



College of Natural Sciences and Mathematics

DEPARTMENT OF BIOLOGICAL SCIENCE

BIOLOGY BACHELOR OF SCIENCE

CLASS OF 2023

CONCENTRATION IN CELL & DEVELOPMENTAL BIOLOGY

| TERM 1 | TERM 2 | TERM 3 | TERM 4 | TERM 5 | TERM 6 | TERM 7 | TERM 8 |
|---|---------------------------------|----------------------|------------------------|--|---|---|---|
| BIOL 151 (GE B2 and B3) 4 units | BIOL 152 4 units | BIOL 251 3 units | BIOL 252 3 units | BIOL 303 3 units | BIOL 302 5 units | Upper Division Biology Elective 3-4 units | Biology Capstone 2-3 units |
| CNSM 101 (GE A3) 3 units | | BIOL 253L 1 unit | BIOL 254L 1 unit | BIOL 325 3 units | Upper Division Biology Elective 3 units | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective(s) to complete required units |
| MATH 130 or MATH 150B* (GE B4) 4 units | CHEM 120A (GE B1) 5 units | CHEM 120B 5 units | CHEM 301A 3 units | CHEM 301B 3 units | MATH 338 (GE B5) 4 units | PHYS 212 3 units | |
| GE A1 or A2 3 units | GE A1 or A2 3 units | GE D1/Z 3 units | GE C1 or C2 3 units | CHEM 302 2 units | PHYS 211 3 units | PHYS 212L 1 unit | |
| GE C1 or C2 3 units | GE C1 or C2 3 units | GE D2 3 units | GE D3 3 units | Upper Division writing ENGL 301 or 363 3 units | PHYS 211L 1 unit | Upper Division GE C3/Z 3 units | Upper Division GE D4/Z 3 units |
| | | | GE E 3 units | | | | Electives to complete 120 units |
| 17 units | 15 units | 15 units | 16 units | 14 units | 16 units | 13-15 units | 12-15 units |

* only if you have AP credit for MATH 150A

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

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE

Cell and Developmental Biology Concentration

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

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

| Course | Course Title |
|------------------------|--|
| BIOL 151 | Cellular & Molecular Biology (GE B2 and B3) |
| BIOL 152 | Evolution & Organismal Biology |
| BIOL 251 | Genetics |
| BIOL 252 | Principles of Ecology |
| BIOL 253L | Cell & Molecular Biology Skills Laboratory |
| BIOL 254L | Research Skills for Ecology and Organismal Biology |
| BIOL 325 | Principles of Evolution |
| CHEM 120A | General Chemistry (GE B1) |
| CHEM 120B | General Chemistry |
| CHEM 301A | Organic Chemistry |
| CHEM 301B | Organic Chemistry |
| CHEM 302 | Organic Chemistry Laboratory |
| MATH 130 or 150A+150B* | A Short Course in Calculus/ Calculus (GE B4) |
| MATH 338 | Statistics Applied to Natural Sciences (GE B5) |
| PHYS 211 | Elementary Physics |
| PHYS 211L | Elementary Physics: Laboratory |
| PHYS 212 | Elementary Physics |
| PHYS 212L | Elementary Physics: Laboratory |

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

Cell & Developmental Concentration Requirements (15 units total)

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

Cell and Developmental Biology Required Courses (8 units)

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

Cell and Developmental Biology Elective Courses (5 units)

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

Cell and Developmental Biology Capstone Courses (2 units)

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

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

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

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

As part of their Biology Requirements students must complete:

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

UNIVERSITY & GE REQUIREMENTS

- Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

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

| Subarea | Title |
|---------|-----------------------|
| A1 | Oral Communication |
| A2 | Written Communication |
| A3 | Critical Thinking |

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

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

- Area C Arts and Humanities.** Complete one course each in C1 and C2 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

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

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

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

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

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



College of Natural Sciences and Mathematics

DEPARTMENT OF BIOLOGICAL SCIENCE
BIOLOGY BACHELOR OF SCIENCE
CLASS OF 2023

CONCENTRATION IN ECOLOGY & EVOLUTIONARY BIOLOGY

| TERM 1 | TERM 2 | TERM 3 | TERM 4 | TERM 5 | TERM 6 | TERM 7 | TERM 8 |
|---|---------------------------------|----------------------|------------------------|--|---|---|---|
| BIOL 151 (GE B2 and B3) 4 units | BIOL 152 4 units | BIOL 251 3 units | BIOL 252 3 units | BIOL 325 3 units | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective 3-4 units | Biology Capstone 2-3 units |
| CNSM 101 (GE A3) 3 units | | BIOL 253L 1 unit | BIOL 254L 1 unit | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective 3 units | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective(s) to complete required units |
| MATH 130 or MATH 150B* (GE B4) 4 units | CHEM 120A (GE B1) 5 units | CHEM 120B 5 units | CHEM 301A 3 units | CHEM 301B 3 units | MATH 338 (GE B5) 4 units | PHYS 212 3 units | |
| GE A1 or A2 3 units | GE A1 or A2 3 units | GE D1/Z 3 units | GE C1 or C2 3 units | CHEM 302 2 units | PHYS 211 3 units | PHYS 212L 1 unit | |
| GE C1 or C2 3 units | GE C1 or C2 3 units | GE D2 3 units | GE D3 3 units | Upper Division writing ENGL 301 or 363 3 units | PHYS 211L 1 unit | Upper Division GE C3/Z 3 units | Upper Division GE D4/Z 3 units |
| | | | GE E 3 Units | | | | Electives to complete 120 units |
| 17 units | 15 units | 15 units | 16 units | 14-15 units | 14-15 units | 13-15 units | 12-14 units |

* only if you have AP credit for MATH 150A

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

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE

Ecology & Evolutionary Biology Concentration

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

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

| Course | Course Title |
|------------------------|--|
| BIOL 151 | Cellular & Molecular Biology (GE B2 and B3) |
| BIOL 152 | Evolution & Organismal Biology |
| BIOL 251 | Genetics |
| BIOL 252 | Principles of Ecology |
| BIOL 253L | Cell & Molecular Biology Skills Laboratory |
| BIOL 254L | Research Skills for Ecology and Organismal Biology |
| BIOL 325 | Principles of Evolution |
| CHEM 120A | General Chemistry (GE B1) |
| CHEM 120B | General Chemistry |
| CHEM 301A | Organic Chemistry |
| CHEM 301B | Organic Chemistry |
| CHEM 302 | Organic Chemistry Laboratory |
| MATH 130 or 150A+150B* | A Short Course in Calculus/ Calculus (GE B4) |
| MATH 338 | Statistics Applied to Natural Sciences (GE B5) |
| PHYS 211 | Elementary Physics |
| PHYS 211L | Elementary Physics: Laboratory |
| PHYS 212 | Elementary Physics |
| PHYS 212L | Elementary Physics: Laboratory |

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

EEB CONCENTRATION REQUIREMENTS (14 units total)

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

EEB Organismal Biology Elective Courses (3-4 units)

| Course | Course Title | Course | Course Title |
|----------|---|----------|-----------------------------------|
| BIOL 317 | Field Marine Biology ¹ (4/2) | BIOL 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 CAPSTONE, NOT BOTH

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

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

As part of their Biology Requirements students must complete:

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

UNIVERSITY & GE REQUIREMENTS

- Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

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

| Subarea | Title |
|---------|-----------------------|
| A1 | Oral Communication |
| A2 | Written Communication |
| A3 | Critical Thinking |

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

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

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

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

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

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

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

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



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

| TERM 1 | TERM 2 | TERM 3 | TERM 4 | TERM 5 | TERM 6 | TERM 7 | TERM 8 |
|---|---------------------------------|----------------------|------------------------|--|---|---|---|
| BIOL 151 (GE B2 and B3) 4 units | BIOL 152 4 units | BIOL 251 3 units | BIOL 252 3 units | BIOL 325 3 units | BIOL 317 4 units | Upper Division Biology Elective 3-4 units | Biology Capstone 2-3 units |
| CNSM 101 (GE A3) 3 units | | BIOL 253L 1 unit | BIOL 254L 1 unit | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective 3 units | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective(s) to complete required units |
| MATH 130 or MATH 150B* (GE B4) 4 units | CHEM 120A (GE B1) 5 units | CHEM 120B 5 units | CHEM 301A 3 units | CHEM 301B 3 units | MATH 338 (GE B5) 4 units | PHYS 212 3 units | |
| GE A1 or A2 3 units | GE A1 or A2 3 units | GE D1/Z 3 units | GE C1 or C2 3 units | CHEM 302 2 units | PHYS 211 3 units | PHYS 212L 1 unit | |
| GE C1 or C2 3 units | GE C1 or C2 3 units | GE D2 3 units | GE D3 3 units | Upper Division writing ENGL 301 or 363 3 units | PHYS 211L 1 unit | Upper Division GE C3/Z 3 units | Upper Division GE D4/Z 3 units |
| | | | GE E 3 Units | | | | Electives to complete 120 units |
| 17 units | 15 units | 15 units | 16 units | 14-15 units | 15 units | 13-15 units | 12-15 units |

* only if you have AP credit for MATH 150A

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

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE Marine Biology Concentration

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

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

| Course | Course Title |
|------------------------|--|
| BIOL 151 | Cellular & Molecular Biology (GE B2 and B3) |
| BIOL 152 | Evolution & Organismal Biology |
| BIOL 251 | Genetics |
| BIOL 252 | Principles of Ecology |
| BIOL 253L | Cell & Molecular Biology Skills Laboratory |
| BIOL 254L | Research Skills for Ecology and Organismal Biology |
| BIOL 325 | Principles of Evolution |
| CHEM 120A | General Chemistry (GE B1) |
| CHEM 120B | General Chemistry |
| CHEM 301A | Organic Chemistry |
| CHEM 301B | Organic Chemistry |
| CHEM 302 | Organic Chemistry Laboratory |
| MATH 130 or 150A+150B* | A Short Course in Calculus/ Calculus (GE B4) |
| MATH 338 | Statistics Applied to Natural Sciences (GE B5) |
| PHYS 211 | Elementary Physics |
| PHYS 211L | Elementary Physics: Laboratory |
| PHYS 212 | Elementary Physics |
| PHYS 212L | Elementary Physics: Laboratory |

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

Marine Biology Concentration Requirements (14 units total)

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

Marine Biology Required Course (4 units)

| | |
|----------|----------------------------|
| BIOL 317 | Field Marine Biology (4/2) |
|----------|----------------------------|

Marine Biology Organismal Biology Courses (4 units)

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

Marine Biology Ecology Courses (4 units)

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

Marine Biology Capstone Courses (2 units)

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

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

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

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

As part of their Biology Requirements students must complete:

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

UNIVERSITY & GE REQUIREMENTS

- Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

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

| Subarea | Title |
|---------|-----------------------|
| A1 | Oral Communication |
| A2 | Written Communication |
| A3 | Critical Thinking |

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

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

- Area C Arts and Humanities.** Complete one course each in C1 and C2 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

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

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

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

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

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



College of Natural Sciences and Mathematics
DEPARTMENT OF BIOLOGICAL SCIENCE
BIOLOGY BACHELOR OF SCIENCE
CLASS OF 2023

CONCENTRATION IN MOLECULAR BIOLOGY & BIOTECHNOLOGY

| TERM 1 | TERM 2 | TERM 3 | TERM 4 | TERM 5 | TERM 6 | TERM 7 | TERM 8 |
|---|---------------------------------|----------------------|------------------------|--|---|---|---|
| BIOL 151 (GE B2 and B3) 4 units | BIOL 152 4 units | BIOL 251 3 units | BIOL 252 3 units | BIOL 309 3 units | BIOL 302 or CHEM 421 3-5 units | Upper Division Biology Elective 3-4 units | Biology Capstone 2-3 units |
| CNSM 101 (GE A3) 3 units | | BIOL 253L 1 unit | BIOL 254L 1 unit | BIOL 325 3 units | Upper Division Biology Elective 3 units | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective(s) to complete required units |
| MATH 130 or MATH 150B* (GE B4) 4 units | CHEM 120A (GE B1) 5 units | CHEM 120B 5 units | CHEM 301A 3 units | CHEM 301B 3 units | MATH 338 (GE B5) 4 units | PHYS 212 3 units | |
| GE A1 or A2 3 units | GE A1 or A2 3 units | GE D1/Z 3 units | GE C1 or C2 3 units | CHEM 302 2 units | PHYS 211 3 units | PHYS 212L 1 unit | |
| GE C1 or C2 3 units | GE C1 or C2 3 units | GE D2 3 units | GE D3 3 units | Upper Division writing ENGL 301 or 363 3 units | PHYS 211L 1 unit | Upper Division GE C3/Z 3 units | Upper Division GE D4/Z 3 units |
| | | | GE E 3 units | | | | Electives to complete 120 units |
| 17 units | 15 units | 15 units | 16 units | 14 units | 14-16 units | 13-15 units | 12-16 units |

* only if you have AP credit for MATH 150A

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

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these courses are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE Molecular Biology & Biotechnology Concentration

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

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

| Course | Course Title |
|------------------------|--|
| BIOL 151 | Cellular & Molecular Biology (GE B2 and B3) |
| BIOL 152 | Evolution & Organismal Biology |
| BIOL 251 | Genetics |
| BIOL 252 | Principles of Ecology |
| BIOL 253L | Cell & Molecular Biology Skills Laboratory |
| BIOL 254L | Research Skills for Ecology and Organismal Biology |
| BIOL 325 | Principles of Evolution |
| CHEM 120A | General Chemistry (GE B1) |
| CHEM 120B | General Chemistry |
| CHEM 301A | Organic Chemistry |
| CHEM 301B | Organic Chemistry |
| CHEM 302 | Organic Chemistry Laboratory |
| MATH 150 or 150A+150B* | A Short Course in Calculus/ Calculus (GE B4) |
| MATH 338 | Statistics Applied to Natural Sciences (GE B5) |
| PHYS 211 | Elementary Physics |
| PHYS 211L | Elementary Physics: Laboratory |
| PHYS 212 | Elementary Physics |
| PHYS 212L | Elementary Physics: Laboratory |

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

Molecular Biology & Biotechnology Concentration Requirements

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

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

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

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

| Course | Course Title | Course | Course Title |
|----------|--|-----------|-------------------------------|
| BIOL 402 | Comp. Lab in 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 CAPSTONE, NOT BOTH

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

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

As part of their Biology Requirements students must complete:

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

UNIVERSITY & GE REQUIREMENTS

- Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

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

| Subarea | Title |
|---------|-----------------------|
| A1 | Oral Communication |
| A2 | Written Communication |
| A3 | Critical Thinking |

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

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

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

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

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

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

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

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



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

| TERM 1 | TERM 2 | TERM 3 | TERM 4 | TERM 5 | TERM 6 | TERM 7 | TERM 8 |
|---|---------------------------------|----------------------|------------------------|--|---|---|---|
| BIOL 151 (GE B2 and B3) 4 units | BIOL 152 4 units | BIOL 251 3 units | BIOL 252 3 units | BIOL 345 3 units | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective 3-4 units | Biology Capstone 2-3 units |
| CNSM 101 (GE A3) 3 units | | BIOL 253L 1 unit | BIOL 254L 1 unit | BIOL 325 3 units | Upper Division Biology Elective 3 units | Upper Division Biology Elective 3-4 units | Upper Division Biology Elective(s) to complete required units |
| MATH 130 or MATH 150B* (GE B4) 4 units | CHEM 120A (GE B1) 5 units | CHEM 120B 5 units | CHEM 301A 3 units | CHEM 301B 3 units | MATH 338 (GE B5) 4 units | PHYS 212 3 units | |
| GE A1 or A2 3 units | GE A1 or A2 3 units | GE D1/Z 3 units | GE C1 or C2 3 units | CHEM 302 2 units | PHYS 211 3 units | PHYS 212L 1 unit | |
| GE C1 or C2 3 units | GE C1 or C2 3 units | GE D2 3 units | GE D3 3 units | Upper Division writing ENGL 301 or 363 3 units | PHYS 211L 1 unit | Upper Division GE C3/Z 3 units | Upper Division GE D4/Z 3 units |
| | | | GE E 3 Units | | | | Electives to complete 120 units |
| 17 units | 15 units | 15 units | 16 units | 14 units | 14-15 units | 13-15 units | 13-16 units |

* only if you have AP credit for MATH 150A

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

INSTRUCTIONS FOR COMPLETING THE BIOLOGY BACHELOR OF SCIENCE

1. Attend Biology major advising each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. **All** Biology and Supporting Courses (CHEM, MATH, PHYS) must be completed with a grade of C or higher.
4. Complete GE courses in areas A1, A2, and A3 with a C- or better. Complete a total of 12 units in GE Area B with a C or higher since these are part of the major. One course from GE Area Z can also fulfill a requirement in categories D1, C3, or D4. Check your Titan Degree Audit for courses that appear in both categories.
5. Declare your concentration during the semester you are taking your last lower-division Biol Core course.
6. Apply for Graduation through your Student Center at the start of Term 7.

BIOLOGY BACHELOR OF SCIENCE

Plant Biology Concentration

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

BIOLOGY CORE AND SUPPORTING COURSES

- Complete the courses listed below:

| Course | Course Title |
|------------------------|--|
| BIOL 151 | Cellular & Molecular Biology (GE B2 and B3) |
| BIOL 152 | Evolution & Organismal Biology |
| BIOL 251 | Genetics |
| BIOL 252 | Principles of Ecology |
| BIOL 253L | Cell & Molecular Biology Skills Laboratory |
| BIOL 254L | Research Skills for Ecology and Organismal Biology |
| BIOL 325 | Principles of Evolution |
| CHEM 120A | General Chemistry (GE B1) |
| CHEM 120B | General Chemistry |
| CHEM 301A | Organic Chemistry |
| CHEM 301B | Organic Chemistry |
| CHEM 302 | Organic Chemistry Laboratory |
| MATH 130 or 150A+150B* | A Short Course in Calculus/ Calculus (GE B4) |
| MATH 338 | Statistics Applied to Natural Sciences (GE B5) |
| PHYS 211 | Elementary Physics |
| PHYS 211L | Elementary Physics: Laboratory |
| PHYS 212 | Elementary Physics |
| PHYS 212L | Elementary Physics: Laboratory |

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

Plant Biology Concentration Requirements (12 units total)

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

Plant Biology Required Course (3 units)

| | |
|----------|---------------------|
| BIOL 345 | Plant Biology (3/1) |
|----------|---------------------|

Plant Biology Elective Courses (7 units)

| Course | Course Title | Course | Course Title |
|----------|-----------------------------------|----------|-------------------------------|
| BIOL 340 | Field Botany (3/2) | BIOL 445 | Plant Cell Physiology (3) |
| BIOL 344 | Survey of the Land Plants (4/2) | BIOL 446 | Marine Phycology (4/2) |
| BIOL 441 | Plant Taxonomy (4/2) | BIOL 447 | Ethnobotany (3/1) |
| BIOL 442 | Pollination Biology (3/1) | BIOL 448 | Plant Molecular Biology (4/1) |
| BIOL 443 | Plant Ecology (4/2) | BIOL 449 | Desert Ecology (4/2) |
| BIOL 444 | Plant Physiological Ecology (4/2) | GEOG 313 | Natural Vegetation (3) |

Plant Biology Capstone Courses (at least 2 units)

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

COURSES CAN COUNT AS ELECTIVES OR CAPSTONE, NOT BOTH

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

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

As part of their Biology Requirements students must complete:

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

UNIVERSITY & GE REQUIREMENTS

- Upper Division Writing Requirement

To meet the upper-division baccalaureate writing requirement, students must pass with a "C" (2.0) or better ENGL 301 or ENGL 363 or six units from the following: BIOL 410, BIOL 411, BIOL 414, BIOL 417, BIOL 422, BIOL 426, BIOL 427, BIOL 446, BIOL 447, BIOL 449, BIOL 465, BIOL 466, BIOL 468, BIOL 470, BIOL 495, BIOL 498.

GENERAL EDUCATION REQUIREMENTS

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

| Subarea | Title |
|---------|-----------------------|
| A1 | Oral Communication |
| A2 | Written Communication |
| A3 | Critical Thinking |

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

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

- **Area C Arts and Humanities.** Complete one course each in C1 and C2 plus an additional C1 OR C2 course for a total of 9 lower division units and one course from C3 for 3 upper division units (*).

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

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

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

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

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