 421 or 423A; Corequisite: BIOL 412
472B	Advances in Biotechnology Laboratory (CHEM 472B)	3/2	S #	BIOL 472A
473	Bioinformatics (CHEM 473)	3/1	S	BIOL 309, 303, or 325, or CHEM 423A
474	Natural History of the Vertebrates	4/2	P	BIOL 251/253L and 252/254L
475	Ichthyology	4/2	S / O	BIOL 251/253L and 252/254L
476	Herpetology	4/2	S / E	BIOL 251/253L and 252/254L
477	Advances in Biotechnology (CHEM 477)	3	P #	BIOL 251/253L and 252/254L. Corequisite: BIOL 412, or CHEM 421 or 423A
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
480E*	SCERP Proseminar	1	F, S	SCERP Scholars only
480M*	MARC Proseminar	1	F, S	MARC Scholars only
481	Advances in Evolution & Ecology	3	S / E	BIOL 314 or 325
482*	Capstone Studies in Biology (Study Abroad)	2/2	W	Consent of instructor; ≥90 units completed
490	Clinical Microbiology (Study Abroad)	3/2	W	BIOL 251/253L and 252/254L and consent of instructor
495†	Biological Internship	3/2	F, S, SS	BIOL 251/253L and 252/254L, ≥90 units completed, and consent of instructor
498†*	Senior Thesis	1-2	F, S	6 units of BIOL 499L (2 units may be taken concurrently)
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 301A
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; SS = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic.
† courses that meet the upper division writing requirement (6 units required to meet the writing requirement). *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

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://admissions.fullerton.edu/prospectivestudent/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.

    - During the final 3 weeks of instruction, a complete withdrawal (from all classes) may be allowed only in cases of a documented serious accident or illness.

    - Petitions for Retroactive Withdrawals can only be filed for courses with WU (Withdrawal Unauthorized) 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 probation and disqualification

- Undergraduate students are placed on academic probation 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 Probation 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 Probation hold is SEPARATE from the Biology department advising hold; students on Probation must also attend Biology advising during advising period to release their Biology hold.

- Undergraduates on academic probation 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 probation (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 probation and disqualification:
  - Probation 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 a Probation Hold from the College of NSM must meet with one of the following members of the **CNSM Student Success Team (in MH-488)** to release their hold:

Graduation Specialist, Sam Barrozo
(MH-488) 657-278-7062 sbarrozo@fullerton.edu
- Focus on Graduation Candidates
- Junior/Senior Advising

Assistant Dean, Tatiana Pedroza
(MH-488) 657-278-7217 tapedroza@fullerton.edu
- Consults on Faculty/Student Issues
- Advocates for students with concerns
- Assists with CSUF policies/referrals

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 or Biol 252)*
- *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*

LOWER-DIVISION CORE Courses Required For All Students

- ☐ Biol 151 – Cellular and Molecular Biology (4 units)
- ☐ Biol 152 – Evolution and Organismal Biology (4 units)

Cell and Molecular Biology Minor

Total # of units required: 22 - 23 units

Lower-Division CORE Requirement (4 units)

- ☐ Biol 251 – Genetics &
- ☐ 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.

Biol 302 – General Microbiology (5) L
Biol 362 – Mammalian Physiology (4) L
Biol 402 – Computer Lab in Molec. Systematics (3) 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 418L – Advances in Cell Biology Lab (2) L
Biol 424 – Immunology (5) L
Biol 426 – Molecular Virology (3)
Biol 428 – Biology of Cancer (3)
Biol 445 – Plant Cell Physiology (3)
Biol 448 – Plant Molecular Biology (4) L
Biol 470 – Cellular Neurobiology (3)
Chem 421 – Biological Chemistry (3) OR Chem 423A – General Biochemistry (3)

L – lab course

Environmental Biology Minor

Total # of units required: 21 - 22 units

Lower-Division CORE Requirement (4 units)

- ☐ Biol 252 – Ecology &
- ☐ Biol 254L Research Skills in Ecol. And Org. Biol.

Upper-Division Required Course (3 units)

- ☐ Biol 325 – Principles of Evolution (3 units)

Upper-Division Electives[1]

Students should choose two courses. At least one must have a laboratory.

Biol 317 – Field Marine Biology (4) L
Biol 345 – Plant Biology (3) L
Biol 340 – Field Botany (3) L
Biol 401 – Biogeography (3) L
Biol 419/Biol 419L – Marine Ecology (3) and Lab (1) L
Biol 422 – Coastal Ecology (4) L
Biol 441 – Plant Taxonomy (4)
Biol 443 – Plant Ecology (4) L
Biol 444 – Plant Physiological Ecology (4) L
Biol 446 – Marine Phycology (4) L
Biol 447 – Ethnobotany (3) L
Biol 449 – Desert Ecology (4) L
Biol 450 – Conservation Biology (3)
Biol 461 – Marine Invertebrate Biology (4) L
Biol 467 – Entomology (4) L
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

[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 302 (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 the Chem minor handout available in the Chemistry and Biochemistry Department office, MH-580.

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 301A), 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 Health Promotion and Disease Prevention

The Health Science Minor, Health Promotion and Disease Prevention track (21 units) provides students with an overview of health and well-being, health behavior theory, and specialized content areas to meet a student's interest. Required courses include Personal Health (PUBH 101) and either Epidemiology (PUBH 401) or Determinants of Health Behavior (PUBH 440). 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 Gerontology

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

Interested in becoming a Health Inspector? Minor in Health Science

The Health Science Minor, Environmental and Occupational Health track (22 units), designed to complement majors such as chemistry and biology, provides students with the necessary coursework to become eligible for the Registered Environmental Health Specialist (REHS) Exam offered by the California Department of Health Services. https://www.cdph.ca.gov/Programs/CEH/DRSEM/Pages/EMB/REHS/REHS.aspx
CSUF is the only campus in Orange County to have an approved program. For more information go to: http://catalog.fullerton.edu or contact the PUBH Department office (657) 278-3316 or KHS-121.

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 (MH-282). 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

Big Data Discovery, and Diversity through Research Education Advancement and Partnerships (BD3-REAP) Program. The National Institutes of Health (NIH)-funded BD3-REAP Program is open to full-time students majoring in natural sciences and mathematics, and health science. The two-year program is designed to prepare students to pursue doctoral studies in biostatistics, bioinformatics, computational biology, and data science. Applications are available at the beginning of the fall semester. For more info, contact Dr. Math Cuajungco, Co-Program Director, phone (657) 278-8522 or mcuajungco@fullerton.edu

BSCR. The **CSUF 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 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 $3000 for the spring and fall semesters and stipend of $2500 per month. Applications are due in early April. Information is available from the director, Dr. Nilay Patel (657) 278 2483.
http://biology.fullerton.edu/stemcells/

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/

MARC Scholars Program. **Maximizing Access to Research Careers** (MARC) applications are accepted each January, before the start of the spring semester. To qualify for the MARC Program, applicants should be from an underrepresented group and majoring in a STEM field (anthropology, biological science, biochemistry, chemistry, bioengineering, biophysics, mathematics, computer science, psychology). Students from any ethnicity who can provide proof of a disadvantaged status are also invited to apply. Applicants must have junior standing or be at least two years away from graduation with a minimum GPA of 3.2. As an honors undergraduate training program, this National Institutes of Health (NIH)-funded program develops fourteen exceptional Scholars per year and prepares them for success in Ph.D. or M.D./Ph.D. programs in biomedical or behavioral science. Scholars receive stipends,

tuition, research materials, and travel support. They also participate in a MARC Proseminar where they study the work of, and interact with, visiting scientists from across the U.S. and engage in an extramural research experience at a Ph.D. institution during their second summer in the MARC Program. Intramural research, which culminates with the defense of a MARC thesis, is conducted with a faculty member in the Department of Anthropology, Biological Science, Chemistry & Biochemistry, Computer Science, Engineering, Mathematics or Psychology. Fact sheets are available online (http://marc.fullerton.edu/), from the program director, Dr. Amybeth Cohen (657) 278-2178, and in the MARC Program Office (657) 278-4251 in MH-161B.

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/

MHIRT Program. The **Minority Health & Health Disparities International 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 Thailand (Chiang Mai University), Argentina (Instituto Fundación Leloir, National Institute for Infectious Diseases, University of San Martín, Institute for Cell and Molecular Biology, School of Medicine-University of Buenos Aires), or England (King's College London, Cambridge University, Oxford University, York University) 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

RCP Program. The CSUF **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 their chosen careers, and 3) move more CSUF graduates into research-based graduate or professional 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 (M.S., Ph.D.), future professionals (M.D., M.D.-Ph.D., D.O., O.D., D.D.S.-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 often apply to MARC 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, MH-282, (657) 278-3614. http://biology.fullerton.edu/scerp/

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 Retention Specialist Sam Barrozo (sbarrozo@fullerton.edu), or the Academic Advising Center in GH-123A.

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 is a writing-intensive course that 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.
- BIOL 495 (3/2) is one of the BIOL courses that counts toward the upper-division writing requirement (6 units BIOL required). 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 Bachelors 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

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:

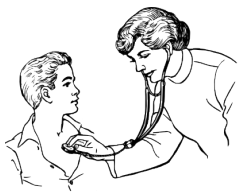
CSUF Health Professions Advising Office: http://www.fullerton.edu/healthprofessions/
Association of American Medical Colleges: http://www.aamc.org
American Association of Colleges of Osteopathic Medicine: http://www.aacom.org
American Association of Colleges of Pharmacy: http://www.aacp.org
Association of Schools and Colleges of Optometry: http://www.opted.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). Their website is: 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 BIOL302 (Microbiology) or CHEM421 (Biochemistry). BIOL361 (Human Anatomy) is an EEB Free Elective course that can count toward the 14 required EEB units, and BIOL362 (Mammalian 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, BIOL361, BIOL362, or CHEM421 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)

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

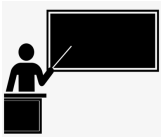
Marine Biology (MB)

course	units
BIOL Core courses	19
BIOL 317	4/2
MB Organismal Biology Course	4
MB Ecology Course	4
MB Capstone Course	2-4
Physiology requirement (BIOL 362 counts here)	3-4
Free electives for BIOL major (BIOL 302, 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-seced.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-seced.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/programs/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) Associate 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 217C 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) Associate Professor; Ph.D., Oregon State University

Teaches: Evolution and Organismal Biology, Coastal Ecology, Marine Ecology, Marine Ecology Lab, Marine Phycology

Research Interests: Marine intertidal community ecology; marine algae and herbivory; habitat modification; interactions between invasive and native species

Office: MH 286A Phone: (657) 278-2382 jburnaford@fullerton.edu

CASEM, Merri Lynn *(2000) Professor; Ph.D., UC Riverside

ACTING DEPARTMENT CHAIR

Teaches: Elements of Biology, Cellular and Molecular Biology, Advances in Cell Biology, Advances in Cell Biology Laboratory, Cellular Neurobiology, Integrative Biology of Spider Silk

Research Interests: Biology education; spider silk

Office: MH 387A Phone: (657) 278-2491 mcasem@fullerton.edu

CHEN, Esther J. *(2006) Associate 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 207C Phone: (657) 278-2543 echen@fullerton.edu

COHEN, Amybeth *(1997) Professor; Ph.D., UC Riverside

DEPARTMENT VICE-CHAIR

Director, MARC Scholars Program

Teaches: Genetics, Principles of Gene Manipulation, Plant Cell Physiology; MARC Proseminar

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 301A Phone: (657) 278-2178 acohen@fullerton.edu

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

CUAJUNGCO, Math P. *(2007) Professor; Ph.D., University of Auckland, New Zealand
Coordinator, MARC Scholars 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 207D Phone: (657) 278-8522 mcuajungco@fullerton.edu

DER, Joshua *(2015) Assistant Professor; Ph.D., Utah State University
Teaches: Principles of Evolution, Population Genetics, Plant Biology
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

DICKSON, Kathryn A. *(1988) Professor; Ph.D., Scripps Institution of Oceanography, UC San Diego
Teaches: Principles of Ecology, Human Physiology, Mammalian Physiology, Comparative Animal Physiology, Marine Biology
Research Interests: Locomotion and endothermy in fishes; comparative physiology and biochemistry; functional morphology of larval fishes
Office: DBH 116N Phone: (657) 278-5266 kdickson@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) Associate 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
Co-director, SCERP Program

Teaches: Elements of Biology, Evolution and Organismal Biology, 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, Medical Microbiology, and other courses in cell and microbiology
Research Interests: Mechanisms of stress adaptation in protozoans, ion channels, cellular physiology
Office: MH 307 Phone: (657) 278-2477 vjimenezortiz @fullerton.edu

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

JOHNSON, Hope A. *(2008) Professor; Ph.D., Stanford University

Teaches: Genetics, General Microbiology, Advances in Microbiology

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 207F Phone: (657) 278-4529 hajohnson@fullerton.edu

MIYAMOTO, Alison *(2008) Associate Professor; Ph.D., Stanford University

Teaches: Cellular and Molecular Biology, Intermediate Cell Biology, Developmental Biology, Stem Cell 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

PAIG-TRAN, Erin (Misty) *(2014) Assistant 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

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) Associate 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) Associate Professor; Ph.D., University of London

Teaches: Genetics, Intermediate Molecular Biology, Molecular Virology, Principles of Gene Manipulation, Plant Molecular Biology

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

Director, California Desert Studies Consortium

Co-director, SCERP Program

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 229A Phone: (657) 278-3678 jschenk@fullerton.edu

SHAHRESTANI, Parvin *(2015) Assistant 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 207G Phone: (657) 278-4233 pshahrestani@fullerton.edu

STAPP, Paul *(2002) Professor; Ph.D., Colorado State University

Graduate Program Adviser, MS Biology

Teaches: Principles of Ecology, Population and Community Ecology, 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 207E 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 International Research Training Program (MHIRT)

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

WALKER, Sean E. *(2003) Professor; Ph.D., Miami University

INTERIM ASSOCIATE DEAN, College of Natural Sciences and Mathematics

Teaches: Evolution and Organismal Biology, Principles of Ecology, Entomology

Research Interests: Evolutionary and behavioral ecology; Evolution of sexual dimorphism; Life history evolution; Sexual selection

Office: MH 282 Phone: (657) 278-3614 swalker@fullerton.edu

WALTER, Ryan *(2015) Assistant Professor; Ph.D., University of Windsor

Teaches: Genetics, Evolutionary Genetics

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

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY ROSTER

ZACHERL, Danielle C. *(2003) Professor; Ph.D., UC Santa Barbara

Teaches: 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 278A Phone: (657) 278-7510 dzacherl@fullerton.edu

FULL-TIME LECTURERS

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

Biol 101 Coordinator

Teaches: Elements of Biology

Office: MH 207H Phone: (657) 278-7098 cchaffee@fullerton.edu

SMITH, Darryl *(2016) Full-time Lecturer; M.S., California State University Fullerton

Teaches: Human Anatomy, Human Anatomy and Physiology, Integrated Anatomy and Physiology, Mammalian Physiology

Office: MH 045 Phone: (657) 278-5051 darrylsmith@fullerton.edu

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

Teaching Credential Adviser

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

Office: MH 236A 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	**278-3614**	**MH 282**
○ Chair – Dr. Merri Lynn Casem	**278-3614**	**MH 282 B**
○ Administrative Support Coordinator – Karen Lau	**278-3614**	**MH 282 C**
○ Administrative Support Assistant II – Doreen Camacho	**278-3614**	**MH 282**
○ Administrative Support Assistant II – Marlene Diaz	**278-3614**	**MH 282**
○ Teaching Credential Advisor – Dr. Megan Tommerup Advises Biology majors seeking admission to the Single-Subject Credential Program.	**278-5283**	**MH 236 A**
○ Biology Minor Advisor – Dr. Megan Tommerup (mtommerup@fullerton.edu)	**278-5283**	**MH 236 A**
CNSM Student Success Team https://nsmssc.weebly.com/		**MH 488**
○ Assistant Dean – Tatiana Pedroza	**278-7217**	**MH 488**
○ Graduation Specialist – Sam Barrozo	**278-7062**	**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**

On-campus Resources for Biology Majors

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

https://nsmssc.weebly.com/

Graduation Specialist, Sam Barrozo
(MH-488) 657-278-7062 sbarrozo@fullerton.edu
- Focus on Graduation Candidates
- Junior/Senior Advising

Assistant Dean, Tatiana Pedroza
(MH-488) 657-278-7217 tapedroza@fullerton.edu
- Consults on Faculty/Student Issues
- Advocates for students with concerns
- Assists with CSUF policies/referrals

Career Specialist, Chanda Ishisaka
(LH-208) 657-278-2020 cishisaka@fullerton.edu
- Career exploration, workshops, and programs
- Internship/Job search
- Graduate/Professional school advising

Tutoring

- **NSM Student Success Center** for Biology, Chemistry and Biochemistry, and Physics (MH-488) 657-278-7082 https://nsmssc.weebly.com/
- **Math Tutoring Center** (MH-553) 657-278-3631
- **Supplemental Instruction** http://www.fullerton.edu/si/
- **University Learning Center** (PLN 200) 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 basicneeds@fullerton.edu
- **Disability Support Services** (GH 101) 657-278-3112 http://www.fullerton.edu/dss/
- **African American Resource Center** (H 222) 657-278-3230 aarc@fullerton.edu
- **Asian Pacific American Resource Center** (GH 211B) 657-278-3742 aparc@fullerton.edu
- **Chicano/a Resource Center** (Titan Shops CRC-109) 657-278-2537 crc@fullerton.edu
- **LGBT Queer Resource Center** (TSU 254) 657-278-4218 lgbtq@fullerton.edu
- **Titan Dreamers Resource Center** (PLN 203) 657-278-3234 tdrc@fullerton.edu
- **WoMen's Center** (GH 205) 657-278-3928 womenscenter@fullerton.edu
- **Adult Re-Entry and Parenting Student Programs** (GH 205) 657-278-3928
- **Veterans Student Services** (GH-230) 657-278-8660 vss@fullerton.edu