# Bachelor of Science in Biology: Concentration in Marine Biology and Limnology Roadmap

120 Total Units Required  
Minimum Number of Units in the Major: 66

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>MATH 226</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE Area A: Written English Communication (A2)</td>
<td>3</td>
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<tr>
<td><strong>Units</strong></td>
<td></td>
<td><strong>15</strong></td>
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<tr>
<td><strong>Second Semester</strong></td>
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<tr>
<td>BIOL 230</td>
<td>Introductory Biology I</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 111 &amp; PHYS 112</td>
<td>General Physics I and General Physics I Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE Area A: Written English Communication II (A4)</td>
<td>3</td>
<td></td>
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<tr>
<td>or Written English Communication (A2) Stretch II</td>
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<tr>
<td><strong>Units</strong></td>
<td></td>
<td><strong>15</strong></td>
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<tr>
<td><strong>Third Semester</strong></td>
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<tr>
<td>BIOL 240</td>
<td>Introductory Biology II</td>
<td>5</td>
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<tr>
<td>CHEM 215 &amp; CHEM 216</td>
<td>General Chemistry II: Quantitative Applications of Chemistry Concepts and General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts</td>
<td>3</td>
</tr>
<tr>
<td>GE Area A: Written English Communication II (A4) if not already satisfied</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>or SF State Studies or University Elective</td>
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<tr>
<td>GE Area D: U.S. History (D2) or U.S. and California Government (D3)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td><strong>16</strong></td>
</tr>
<tr>
<td><strong>Fourth Semester</strong></td>
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<tr>
<td>CHEM 130</td>
<td>General Organic Chemistry</td>
<td>3</td>
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</tbody>
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MATH 227  
or PHYS 121 and PHYS 122

Calculus II  
or General Physics II and General Physics II Laboratory

GE Area C: Humanities: Literature (C3) | 3 |
GE Area D: Social Sciences (D1) | 3 |
GE Area D: U.S. History (D2) or U.S. and California Government (D3) | 3 |

**Units** | **16** |

**Fifth Semester** |
BIOL 355 | Genetics | 3 |
BIOL 458 | Biometry | 4 |
GE Area C: Arts (C1) | 3 |
GE Area C: Arts (C1) or Humanities (C2) | 3 |
SF State Studies or University Elective | 3 |

**Units** | **16** |

**Sixth Semester** |
BIOL 337 | Evolution | 3 |
BIOL 525 or BIOL 630 | Plant Physiology or Animal Physiology | 3 |
GE Area UD-C: Upper Division Arts and/or Humanities (Consider SF State Studies Course) | 3 |
SF State Studies or University Elective – Take Two | 6 |

**Units** | **15** |

**Seventh Semester** |
Units on Advisement | 3-5 |
Upper Division Electives (14-17 units) – Take Two | 6 |
GE Area UD-D: Upper Division Social Sciences (Consider SF State Studies Course) | 3 |
SF State Studies or University Elective | 3 |

**Units** | **15-17** |

**Eighth Semester** |
Upper Division Electives (14-17 units) – Take Two | 6 |
SF State Studies or University Elective – Take Two | 6 |

**Units** | **12** |

**Total Units** | **120-122**

1 Depending on courses completed through Early Start and in high school, students in Pathway/Category 3 or 4 may be required to enroll in additional courses before they can take MATH 199 or MATH 226. Most students in Pathway/Category 3 or 4 will need to take a stretch format for MATH 199 (MATH 197 in Fall 2018 and MATH 198 in Spring 2019). Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center (http://cms.sfsu.edu/content/student-center). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (http://developmentalstudies.sfsu.edu).

2 To avoid taking additional units, it is recommended that you meet LLD and SF State Studies requirements (AERM, GP, ES, SJ) within your GE or major.
ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

Units on Advisement (3-5 units)
- BIOL 534 Wetland Ecology (4 units)
- BIOL 580 Limnology (3 units)
- BIOL 582 Biological Oceanography (4 units)
- BIOL 585 Marine Ecology (3 units)
  and BIOL 586 Marine Ecology Laboratory (2 units)

Upper Division Electives (14-17 units)
- BIOL 502 Biology of the Algae (3 units)
- BIOL 526 Plant Molecular Physiology Laboratory (2 units)
- BIOL 532 Restoration Ecology (3 units)
- BIOL 555 Marine Invertebrate Zoology (4 units)
- BIOL 556 Natural History of Marine Invertebrates (4 units)
- BIOL 570GW Biology of Fishes - GWAR (4 units)
- BIOL 575 Fisheries Biology (3 units)
- BIOL 584 Marine Microbial Ecology Laboratory (1 units)
- BIOL 586 Marine Ecology Laboratory (2 units)
- BIOL 631GW Animal Physiology Laboratory - GWAR (4 units)
- CHEM 680 Chemical Oceanography (3 units)
- ERTH 434 Coastal Processes (3 units)
- ERTH 642 Watershed Assessment and Restoration (4 units)