Undergraduate Advising Handbook

Department of

Biological Science

California State University

Fullerton

Catalog Year FALL 2018

CALIFORNIA STATE UNIVERSITY, FULLERTON

Department of Biological Science
College of Natural Sciences & Mathematics
McCarthy Hall-282
800 N. State College Blvd., Fullerton, CA 92831 / T 657-278-3614 / F 657-278-3426 / http://biology.fullerton.edu

Dear Biology Major,

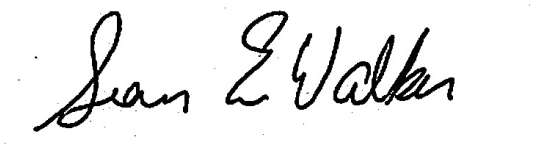
Welcome to the Department of Biological Science at Cal State Fullerton! Many of you have chosen Biology as a major because of a strong interest in science and in pursuing a biology-related career (e.g. biotechnology, health care, environmental management and conservation, research, teaching) or in continuing to professional or graduate school. Your aspirations require you to set high expectations for yourself and to embrace the challenges of being a science major: difficult classes, long labs or field trips, and lots of time studying! Make the effort to engage with department faculty when you have questions about course content or your path to graduation. Also, give yourself the best opportunity to graduate and to reach your career goals by making good choices about how you spend your time, engaging in meaningful internship/research/volunteer opportunities related to your career, and taking advantage of the resources that are here for you at CSUF (e.g. the Career Center, the Academic Advising Center, the CNSM Student Success Team, the CNSM Opportunity Center, Supplemental Instruction, and Faculty Advisors – see the last few pages of this handbook).

This handbook is intended to help you navigate the requirements for your bachelor's degree in biological science. Please review its contents and make it part of your permanent records.

As part of our mandatory advising program, which is designed to help you make efficient progress toward graduation, you will participate in group advising sessions until you declare a concentration, and thereafter will be assigned to meet with a Biology faculty adviser. Attending advising each semester (usually in April and October/November) will allow you to evaluate progress toward your degree objectives and to remove your advising hold. Please bring a current copy of your Titan Degree Audit when attending academic advising sessions. In addition, I recommend that you establish a strong relationship with your adviser so that you have someone whom you know well and who can write letters of recommendation for you when needed.

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

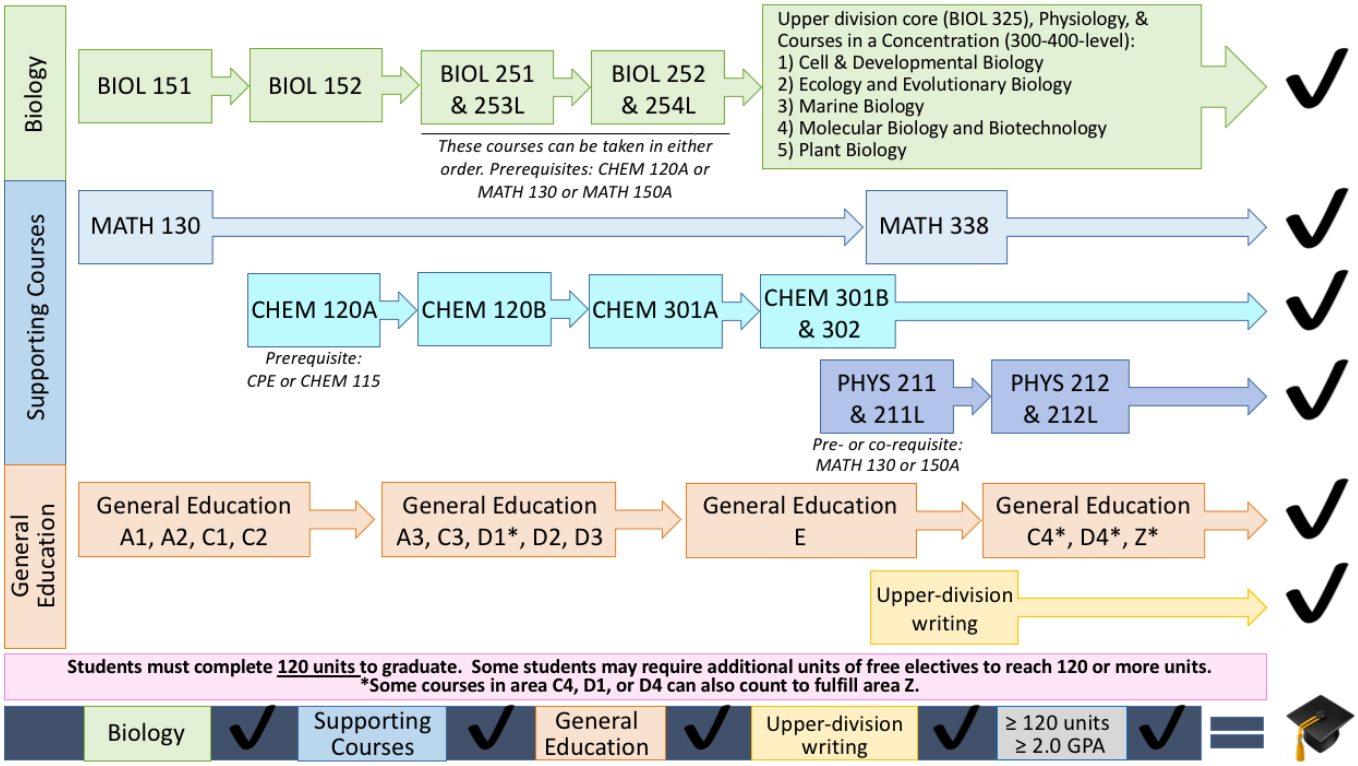
Sincerely,



Sean E. Walker, Ph.D.
Professor and Chair
Department of Biological Science
June 4, 2018

TABLE OF CONTENTS

BACHELOR OF SCIENCE DEGREE IN BIOLOGY



- ☐ 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, C4, 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.
  - 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).*

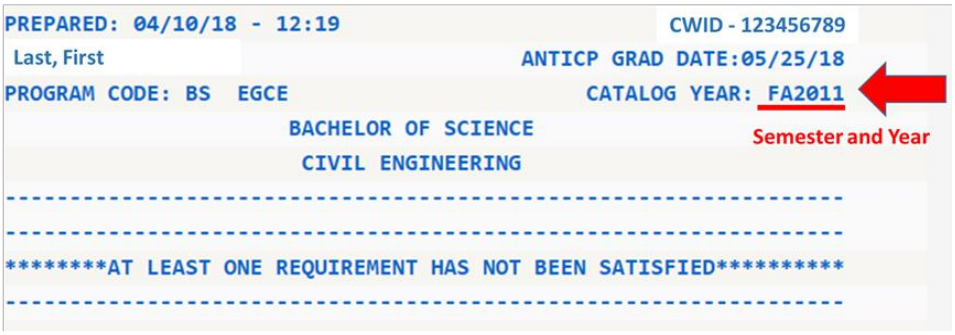
May I choose a catalog year other than what I was assigned when I first enrolled here?

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

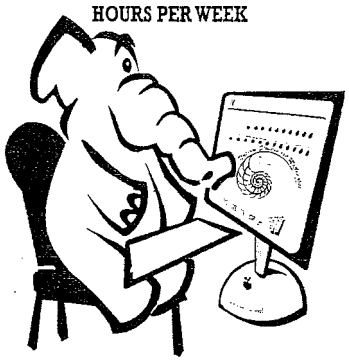
PLANNING TIME TO GRADUATION

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 freshmen entering 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
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 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 2018

CONCENTRATION IN CELL AND 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# 3 units		BIOL 253L 1 unit	BIOL 254L 1 unit	BIOL 325 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 A3 3 units	GE C3 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 D1/Z 3 units	GE D2 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C4/Z 3 units	Upper Division GE D4/Z 3 units
			GE D3 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	12-14 units

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

 # For freshmen entering Fall 2018, CNSM 101 fulfills 3 units of the 40 required Biology units

30	GE lower division
6	GE upper division
40	Biology Required Courses#
34	Biology Supporting Courses
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 Area B4 with a C or higher since it is part of the major. Complete a total of 12 units in GE Area B. One course from GE Area Z can also fulfill a requirement in categories D1, C4, 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.

Revised June 04, 2018

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 and 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 as 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)

CNSM 101 (for freshmen entering Fall 2018) and any upper division biology majors course(s) can be used to complete the remaining units needed to reach 40 total biology units.

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 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES

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 in each subarea for a total of 9 lower division and 3 upper division units.

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3	Origins of World Civilizations
C4	Explorations in the Arts and Humanities (upper div)

• **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 C4 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 2018

CONCENTRATION IN ECOLOGY AND 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# 3 units		BIOL 253L 1 unit	BIOL 254L 1 unit	Upper Division Biology Elective 3-4 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 A3 3 units	GE C3 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 D1/Z 3 units	GE D2 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C4/Z 3 units	Upper Division GE D4/Z 3 units
			GE D3 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*

 # For freshmen entering Fall 2018, CNSM 101 fulfills 3 units of the 40 required Biology units

30	GE lower division
6	GE upper division
40	Biology Required Courses#
34	Biology Supporting Courses
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 Area B4 with a C or higher since it is part of the major. Complete a total of 12 units in GE Area B. One course from GE Area Z can also fulfill a requirement in categories D1, C4, 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.

Revised June 04, 2018

BIOLOGY BACHELOR OF SCIENCE
Ecology and 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 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)
BIOL 461	Marine Invert. Biology[1] (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	Computer Lab Molec. Systematics (3/1)	BIOL 444	Plant Physiological 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 as 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)

CNSM 101 (for freshmen entering Fall 2018) and any upper division biology majors course(s) can be used to complete the remaining units needed to reach 40 total biology units.

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 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES

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 in each subarea for a total of 9 lower division and 3 upper division units.

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3	Origins of World Civilizations
C4	Explorations in the Arts and Humanities (upper div)

• **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 C4 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 2018

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# 3 units		BIOL 253L 1 unit	BIOL 254L 1 unit	Upper Division Biology Elective 3-4 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 A3 3 units	GE C3 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 D1/Z 3 units	GE D2 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C4/Z 3 units	Upper Division GE D4/Z 3 units
			GE D3 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*

 # For freshmen entering Fall 2018, CNSM 101 fulfills 3 units of the 40 required Biology units

30	GE lower division
6	GE upper division
40	Biology Required Courses#
34	Biology Supporting Courses
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 Area B4 with a C or higher since it is part of the major. Complete a total of 12 units in GE Area B. One course from GE Area Z can also fulfill a requirement in categories D1, C4, 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.

Revised June 04, 2018

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 as 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)

CNSM 101 (for freshmen entering Fall 2018) and any upper division biology majors course(s) can be used to complete the remaining units needed to reach 40 total biology units.

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 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES

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 in each subarea for a total of 9 lower division and 3 upper division units.

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3	Origins of World Civilizations
C4	Explorations in the Arts and Humanities (upper div)

• **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 C4 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 2018

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# 3 units		BIOL 253L 1 unit	BIOL 254L 1 unit	BIOL 325 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 A3 3 units	GE C3 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 D1/Z 3 units	GE D2 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C4/Z 3 units	Upper Division GE D4/Z 3 units
			GE D3 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*

 # For freshmen entering Fall 2018, CNSM 101 fulfills 3 units of the 40 required Biology units

30	GE lower division
6	GE upper division
40	Biology Required Courses#
34	Biology Supporting Courses
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 Area B4 with a C or higher since it is part of the major. Complete a total of 12 units in GE Area B. One course from GE Area Z can also fulfill a requirement in categories D1, C4, 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.

Revised June 04, 2018

BIOLOGY BACHELOR OF SCIENCE
Molecular Biology and Biotechnology

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 and 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**	General Microbiology (5/2) OR
CHEM 421	Biological Chemistry (3)

Molecular Biology and Biotechnology Elective Courses (5-6 units)

Course	Course Title	Course	Course Title
BIOL 402	Comp. Lab in Molecular Systematics (3/1)	BIOL 430	Advances in Microbiology (3)
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)	CHEM 421	Biological Chemistry (3)
BIOL 426	Molecular Virology (3)		

Molecular Biology and Biotechnology Capstone Courses (2 units)

Course	Course Title	Course	Course Title
BIOL 400	Sem. In Biology Education (2)	BIOL 472B	Adv. Biotech. Lab (3/2)
BIOL 412	Principles Gene Manipulation (3)	BIOL 482	Capstone Studies in Biology (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)

Courses can count as Electives or as 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)

CNSM 101 (for freshmen entering Fall 2018) and any upper division biology majors course(s) can be used to complete the remaining units needed to reach 40 total biology units.

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 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES

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 in each subarea for a total of 9 lower division and 3 upper division units.

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3	Origins of World Civilizations
C4	Explorations in the Arts and Humanities (upper div)

• **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 C4 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 2018

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# 3 units		BIOL 253L 1 unit	BIOL 254L 1 unit	BIOL 325 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 A3 3 units	GE C3 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 D1/Z 3 units	GE D2 3 units	Upper Division writing ENGL 301 or 363 3 units	PHYS 211L 1 unit	Upper Division GE C4/Z 3 units	Upper Division GE D4/Z 3 units
			GE D3 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*

 # For freshmen entering Fall 2018, CNSM 101 fulfills 3 units of the 40 required Biology units

30	GE lower division
6	GE upper division
40	Biology Required Courses#
34	Biology Supporting Courses
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 Area B4 with a C or higher since it is part of the major. Complete a total of 12 units in GE Area B. One course from GE Area Z can also fulfill a requirement in categories D1, C4, 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.

Revised June 04, 2018

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 as 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)

CNSM 101 (for freshmen entering Fall 2018) and any upper division biology majors course(s) can be used to complete the remaining units needed to reach 40 total biology units.

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 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.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking

• **Area B Scientific and Quantitative Reasoning.** Fulfilled by MAJOR/SUPPORTING COURSES

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 in each subarea for a total of 9 lower division and 3 upper division units.

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3	Origins of World Civilizations
C4	Explorations in the Arts and Humanities (upper div)

• **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 C4 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	Prerequisites	Units	Offered
301	Problems in Environmental Biology	SCERP scholars only	3/2	SS
302	General Microbiology	BIOL 251/253L, 252/254L, and CHEM 120B	5/2	F, S
303	Intermediate Cell Biology	BIOL 251/253L, 252/254L, and CHEM 120B	3	F, S
304	Supervised Biology Lab Instruction	BIOL 251/253L, 252/254L, and CHEM 120B	2	P
309	Intermediate Molecular Biology	BIOL 251/253L, 252/254L, and CHEM 120B	3	F, S
314	Population and Community Ecology	BIOL 251/253L and 252/254L	3	F
317	Field Marine Biology	BIOL 251/253L and 252/254L	4/2	S / E
329	Essential Techniques in Cell Biology	BSCR scholars only; BIOL 302; and BIOL 303 or 309	3/2	SS
336	GEO/BIO Field Investigations	BIOL 252/254L or GEOL 335	3/2	I
340	Field Botany	BIOL 251/253L and 252/254L	3/2	S / E
344	Survey of Land Plants	BIOL 251/253L and 252/254L	4/2	P
345	Plant Biology	BIOL 251/253L and 252/254L	3/1	F
361	Human Anatomy	BIOL 251/253L, 252/254L, and CHEM 120B	4/2	F, S
362	Mammalian Physiology	BIOL 251/253L, 252/254L, and CHEM 120B	4/1	F, S
400	Seminar in Biology Education	BIOL 302, 303, 309, 314, or 325	2	P
401	Biogeography	BIOL 314 or 325	3	F / E
402	Computer Lab in Molecular Systematics	BIOL 303, 309, 314, or 325	3/1	F / O
405	Developmental Biology	BIOL 303 or 309	3	S
407	Genes & Genomes	BIOL 303 or 309	3	F / E
409	Teaching Evolution: Online Course for Teachers	BIOL 251/253L, 252/254L, and GE Category B2	3	P
410	Evolutionary Genetics	BIOL 251/253L and 252/254L	4/1	F
411†	Medical Genetics	BIOL 302 or 309, or CHEM 421 or 423A	3	SS
412	Principles of Gene Manipulation	BIOL 309 and CHEM 301B; or CHEM 423A	3	F
413	Advances in Molecular Genetics	BIOL 309 and CHEM 301B; or CHEM 423A	3	S
414†	Microbial Genetics	BIOL 302 or 309, or CHEM 421 or 423A	3	I
417†	Advances in Cell Biology	BIOL 303	3	F, S
418L	Advances in Cell Biology Laboratory	BIOL 303	2/2	P
419	Marine Ecology	BIOL 314 or 325	3	F / O
419L	Marine Ecology Lab	Corequisite: BIOL 419	1/1	F / O
422†	Coastal Ecology	BIOL 314 or 325	4/2	F / E
424	Immunology	BIOL 302; and BIOL 303 or 309	5/2	S
426†	Molecular Virology	BIOL 302, 303, or 309, or CHEM 421	3	S
427†	Stem Cell Biology	BIOL 303 or 309. BIOL 405 or 424 recommended	3	F, S
428	Biology of Cancer	BIOL 303, 309, 314, or 325. BIOL 424 recommended	3	F
429	Techniques in Stem Cell Biology	BIOL 302; and BIOL 303 or 309	3/2	F
430	Advances in Microbiology	BIOL 302	3	F, S
436	Advanced Applied Statistics (MATH 436)	MATH 338	4/1	S #
438	Public Health Microbiology	BIOL 302	4/2	F, S
441	Plant Taxonomy	BIOL 325, 340, 344, or 345	4/2	P
442	Pollination Biology	BIOL 251/253L and 252/254L	3/1	P
443	Plant Ecology	BIOL 314, 325, or 345	4/2	S / O
444	Plant Physiological Ecology	BIOL 251/253L and 252/254L	4/2	F / O
445	Plant Cell Physiology	BIOL 302, 309, or 314, or CHEM 421 or 423A	3	F / E
446†	Marine Phycology	BIOL 251/253L and 252/254L	4/2	F / O

(Continued next page) ⟶

KEY † courses that meet the upper division writing requirement (6 units required to meet the writing requirement)
Prerequisites listed are for Biol majors. **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; I = Intersession; E = Even years; O = Odd years; P = Periodic. *A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; ** Maximum of 3 units (total) may be applied to Biology major requirements; # See Mathematics, Anthropology, or Chemistry Schedules

BIOL	Course name	Prerequisites	Units	Offered
447	Ethnobotany	BIOL 314 or 325	3/1	P
448	Plant Molecular Biology	BIOL 302, 303, 309, or 345, or CHEM 421 or 423A	4/1	SS
449†	Desert Ecology	BIOL 314 or 325	4/2	S / E
450	Conservation Biology	BIOL 314 or 325	3	S
451	Advanced Evolutionary Anthropology (ANTH 451)	ANTH 322, ANTH 344, or BIOL 274	3	S #
456	Hormones and Behavior (ANTH 456)	GE Category B5	3	F #
461	Marine Invertebrate Biology	BIOL 251/253L and 252/254L	4/2	F / E
462	General Parasitology	BIOL 302	4/1	P
465†	Integrative Biology of Spider Silk	BIOL 303, 309, 314, or 325	3	P
466†	Behavioral Ecology	BIOL 251/253L and 252/254L	3	F / E
467	Entomology	BIOL 251/253L and 252/254L	4/2	S / E
468†	Comparative Animal Physiology	BIOL 251/253L, 252/254L, and CHEM 120B	4/1	S / E
470†	Cellular Neurobiology	BIOL 362; and BIOL 303 or 309	3	S
472A	Advances in Biotechnology Laboratory (CHEM 472A)	BIOL 302 or 309, or CHEM 421 or 423A; Corequisite: BIOL 412	3/2	F
472B	Advances in Biotechnology Laboratory (CHEM 472B)	BIOL 472A	3/2	S #
473	Bioinformatics (CHEM 473)	BIOL 309, 303, or 325, or CHEM 423A	3/1	S
474	Natural History of the Vertebrates	BIOL 251/253L and 252/254L	4/2	P
475	Ichthyology	BIOL 251/253L and 252/254L	4/2	S / O
476	Herpetology	BIOL 251/253L and 252/254L	4/2	P
477	Advances in Biotechnology (CHEM 477)	BIOL 251/253L and 252/254L. Corequisite: BIOL 412, or CHEM 421 or 423A	3	P #
478	Mammalogy	BIOL 251/253L and 252/254L	4/2	F / O
479	Ornithology	BIOL 251/253L and 252/254L	4/2	S / O
480*	Advanced Topics in Undergrad Biology	Consent of instructor	1-3	F, S
480C*	Stem Cell Proseminar	BSCR Scholars only; BIOL 329	2	F
480D*	Colloquium: Diverse Topics in Biology	Pre- or Co-requisite: a 300-400-level Biology course	1	F, S
480E*	SCERP Proseminar	SCERP Scholars only	1	F, S
480M*	MARC Proseminar	MARC Scholars only	1	F, S
481	Advances in Evolution & Ecology	BIOL 314 or 325	3	F / O
482*	Capstone Studies in Biology (Study Abroad)	Consent of instructor; ≥90 units completed	2/2	I
490	Clinical Microbiology (Study Abroad)	BIOL 251/253L and 252/254L and consent of instructor	3/2	I
495†	Biological Internship	BIOL 251/253L and 252/254L, ≥90 units completed, and consent of instructor	3/2	F, S
498†*	Senior Thesis	6 units of BIOL 499L (2 units may be taken concurrently)	1-2	F, S
499L*	Independent Laboratory Study	Consent of instructor; junior or senior standing	1-3	F, S
CHEM 421**	Biological Chemistry (for Biology majors)	CHEM 301A	3	F, S #
CHEM 423A**	General Biochemistry (for Biochemistry majors)	CHEM 301B. Corequisite: CHEM 315	3	F, S #

KEY † courses that meet the upper division writing requirement (6 units required to meet the writing requirement) **Prerequisites** listed are for Biol majors. **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; I = Intersession; E = Even years; O = Odd years; P = Periodic. *A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; ** Maximum of 3 units (total) may be applied to Biology major requirements; # See Mathematics, Anthropology, or Chemistry Schedules

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** to release their hold:

Graduation Specialist, Tatiana Pedroza
(MH-488) 657-278-7217 tapedroza@fullerton.edu
- Junior/Senior Advising
- Probation and GE advising
- Focus on Graduation Candidates
- Appointments at http://nsmgradspecialist.youcanbook.me

Retention Specialist, Sam Barrozo
(MH-488) 657-278-7062 sbarrozo@fullerton.edu
- Freshman/Sophomore Advising
- Probation and GE advising
- Interventions for at-risk students

Assistant Dean, Colleen McDonough
(MH-488) 657-278-4158
cmcdonough@fullerton.edu
- Consults on Faculty/Student Issues
- Advocates for students with concerns
- Assists with University policies/procedures
- CSUF resources and 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

MINORS ASSOCIATED WITH BIOLOGY

Minor in Chemistry

The Chemistry minor is appropriate for students majoring in Biology, Geological Science, Physics, or Science Education. It is also appropriate for students interested in Art Restoration, Environmental Science, Forensic Science, Business Administration, Medical Technology, Patent or Environmental Law, or Science Writing. Students with interests in these areas should consult the Chemistry Department about courses appropriate for a minor.

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 Biol 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).

Acceptable CHEM Upper Division Courses[≠]

Analytical	Biochemistry	Inorganic	Organic
316	421*	325	302
411A-G	422	425	306A, B
	423A*, B**		429
	445		430
	472A, B		431
	473		467

Physical	Environmental	Research	Other
355	436	490	480T
361A, B	438	492	
371A, B	439	495	
410		499	

Classes not listed here may NOT be used to complete the Minor.

[≠]It is the student's responsibility to make sure all appropriate pre-requisites have been met prior to enrolling in any courses. **For courses co-listed with another department, a student must enroll in the CHEM course.**

*A student can use either CHEM 421 or 423A for the minor, not both. Students should not be enrolled in CHEM 421 and CHEM 423A in the same semester.

**CHEM 421 is not an appropriate pre-requisite for CHEM 423B.

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 Chair of HESC Department (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, UH-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

GE requirements are different for students with Catalog Year Fall 2018 compared to students with prior Catalog Years. Please go to http://www.fullerton.edu/undergraduate/general_education/courses-after-2018.php for additional information about GE requirements and a current list of approved GE courses for Catalog years Fall 2018 and later. For questions about GEs, contact the CNSM Retention Specialist Sam Barrozo (sbarrozo@fullerton.edu), or the Academic Advising Center in UH-123A.

What can I do with my Bachelors Degree in Biology?

Career info from CSUF Biology

- http://www.fullerton.edu/biology/careers/index.php
- student announcements and opportunities (including internship and job postings) http://biology.fullerton.edu/oppo.html

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 and 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, and Physicians 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:

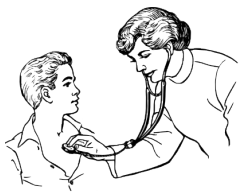
CSUF Health Professions Advising Office: http://www.fullerton.edu/healthprofessions/
Association of American Medical Colleges: http://www.aamc.org
American Association of Colleges of Osteopathic Medicine: http://www.aacom.org
American Association of Colleges of Pharmacy: http://www.aacp.org
Association 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/
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 (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 UH-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 and Impact the Future!

What Public School Teaching Looks Like

Science teachers usually teach at the middle or high school levels.

- Middle school science teachers usually teach 5-6 periods of science each day. Each period is about 45 minutes in length. Teachers also have a planning period of about 45 minutes per day.
- High School science teachers usually teach 5 periods of science each day, and each period is about 55 minutes in length. Teachers also have a planning period of about 55 minutes.
- Teachers are usually required to be on site about 30 minutes before and after the school day.
- Teachers are also expected to attend department and school meetings, participate in professional development activities, hold parent and student conferences as needed, and make curriculum decisions regarding textbooks, laboratory activities, assignments, and assessments. Science teachers also select laboratory equipment.

What science is taught depends on the grade level. California has identified content standards for each grade level as follows:

- 6th Grade Focus on Earth Science; 7th Grade Focus on Life Science; 8th Grade Focus on Physical Science; Grades 9-12 include Natural/General Science and also Physics, Chemistry, Biology/Life Sciences, and Earth Sciences

Why Teaching is a Great Career Choice

Intrinsic Reasons for Teaching

- Joy of seeing students learn; potential to affect the lives of others
- Performing a significant social service
- Fellow teachers/colleagues relationships
- Work you love to do; gives sense you are respected and appreciated
- Love of subject taught; lifelong learning opportunities

Intrinsic Reasons for Teaching Science

- Science teachers shape students' lives and impact society
- Science teachers are part of the scientific community
- Science teachers influence the future

Extrinsic Reasons for Teaching

- **Salaries –** Beginning salaries for teachers in Southern California start around $45,000; veteran teachers may earn as much as $95,000. Teachers are paid additional stipends for coaching, serving in leadership roles, and for summer school teaching. Teachers move up the pay scale each year and jump extra steps for completing additional education. Moreover, teachers may be compensated at the hourly rate (ranging from $25-30) for some activities completed outside the school day.
- **Work Schedule –** Teachers typically work two semesters of 18 weeks plus 10 teacher work days. This means that teachers work about 185 days per year, compared to 260 week days of a standard year. Contracts also specify the number of compensated sick days (usually 10). Substitute coverage is provided for teachers to attend professional development activities. Many teachers use the summer for rejuvenation, education or travel, or part-time employment.
- **Benefits –** Teaching offers great retirement plans and health/dental/vision benefits. Membership in teacher credit unions that offer low interest loans.
- **Job Security –** Most teachers are tenured (have certain protections against job loss) after two years.
- **Opportunities for Advancement –** Teachers may become curriculum specialists, department chairs, counselors, and school and district administrators.

For more information, please contact Dr. Megan Tommerup, Teaching Credential Adviser (mtommerup@fullerton.edu).

Steps to Earning a Teaching Credential in Science

To earn a secondary science teaching credential, candidates must (1) demonstrate subject matter competency and (2) complete a program of professional preparation.

STEP 1: Demonstrating Subject Matter Competency

- The California Commission on Teacher Credentialing authorizes eight different science credentials for teaching in grades 7-12.
  - Each credential requires demonstration of subject matter competence through completion of specific undergraduate or graduate degrees OR successful passage of subtests of the California Science Examination for Teachers (CSET) in Science.
  - Candidates with a regular credential in a science area are authorized to teach in their specific discipline as well as general, integrated, and middle school science.
- The most common route to subject matter competency is a major in a specific discipline and passage of the appropriate CSETs. These are listed at http://ed.fullerton.edu/SecEd/Credential_Prog/Science.htm

STEP 2: Completing a Credential Program

- The California State University Fullerton Single Subject Credential Program requires 12 units of prerequisite coursework and two semesters of credential program coursework and fieldwork. A list of coursework is found at http://ed.fullerton.edu/SecEd/Credential_Prog/Program_Course_Sequence.htm
  - If you want to complete your credential while employed as a teacher (Intern Program), two additional courses are required in advance (EDSC 400 & EDSC 410).
  - All prerequisite and pre-service courses are offered summer, fall, intersession, and spring; WEB sections of all courses are available.

Financial Support While Earning Your Credential

There are two major financial opportunities to support students while they are earning their credential:

- Got loans? If you need some, get some! The **Assumption Program of Loans for Education (APLE)** assumes up to $19,000 in outstanding educational loan balances in return for four consecutive years of teaching science.
  - http://aple.csusuccess.org/scholarship
- The **Internship Program** allows science teachers to earn their credential while employed.
  - http://ed.fullerton.edu/current-students/internships/

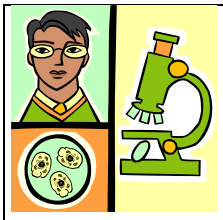
Next Steps if you are Interested in this Career Option

- **Visit the Center for Careers in Teaching -** http://www.fullerton.edu/cct
- **Complete required prerequisite coursework**.
  - Coursework may be completed during your undergraduate education.
  - Some courses may count as GE or electives.
- **Attend a Single Subject Credential Program overview**
  - http://ed.fullerton.edu/future-students/credential-programs/
- **Apply to the Single Subject Credential Program**
  - http://ed.fullerton.edu/future-students/credential-programs/
  - Deadlines: February 28 for Fall semester and September 30 for Spring semester
- **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 Resources for Future Science Teachers

- **National Association of Biology Teachers -** http://www.nabt.org/
- **National Science Teachers Association Career Center -** http://careers.nsta.org/
- **American Institute of Biological Sciences Resources for Teaching and Learning -** http://www.aibs.org/education/teaching_resources.html
- **Occupational Outlook Handbook – Information on Teaching -** http://www.bls.gov/ooh/about/teachers-guide.htm - the site offers extensive information on the nature of teaching, the employment picture, working conditions, and the job outlook

For more information, please contact Dr. Megan Tommerup, Teaching Credential Adviser (mtommerup@fullerton.edu).



SCIENCE TEACHING ACADEMIC PLAN: BIOLOGY

THIS IS A SAMPLE ACADEMIC PLAN

Candidates completing this pathway will earn a Bachelor of Science in Biology, prepare for the Biology CSET subtests, and complete the Single Subject Credential Program in Science. This plan is intended to be a sample only. The number of units taken each semester will depend upon the student's satisfactory performance and progress. This plan should not replace consultation with an advisor as requirements are subject to change.

	Semester 1		Semester 2	
FRESHMAN	G.E. Written Communication (G.E. A.A2)	3	BIOL 152 (Major)	4
	MATH 130 or 150A (Major & G.E. B.B4)	4	G.E. Intro to the Humanities (G.E. C.C2)	3
	BIOL 151 (Major & G.E. B.B2 & B. B3)	4	CHEM 120A (Major & G.E. B.B3)	5
	G.E. Intro to the Arts (G.E. C.C1)	3	G.E. Oral Communication (G.E. A.A1)	3
	Total Units:	14	Total Units:	15
	To finish in 4 years, students may be required to take courses during the Summer Sessions OR Intersession.			
	Recommended: GE World Civilization and Cultures (G.E. D. D2) and GE American History, Institutions and Values (G.E. D. D3)			
SOPHMORE	**Semester 3**		**Semester 4**	
			******Attend Credential Program Overview******	
	BIOL 251 and 253L (Major)	4	BIOL 252 and 254L (Major)	4
	Critical Thinking (G.E. A.A3)	3	CHEM 301A (Major)	3
	CHEM 120B (Major)	5	G.E. Origins of the World Civilizations (G.E. C.C4)	3
	G.E. American Government (G.E. D.D4)	3	G.E. Intro to Social Science (G.E. D. D1)	3
	Total Units:	15	Total Units:	13
	To finish in 4 years, students may be required to take courses during the Summer Sessions OR Intersession.			
	Recommended: GE World Civilization and Cultures (G.E. D. D2) and GE American History, Institutions and Values (G.E. D. D3)			
JUNIOR	**Semester 5**		**Semester 6**	
	******Take CBEST******		******File Grad Check******	
	CHEM 301B and 302 (Major)	5	BIOL Concentration Courses	6
	BIOL Concentration Course	3	MATH 337, MATH 338 or MATH 150B (Major)	4
	EDSC 304 (Cred. Prog. Prereq) (1) (2)	3	G.E. 300-Level Course (G.E. C.C3)	3
	G.E. Explorations in Social Sciences (G.E. D. D5)	3	EDSC 310 (Cred Prog Prereq) (1)	3
	Total Units:	14	Total Units:	16
	To finish in 4 years, students may be required to take courses during the Summer Sessions OR Intersession.			
	Recommended: Credential Program Prerequisites - EDSC 320 (G.E. E.) and/or EDSC 330 and/or EDSC 340 OR Courses that will satisfy degree requirements for Biology Major.			
SENIOR	**Semester 7**		**Semester 8**	
	******Take CSET Subtests (5) ******		******Apply to Credential Program******	
	BIOL Concentration Courses Upper-Division (3) (4)	6	BIOL Concentration Courses Upper-Division (3) (4)	8+
	PHYS 211 + 211 Lab (Major & G.E. B. B1)	4	PHYS 212 + 212 Lab (Major & G.E. B. B5)	4
	G.E. 300-Level Course (G.E. Z)	3		
	Cred Prog Prereq (EDSC 320 or 330 or 340) (1)	3	Total Units:	12+
	Total Units:	16	******Graduate with BS Biology******	
	A GRADE OF "C" (2.0) OR BETTER IS REQUIRED FOR MAJOR CLASSES, INCLUDING SUPPORTING COURSES.			

Special Notes:

- Class with footnote (1): Courses may be completed earlier in academic program. EDSC 304, 310, 320, 330, 340, and 410 are available fall, spring, summer, and intersession in Web and traditional formats.
- Class with footnote (2): Successful passage of CSET Subtests I (133) & II (134) can be substituted for EDSC 304.
- Class with footnote (3): Courses should include 6.0 units of approved Biology 400-level classes to meet Upper-Division Writing Requirements or successful passage of ENGL 301. Note: Students also need to take EWP test.
- Class with footnote (4): Students must take and pass (with a C or better [2.0]) a minimum of 23 units of Upper-Division Biology Electives in their chosen concentration to successfully complete requirements for a BS in Biology.
- Footnote (5): CSET Science Subtests: General Science I (118) & II (119) plus Concentration Area Subtest III (120-123) [http://www.ctcexams.nesinc.com].

Professional Track Intern candidates earn their credential while employed full-time in the public schools as science teachers. Students that opt for the *Professional Track* (Internship program) may be required to take additional prerequisite courses. Please see Credential Program advisor if you are a Professional Track candidate.

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) Assistant 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

DEPARTMENT CO-VICE-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 CO-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) Assistant 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) Associate 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: MH 236B 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) Assistant 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

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

DEPARTMENT CHAIR

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**
o Chair – Dr. Sean Walker	**278-3614**	**MH 282 B**
o Administrative Support Coordinator – Karen Lau	**278-2461**	**MH 282 C**
o Administrative Support Assistant II – Ernestine Hood	**278-4234**	**MH 282**
o Administrative Support Assistant II – Doreen Camacho	**278-4227**	**MH 282**
o Teaching Credential Advisor – Dr. Megan Tommerup Advises Biology majors seeking admission to the Single-Subject Credential Program.	**278-5283**	**MH 236 A**
o Biology Minor Advisor – Dr. Megan Tommerup (mtommerup@fullerton.edu)		
College of Natural Sciences and Mathematics, Dean's Office	**278-2638**	**MH 166**
o Assistant Dean – Dr. Colleen McDonough	**278-4158**	**MH 488B**
o Graduation Specialist – Tatiana Pedroza	**278-7217**	**MH 488C**
o Retention Specialist – Sam Barrozo	**278-7062**	**MH 488A**
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**	**UH 123**
Academic Appeals Students are encouraged to resolve grade disputes informally through the instructor, Department Chair, and Dean of the College. If informal resolution is not possible, the Coordinator of Academic Appeals will provide information and clarification about University policies and will work to resolve the dispute.	**278-3836**	**LH 805**
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**	**FTS 710**
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**
Disability Support Services Provides assistance and services to students with physical and learning disabilities.	**278-3117**	**UH 101**
Financial Aid	**278-3125**	**UH 146**
Health Professions Advising Office NOTE: Advisement through the Health Professions Office does not replace mandatory advisement through the Department.	**278-3980**	**UH 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 EWP, ELM, GRE, EPT, TOEFL, & CBEST.	**278-2738**	**UH 229**
Transfer Resource Center Peer mentors and study area for recent Transfer students.	**278-8398**	**MH 525**
Tutoring Opportunity Center (OCSAMS) provides tutoring, computers, and photocopy machine.	**278-3836**	**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.	**278-7082**	**PLN 200**

On-campus Resources for Biology Majors

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

Graduation Specialist, Tatiana Pedroza
(MH-488) 657-278-7217 tapedroza@fullerton.edu
- Junior/Senior Advising
- Probation and GE advising
- Focus on Graduation Candidates
- Appointments at
http://nsmgradspecialist.youcanbook.me

Retention Specialist, Sam Barrozo
(MH-488) 657-278-7062 sbarrozo@fullerton.edu
- Freshman/Sophomore Advising
- Probation and GE advising
- Interventions for at-risk students

Assistant Dean, Colleen McDonough
(MH-488) 657-278-4158 cmcdonough@fullerton.edu
- Consults on Faculty/Student Issues
- Advocates for students with concerns
- Assists with University policies/procedures
- CSUF resources and referrals

Tutoring

- **Opportunity Center** for Biology, Chemistry and Biochemistry, and Physics (MH-488) 657-278-7082 http://www.fullerton.edu/nsm/student_success/ocsams/ocsams.php
- **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** (UH 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.
- **Disability Support Services** (UH 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** (UH 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** (UH 205) 657-278-3928 womenscenter@fullerton.edu
- **Adult Re-Entry and Parenting Student Programs** (UH 205) 657-278-3928
- **Veterans Student Services** (UH-230) 657-278-8660 vss@fullerton.edu