

# **BACHELOR OF SCIENCE DEGREE IN BIOLOGY**

## **Catalog Year Fall 2023 and after**

### **To progress through the Biology major:**

1. Be aware of pre-requisites for each course.
2. Track your academic progress using your TDA.
3. Attend Biology major advising each semester and visit your CNSM Student Success Team to review GE and graduation requirements.
4. Declare your concentration during the semester you are taking your last lower-division BIOL Core course.
5. Apply for Graduation through your Student Center two semesters before anticipated graduation. For example, for an anticipated graduation date in spring, apply *before* the beginning of the fall semester. Applying for graduation will initiate the department 'grad check' process. Once the department completes your grad check, you will be notified of remaining graduation requirements.

### **All Biology lower-division Core courses (16 units) must be completed prior to starting upper division Biology:**

- BIOL 151 (4/1)
- BIOL 152 (4/1)
- BIOL 251 (3) & 253L (1/1)
- BIOL 252 (3) & 254L (1/1)

### **Upper-division Core (3 units) must be completed prior to graduation (or earlier, if needed as a prerequisite course):**

- BIOL 325 (3)

→ Units are shown in parenthesis as "total number of units for the course/lab units in the course" (i.e. 4/1).

### **CHECKLIST:**

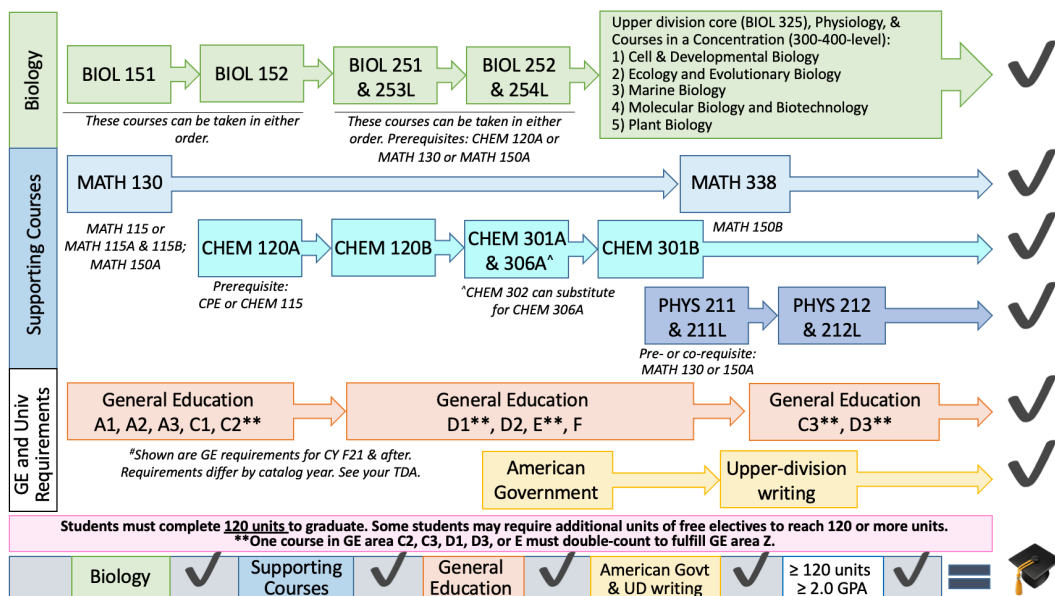
- Is your Catalog Year Fall 2018 or after? (Check first page of TDA.) **These worksheets are ONLY valid for Catalog Years Fall 2018 and after.**
- You will take a total of 19 units of BIOL Core courses. Looking at your TDA, find the concentration requirements and select the courses you will take.
  - **If the total BIOL units is < 40 units, you MUST take Upper Division Free Elective courses to reach 40 units.** Free elective courses are any BIOL major 300-400 level courses. (Non-majors courses do not count towards the 40 units.)  
**List Free Elective courses:** \_\_\_\_\_
- Have you selected  $\geq 6$  units upper division (300-400 level) lab/field courses in your plan? List courses with lab/field:  
\_\_\_\_\_
  - $\geq 3$  of the 6 lab/field units MUST come from courses in your concentration
- Is there a Physiology course included in your plan? List Physiology course: \_\_\_\_\_
- Are there  $\geq 6$  units of 400-level courses included in your plan? List 400-level courses:  
\_\_\_\_\_
- For EEB concentration only:* Are there  $\geq 14$  units total from EEB courses?
- Is your BIOL GPA  $\geq 2.0$ ? Current BIOL GPA: \_\_\_\_\_
- No more than a combined total of 6 units of BIOL 480 (3 max), 482 (2 max), 498 (3 max), and BIOL 499L (6 max) shall be counted toward the upper-division BIOL units required for the major. No more than 3 units of BIOL 499L shall be counted toward the 6 units of upper-division lab or field courses required for the major.

### **Supporting courses, GE, and other requirements:**

- Ensure that  $\geq 9$  units of your GE are upper division (300-400 level) from GE Areas B, C, and D.
- Upper-division Writing: ENGL 363 or ENGL 301 or BIOL 498.
- 34 units of supporting courses.
  - Note: If you take o-chem at a community college, you may need to take extra upper division units to reach the CSUF requirement of 40 upper division units. O-chem course(s) transfer from the community college as 200-level course(s).
  - The Math requirement can be fulfilled by taking Math 150A and 150B, this may be the situation if calculus is transferred from the community college. Otherwise, students should enroll in MATH 130 and 338.

# BIOLOGY CORE AND SUPPORTING COURSES WORKSHEET

(This version applies to Catalog Years Fall 2018 and after)



## Required Biology Core Courses must be passed with a C or better (19 units):

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

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

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

Course	Title (units)	When passed	Grade
MATH 130 <u>and</u> MATH 338 <b>OR</b>	Calculus (4) <u>and</u> Statistics (4)		
MATH 150A <u>and</u> MATH 150B	Calculus (4) <u>and</u> Calculus (4)		
CHEM 120A	General Chemistry (5)		
CHEM 120B	General Chemistry (5)		
CHEM 301A	Organic Chemistry (3)		
CHEM 306A	Organic Chemistry Lab (2)		
CHEM 301B	Organic Chemistry (3)		
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) <b>OR</b> ENGL 363* Scientific Writing (3) <b>OR</b> 3 units BIOL 498		
* Students interested in health professions careers should take ENGL 301 or ENGL 363.		

**Be aware of courses that have prerequisites:**

<b>Course</b>	<b>Prerequisites (co-requisites noted in parenthesis)</b>
BIOL 151	none
BIOL 152	none
BIOL 251	BIOL 151 and BIOL 152 and CHEM 120A or MATH 130 or MATH 150A
BIOL 253L	BIOL 251 (co-req)
BIOL 252	BIOL 151 and BIOL 152 and CHEM 120A or MATH 130 or MATH 150A
BIOL 254L	BIOL 252 (co-req)
BIOL 325	BIOL 251/253L and BIOL 252/254L
MATH 130/150A	passing score on ALEKS, MQE, or exemption
MATH 150B	MATH 150A
MATH 338	MATH 130 or MATH 150B or consent of instructor
CHEM 120A	Passing score on CPE or CHEM 115
CHEM 120B	CHEM 120A
CHEM 301A	CHEM 120A and 120B
CHEM 306A	CHEM 120B; CHEM 301A (co-req)
CHEM 301B	CHEM 301A
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)

## Cell and Developmental Biology Concentration - CY F18 and after

**Cell and Developmental Biology Required (Gateway) courses (8 units)**

BIOL	Course name	Units	Offered	Prerequisites
302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
303	Intermediate Cell Biology	3	F, S, SU	BIOL 251/253L, 252/254L, and CHEM 120B

**Cell and Developmental Biology Elective Courses (5 units):**

329	Essential Techniques in Cell Biology	3/2	SU	BSCR scholars only; BIOL 302; and BIOL 303 or 309
362	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
405	Developmental Biology	3	S	BIOL 303 or 309
417	Advances in Cell Biology	3	F, S	BIOL 303
424	Immunology	5/2	S	BIOL 302; and BIOL 303 or 309
427	Stem Cell Biology	3	F, S	BIOL 303 or 309. BIOL 405 or 424 recommended
428	Biology of Cancer	3	F, SU	BIOL 303, 309, 314, or 325. BIOL 424 recommended
429	Techniques in Stem Cell Biology	3/2	F	BIOL 302; and BIOL 303 or 309
431	Advanced Microbiology Lab	3/2	F	BIOL 302
438	Public Health Microbiology	4/2	F, S	BIOL 302
445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
454L	Microscopy and Imaging in Biology	2/2	S	BIOL 302, 303, 309, or 325
462	General Parasitology	4/2	F	BIOL 302
465	Integrative Biology of Spider Silk	3	S / O	BIOL 303, 309, 314, or 325
470	Cellular Neurobiology	3	F / E	BIOL 362; and BIOL 303 or 309
490T	Clinical Microbiology (Study Abroad)	3/2	W	Consent of instructor

**Cell and Developmental Biology Capstone courses (2 units)**

400	Seminar in Biology Education	3	F	BIOL 302, 303, 309, 314, or 325
424	Immunology	5/2	S	BIOL 302; and BIOL 303 or 309
427	Stem Cell Biology	3	F, S	BIOL 303 or 309. BIOL 405 or 424 recommended
428	Biology of Cancer	3	F, SU	BIOL 303, 309, 314, or 325. BIOL 424 recommended
429	Techniques in Stem Cell Biology	3/2	F	BIOL 302; and BIOL 303 or 309
431	Advanced Microbiology Lab	3/2	F	BIOL 302
438	Public Health Microbiology	4/2	F, S	BIOL 302
462	General Parasitology	4/2	F	BIOL 302
465	Integrative Biology of Spider Silk	3	S / O	BIOL 303, 309, 314, or 325
470	Cellular Neurobiology	3	F / E	BIOL 362; and BIOL 303 or 309
482*	Capstone Studies in Biology (Study Abroad)	2/2	W	Consent of instructor; ≥90 units completed
490T	Clinical Microbiology (Study Abroad)	3/2	W	Consent of instructor
495	Biological Internship	3/2	F, S, SU	≥90 units completed including BIOL 302, 303, 309, 317, 325, or 345
498*	Senior Thesis	1-3	F, S	Consent of instructor. Co-req: BIOL 499L
499L*	Independent Laboratory Study	1-3	F, S	Consent of instructor; junior or senior standing

**COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH**

**Physiology: 1 course in Physiology is required. This course can be taken as part of the concentration electives (if allowed) or separately (3 units).**

302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
362	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
468	Comparative Animal Physiology	4/1	S / E	BIOL 251/253L, 252/254L, and CHEM 120B

**Units** are shown as “total number of units for the course/lab units in the course”. **Offered** lists when the course is usually offered, but be aware that schedule changes are possible! F = Fall; S = Spring; SU = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic. \* A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; see your TDA.

## Ecology and Evolutionary Biology Concentration - CY F18 and after

**EEB Organismal Biology courses (3-4 units):**

	BIOL	Course name	Units	Offered	Prerequisites
	317	Field Marine Biology <sup>1</sup>	4/2	S	BIOL 251/253L and 252/254L
	332	Biology of the Vertebrates	3	F / O	BIOL 251/253L and 252/254L
	340	Field Botany	3/2	S / E	BIOL 251/253L and 252/254L
	345	Plant Biology	3/1	F	BIOL 251/253L and 252/254L
	441	Plant Taxonomy	4/2	S / O	BIOL 325, 340, 344, or 345
	446	Marine Phycology <sup>1</sup>	4/2	F / O	BIOL 251/253L and 252/254L
	461	Marine Invertebrate Biology <sup>1</sup>	4/2	F / E	BIOL 251/253L and 252/254L
	475	Ichthyology <sup>1</sup>	4/2	S / O	BIOL 251/253L and 252/254L
	476	Herpetology	4/2	S / E	BIOL 251/253L and 252/254L
	478	Mammalogy	4/2	F / E	BIOL 251/253L and 252/254L
	479	Ornithology	4/2	S / O	BIOL 251/253L and 252/254L

**EEB Ecology elective courses (3-4 units)**

	301	Problems in Environmental Biology	3/2	SU	SCERP scholars only
	314	Population and Community Ecology	3	F / E	BIOL 251/253L and 252/254L
	419 & 419L	Marine Ecology <sup>1</sup> Marine Ecology Lab <sup>1</sup>	3 & 1/1	F / O	for BIOL 419: BIOL 314 or 325 for BIOL 419L: Corequisite BIOL 419
	422	Coastal Ecology <sup>1</sup>	4/2	F / E	BIOL 314 or 325
	443	Plant Ecology	4/2	S / E	BIOL 314, 325, or 345
	449	Desert Ecology	4/2	S / O	BIOL 314 or 325
	466	Behavioral Ecology	3	F / O	BIOL 251/253L and 252/254L

**EEB Free elective courses (4-6 units) Any course listed below, or any course listed as an EEB Organismal biology elective, an EEB Ecology elective, or an EEB Capstone course can be used to fulfill the 14 required EEB units**

	361	Human Anatomy	4/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
	402	Computer Lab in Molecular Systematics	3/1	F / O	BIOL 303, 309, 314, or 325
	407	Genes and Genomes	3	S / E	BIOL 303, 309, 314, or 325
	410	Evolutionary Genetics	4/2	F	BIOL 251/253L and 252/254L
	444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
	468	Comparative Animal Physiology	4/1	S / E	BIOL 251/253L, 252/254L, and CHEM 120B

**EEB Capstone courses (2 units)**

	400	Seminar in Biology Education	3	F	BIOL 302, 303, 309, 314, or 325
	401	Biogeography	3	F / E	BIOL 314 or 325
	450	Conservation Biology	3	S	BIOL 314 or 325
	465	Integrative Biology of Spider Silk	3	S / O	BIOL 303, 309, 314, or 325
	481	Advances in Evolution & Ecology	3	S / E	BIOL 314 or 325
	482*	Capstone Studies in Biol (Study Abroad)	2/2	W	Consent of instructor; ≥90 units completed
	495	Biological Internship	3/2	F, S, SU	≥90 units completed including BIOL 302, 303, 309, 317, 325, or 345
	498*	Senior Thesis	1-3	F, S	Consent of instructor. Co-req: BIOL 499L
	499L*	Independent Laboratory Study	1-3	F, S	Consent of instructor; junior or senior standing

**COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH**

**Physiology: 1 course in Physiology is required. This course can be taken as part of the concentration electives (if allowed) or separately (3 units).**

	302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
	362	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
	444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
	445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
	468	Comparative Animal Physiology	4/1	S / E	BIOL 251/253L, 252/254L, and CHEM 120B

<sup>1</sup> Only one of these Marine Biol classes (4 units max) may be counted toward the EEB concentration units. **Units** are shown as “total number of units for the course/lab units in the course”. **Offered** lists when the course is usually offered, but be aware that schedule changes are possible! F = Fall; S = Spring; SU = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic. \* A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; see your TDA.

## Marine Biology Concentration – CY F18 and after

**Marine Biology Required (Gateway) course (4 units):**

BIOL	Course name	Units	Offered	Prerequisites
317	Field Marine Biology	4/2	S	BIOL 251/253L and 252/254L

**Marine Biology Organismal courses (4 units):**

446	Marine Phycology	4/2	F / O	BIOL 251/253L and 252/254L
461	Marine Invertebrate Biology	4/2	F / E	BIOL 251/253L and 252/254L
475	Ichthyology	4/2	S / O	BIOL 251/253L and 252/254L

**Marine Biology Ecology courses (4 units):**

419 & 419L	Marine Ecology & Marine Ecology Lab	3 & 1/1	F / O	for BIOL 419: BIOL 314 or 325 for BIOL 419L: Corequisite BIOL 419
422	Coastal Ecology	4/2	F / E	BIOL 314 or 325

**Marine Biology Capstone courses (2 units)**

400	Seminar in Biology Education	3	F	BIOL 302, 303, 309, 314, or 325
401	Biogeography	3	F / E	BIOL 314 or 325
422	Coastal Ecology	4/2	F / E	BIOL 314 or 325
450	Conservation Biology	3	S	BIOL 314 or 325
481	Advances in Evolution & Ecology	3	S / E	BIOL 314 or 325
482*	Capstone Studies in Biology (Study Abroad)	2/2	W	Consent of instructor; ≥90 units completed
495	Biological Internship	3/2	F, S, SU	≥90 units completed including BIOL 302, 303, 309, 317, 325, or 345
498*	Senior Thesis	1-3	F, S	Consent of instructor. Co-req: BIOL 499L
499L*	Independent Laboratory Study	1-3	F, S	Consent of instructor; junior or senior standing

**COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH**

**Physiology: 1 course in Physiology is required. This course can be taken as part of the concentration electives (if allowed) or separately (3 units).**

302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
362	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
468	Comparative Animal Physiology	4/1	S / E	BIOL 251/253L, 252/254L, and CHEM 120B

**Units** are shown as “total number of units for the course/lab units in the course”. **Offered** lists when the course is usually offered, but be aware that schedule changes are possible! F = Fall; S = Spring; SU = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic. \* A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; see your TDA.

## Molecular Biology and Biotechnology Concentration – CY F18 and after

**Molecular Biology and Biotechnology Required (Gateway) courses (6-8 units)**

BIOL	Course name	Units	Offered	Prerequisites
309	Intermediate Molecular Biology	3	F, S, SU	BIOL 251/253L, 252/254L, and CHEM 120B

**AND one of the following:**

302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
CHEM 421**	Biological Chemistry	3	F, S #	CHEM 301B

**Molecular Biology and Biotechnology Elective courses (6-7 units):**

402	Computer Lab in Molecular Systematics	3/1	F / O	BIOL 303, 309, 314, or 325
405	Developmental Biology	3	S	BIOL 303 or 309
407	Genes & Genomes	3	S / E	BIOL 303, 309, 314, or 325
410	Evolutionary Genetics	4/2	F	BIOL 251/253L and 252/254L
411	Medical Genetics	3	SU	BIOL 302 or 309, or CHEM 421 or 423A
412	Principles of Gene Manipulation	3	F	BIOL 309 and CHEM 301B; or CHEM 423A
413	Advances in Molecular Genetics	3	S	BIOL 309 and CHEM 301B; or CHEM 423A
414	Microbial Genetics	3	W	BIOL 302 or 309, or CHEM 421 or 423A
426	Molecular Virology	3	S	BIOL 302, 303, or 309, or CHEM 421
430	Advances in Microbiology	3	F, S	BIOL 302
431	Advanced Microbiology Lab	3/2	F	BIOL 302
438	Public Health Microbiology	4/2	F, S	BIOL 302
445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
448	Plant Molecular Biology	4/1	P	BIOL 302, 303, 309, or 345, or CHEM 421 or 423A
462	General Parasitology	4/2	F	BIOL 302
472A	Adv. Biotech Lab (CHEM 472A)	3/2	F	BIOL 302; and BIOL 309, CHEM 421, or CHEM 423A; Coreq: BIOL 412
472B	Advances in Biotech Lab (CHEM 472B)	3/2	S #	CHEM 421 or 423A, and consent of instructor
473	Bioinformatics (CHEM 473)	3/1	S	BIOL 309, 303, or 325, or CHEM 423A
490T	Clinical Microbiology (Study Abroad)	3/2	W	Consent of instructor
CHEM 421**	Biological Chemistry (for Biology majors) or CHEM 423A**	3	F, S #	For CHEM 421: CHEM 301B For CHEM 423A: CHEM 301B. Corequisite: CHEM 315

**Molecular Biology and Biotechnology Capstone courses (2 units minimum)**

400	Seminar in Biology Education	3	F	BIOL 302, 303, 309, 314, or 325
412	Principles of Gene Manipulation	3	F	BIOL 309 and CHEM 301B; or CHEM 423A
426	Molecular Virology	3	S	BIOL 302, 303, or 309, or CHEM 421
429	Techniques in Stem Cell Biology	3/2	F	BIOL 302; and BIOL 303 or 309
430	Advances in Microbiology	3	F, S	BIOL 302
431	Advanced Microbiology Lab	3/2	F	BIOL 302
438	Public Health Microbiology	4/2	F, S	BIOL 302
462	General Parasitology	4/2	F	BIOL 302
472A	Advances in Biotech Lab (CHEM 472A)	3/2	F	BIOL 302; and BIOL 309, CHEM 421, or CHEM 423A; Coreq: BIOL 412
472B	Advances in Biotech Lab (CHEM 472B)	3/2	S #	CHEM 421 or 423A, and consent of instructor
482*	Capstone Studies in Biol (Study Abroad)	2/2	W	Consent of instructor; ≥90 units completed
490T	Clinical Microbiology (Study Abroad)	3/2	W	Consent of instructor
495	Biological Internship	3/2	F, S, SU	≥90 units completed including BIOL 302, 303, 309, 317, 325, or 345
498*	Senior Thesis	1-3	F, S	Consent of instructor. Co-req: BIOL 499L
499L*	Independent Laboratory Study	1-3	F, S	Consent of instructor; junior or senior standing

**COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH**

**Physiology: 1 course in Physiology is required. This course can be taken as part of the concentration electives (if allowed) or separately (3 units).**

302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
362	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
468	Comparative Animal Physiology	4/1	S / E	BIOL 251/253L, 252/254L, and CHEM 120B

**Units** are shown as “total number of units for the course/lab units in the course”. **Offered** lists when the course is usually offered, but be aware that schedule changes are possible! F = Fall; S = Spring; SU = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic. \* A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; see your TDA.

\*\* Maximum of 3 units (total) may be applied to Biology major requirements.

## Plant Biology Concentration – CY F18 and after

**Plant Biology Required (Gateway) course (3 units):**

	BIOL	Course name	Units	Offered	Prerequisites
	345	Plant Biology	3/1	F	BIOL 251/253L and 252/254L

**Plant Biology Elective courses (7 units):**

	340	Field Botany	3/2	S / E	BIOL 251/253L and 252/254L
	441	Plant Taxonomy	4/2	S / O	BIOL 325, 340, 344, or 345
	443	Plant Ecology	4/2	S / E	BIOL 314, 325, or 345
	444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
	445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
	446	Marine Phycology	4/2	F / O	BIOL 251/253L and 252/254L
	448	Plant Molecular Biology	4/1	P	BIOL 302, 303, 309, or 345, or CHEM 421 or 423A
	449	Desert Ecology	4/2	S / O	BIOL 314 or 325
	GEOG 313	Natural Vegetation	3	P	None

**Plant Biology Capstone courses (2 units minimum)**

	450	Conservation Biology	3	S	BIOL 314 or 325
	482*	Capstone Studies in Biology (Study Abroad)	2/2	W	Consent of instructor; ≥90 units completed
	495	Biological Internship	3/2	F, S, SU	≥90 units completed including BIOL 302, 303, 309, 317, 325, or 345
	498*	Senior Thesis	1-3	F, S	Consent of instructor. Co-req: BIOL 499L
	499L*	Independent Laboratory Study	1-3	F, S	Consent of instructor; junior or senior standing

**Physiology: 1 course in Physiology is required. This course can be taken as part of the concentration electives (if allowed) or separately (3 units).**

	302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
	362	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
	444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
	445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
	468	Comparative Animal Physiology	4/1	S / E	BIOL 251/253L, 252/254L, and CHEM 120B

**Units** are shown as “total number of units for the course/lab units in the course”. **Offered** lists when the course is usually offered, but be aware that schedule changes are possible! F = Fall; S = Spring; SU = Summer; W = Winter; E = Even years; O = Odd years; P = Periodic. \* A combined total of 6 units from all of these classes may be applied to the upper division Biology units required for the major; see your TDA.



## UPPER DIVISION (300-400 Level) BIOLOGY MAJORS ELECTIVES

BIOL	Course name	Units	Offered	Prerequisites
301	Problems in Environmental Biology	3/2	SU	SCERP scholars only
302	General Microbiology	5/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
303	Intermediate Cell Biology	3	F, S, SU	BIOL 251/253L, 252/254L, and CHEM 120B
309	Intermediate Molecular Biology	3	F, S, SU	BIOL 251/253L, 252/254L, and CHEM 120B
317	Field Marine Biology	4/2	S	BIOL 251/253L and 252/254L
329	Essential Techniques in Cell Biology	3/2	SU	BSCR scholars only; BIOL 302; and BIOL 303 or 309
332	Biology of the Vertebrates	3	F / O	BIOL 251/253L and 252/254L
336	GEO/BIO Field Investigations	3/2	W	BIOL 252/254L or GEOL 335
340	Field Botany	3/2	S / E	BIOL 251/253L and 252/254L
345	Plant Biology	3/1	F	BIOL 251/253L and 252/254L
361	Human Anatomy	4/2	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
362	Mammalian Physiology	4/1	F, S	BIOL 251/253L, 252/254L, and CHEM 120B
398	Scientific Communication Workshop	1	F, S	BIOL 299L or BIOL 499L, junior or senior standing
400	Seminar in Biology Education	3	F	BIOL 302, 303, 309, 314, or 325
401	Biogeography	3	F / E	BIOL 325
402	Computer Lab in Molecular Systematics	3/1	F / O	BIOL 303, 309, or 325
405	Developmental Biology	3	S	BIOL 303 or 309
407	Genes & Genomes	3	S / E	BIOL 303, 309, or 325
410	Evolutionary Genetics	4/2	F	BIOL 251/253L and 252/254L
411	Medical Genetics	3	SU	BIOL 302 or 309, or CHEM 421 or 423A
412	Principles of Gene Manipulation	3	F	BIOL 309 and CHEM 301B; or CHEM 423A
413	Advances in Molecular Genetics	3	S	BIOL 309 and CHEM 301B; or CHEM 423A
414	Microbial Genetics	3	W	BIOL 302 or 309, or CHEM 421 or 423A
417	Advances in Cell Biology	3	F, S	BIOL 303
418L	Advances in Cell Biology Lab	2/2		BIOL 303
419	Marine Ecology	3	F / O	BIOL 325
419L	Marine Ecology Lab	1/1	F / O	Corequisite: BIOL 419
422	Coastal Ecology	4/2	F / E	BIOL 325
424	Immunology	5/2	S	BIOL 302; and BIOL 303 or 309
426	Molecular Virology	3	S	BIOL 302, 303, or 309, or CHEM 421
427	Stem Cell Biology	3	F, S	BIOL 303 or 309. BIOL 405 or 424 recommended
428	Biology of Cancer	3	F, SU	BIOL 303, 309, or 325. BIOL 424 recommended
429	Techniques in Stem Cell Biology	3/2	F	BIOL 302; and BIOL 303 or 309
430	Advances in Microbiology	3	F, S	BIOL 302
431	Advanced Microbiology Lab	3/2	F	BIOL 302
438	Public Health Microbiology	4/2	F, S	BIOL 302
441	Plant Taxonomy	4/2	S / O	BIOL 325, 340, 344, or 345
443	Plant Ecology	4/2	S / E	BIOL 325, or 345
444	Plant Physiological Ecology	4/2	S / O	BIOL 251/253L and 252/254L
445	Plant Cell Physiology	3	F / E	BIOL 302, 309, 325, 345, or CHEM 421 or 423A
446	Marine Phycology	4/2	F / O	BIOL 251/253L and 252/254L
448	Plant Molecular Biology	4/1	P	BIOL 302, 303, 309, or 345, or CHEM 421 or 423A

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

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

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

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

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