Bachelor of Science in Biology: Concentration in Physiology

Impaction

All Biology concentrations are currently impacted which means there are more applications than capacity. Transfer student applications for admission to this major are accepted by the University’s Office of Undergraduate Admissions only during the application filing period of October 1 to November 30 (for admission the following fall). No late applications or applications for spring will be considered. Both new transfer and on-campus students wishing to change majors are required to submit an additional departmental application. See departmental website biology.sfsu.edu for supplemental program application and deadlines.

General Information and Requirements

- Candidates entering the bachelor’s programs in biology should have completed three years of high school mathematics and one year of high school chemistry to allow completion of the curriculum in a timely fashion (see Undergraduate Admission Requirements (bulletin.sfsu.edu/undergraduate-admissions/application-procedures/#UAR)).
- All major course work must be completed with letter grades (CR/NC is not acceptable).
- A minimum grade point average of 2.0 in all course work is required to receive a degree in these programs.
- To remain enrolled in a biology course, students must be prepared to provide copies of transcripts demonstrating completion of prerequisite courses with a grade of C− or better.
- At least 12 units in biology must be completed at SF State.
- Early in the first semester, and at regular intervals thereafter, students must consult with a biology advisor to plan a program of study. For the most current advising information, go to biology.sfsu.edu (http://biology.sfsu.edu)

Graduation Writing Assessment Requirement (GWAR)

(Note: Prior to fall 2012, GWAR would have been satisfied by passing ENG 414 (or ENG 410 or ENG 411 for CMS students) or a GWAR designated course from another discipline.)

Students must earn a C or better in a GWAR course to satisfy the requirement.

Biology majors have flexibility for which GWAR course they can take to meet their requirement, as long as the prerequisites for the course have been completed.

In general,

- Cell & Molecular Biology majors should take BIOL 351GW;
- Microbiology majors should take BIOL 402GW;
- Botany, Ecology, and Zoology majors may choose between BIOL 475GW, BIOL 478GW or BIOL 529GW;
- Marine Biology majors may choose between BIOL 570GW or BIOL 631GW; and
- Physiology majors may choose between BIOL 613GW or BIOL 631GW.
- General Biology majors may take any BIOL GWAR class.

See also the Department of Biology home page for GWAR in Biology: biology.sfsu.edu/content/gwar (http://biology.sfsu.edu/content/gwar) or contact a departmental advisor for further information.

The department does not permit multiple concentrations within the biology degree program. All of the curricula require preliminary work in physics and chemistry because many important biological concepts are based squarely upon principles in the physical sciences. Also, each curriculum includes upper division work in the biological sciences so that students will receive reasonable breadth and depth in their degree program. Because of the sequential arrangement of courses students are urged to consult the descriptions for the prerequisites of all their courses.

Although course electives are listed for most of the majors, new electives are always being added to various programs. Therefore, we highly recommend that students seek advisement prior to enrolling in elective courses in their major.

Concentration in Physiology

This program is designed to provide a firm foundation in physiology. Students interested in vertebrate, invertebrate, and plant physiology will find this concentration appropriate. The program is especially suited for preparation for advanced study at the postgraduate level or to prepare for careers in the health professions. In addition to major curricula in physiology, service courses are provided for nursing, clinical science, exercise physiology, kinesiology, and physical therapy majors.

Biology (B.S.): Concentration in Physiology — 67 units

General Education Met in the Major

General Education requirements met in the Biology major (all concentrations) or Undeclared with Interest in Biology:

The requirements below are deemed “met in the major” upon completion of the courses listed (even though the courses and their prerequisites are not approved for GE). This is true whether or not the student completes the major.

- Area B1 (Physical Science) is satisfied upon completion of CHEM 130 or CHEM 233.
- Areas B2 (Life Science) and B3 (Laboratory Science) are satisfied upon completion of BIOL 240.
- Upper Division General Education, Physical, and Life Sciences (UD–B) is satisfied upon completion of BIOL 355.

The GWAR in the B.S. biology, physiology concentration, can be satisfied with the physiology lab courses BIOL 613GW or BIOL 631GW.

Lower Division Requirements (38–39 units)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOL 230</td>
<td>Introductory Biology I</td>
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</tr>
<tr>
<td>BIOL 240</td>
<td>Introductory Biology II</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 130</td>
<td>General Organic Chemistry¹</td>
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Bachelor of Science in Biology: Concentration in Physiology

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Course Level</th>
<th>Units</th>
<th>Area Designation</th>
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<tr>
<td>Oral Communication</td>
<td>LD</td>
<td>3</td>
<td>A1</td>
</tr>
<tr>
<td>Written English Communication I</td>
<td>LD</td>
<td>3</td>
<td>A2</td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>LD</td>
<td>3</td>
<td>A3</td>
</tr>
<tr>
<td>Written English Communication II</td>
<td>LD</td>
<td>3</td>
<td>A4</td>
</tr>
<tr>
<td>Physical Science</td>
<td>LD</td>
<td>3</td>
<td>B1</td>
</tr>
<tr>
<td>Life Science</td>
<td>LD</td>
<td>3</td>
<td>B2</td>
</tr>
<tr>
<td>Lab Science</td>
<td>LD</td>
<td>1</td>
<td>B3</td>
</tr>
</tbody>
</table>

**Upper Division Requirements (29–33 units)**

**General Chemistry II: Quantitative Applications of Chemistry Concepts**

**Chemistry Core Courses**

Select 3–4 units from the following:

- **CHEM 215** General Chemistry II: Quantitative Applications of Chemistry Concepts
- **CHEM 216** General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts

**MATH 226** Calculus I

Select 3–4 units from the following:

- **BIOL 358** Forensic Genetics: Math Matters
- **BIOL 458** Biometry
- **MATH 124** Elementary Statistics
- **MATH 227** Calculus II

**PHYS 111** General Physics I

Select 8 units from the following:

- **PHYS 112** and General Physics I Laboratory
- **PHYS 121** and General Physics II
- **PHYS 122** and General Physics II Laboratory
- **PHYS 220** General Physics with Calculus I
- **PHYS 221** and General Physics with Calculus I Laboratory
- **PHYS 230** and General Physics with Calculus II
- **PHYS 232** and General Physics with Calculus II Laboratory

**BIOL 357** Molecular Genetics

**BIOL 358** (Cell Biology)

**BIOL 359** (Genetics)

**Developmental Biology**

**Laboratory:**

- **BIOL 358** Animal Physiology Laboratory
- **BIOL 360** Animal Physiology Laboratory - GWAR
- **BIOL 361** Animal Physiology Laboratory - GWAR

**Ecological, Anatomical, and Evolutionary Emphasis**

**BIOL 631** (General Ecology)

**BIOL 632** (Comparative Anatomy of Vascular Plants I)

**BIOL 633** (Comparative Anatomy of Vascular Plants II)

**BIOL 634** (Comparative Anatomy of Vascular Plants III)

**BIOL 635** (Comparative Anatomy of Vascular Plants IV)

**BIOL 636** (Comparative Anatomy of Vascular Plants V)

**BIOL 637** (Comparative Anatomy of Vascular Plants VI)

**BIOL 638** (Comparative Anatomy of Vascular Plants VII)

**BIOL 639** (Comparative Anatomy of Vascular Plants VIII)

**BIOL 640** (Comparative Anatomy of Vascular Plants IX)

**BIOL 641** (Comparative Anatomy of Vascular Plants X)

**BIOL 642** (Comparative Anatomy of Vascular Plants XI)

**BIOL 643** (Comparative Anatomy of Vascular Plants XII)

**BIOL 644** (Comparative Anatomy of Vascular Plants XIII)

**BIOL 645** (Comparative Anatomy of Vascular Plants XIV)

**BIOL 646** (Comparative Anatomy of Vascular Plants XV)

**BIOL 647** (Comparative Anatomy of Vascular Plants XVI)

**BIOL 648** (Comparative Anatomy of Vascular Plants XVII)

**BIOL 649** (Comparative Anatomy of Vascular Plants XVIII)

**BIOL 650** (Comparative Anatomy of Vascular Plants XIX)

**BIOL 651** (Comparative Anatomy of Vascular Plants XX)

**BIOL 652** (Comparative Anatomy of Vascular Plants XXI)

**BIOL 653** (Comparative Anatomy of Vascular Plants XXII)

**BIOL 654** (Comparative Anatomy of Vascular Plants XXIII)

**BIOL 655** (Comparative Anatomy of Vascular Plants XXIV)

**BIOL 656** (Comparative Anatomy of Vascular Plants XXV)

**BIOL 657** (Comparative Anatomy of Vascular Plants XXVI)

**BIOL 658** (Comparative Anatomy of Vascular Plants XXVII)

**BIOL 659** (Comparative Anatomy of Vascular Plants XXVIII)

**BIOL 660** (Comparative Anatomy of Vascular Plants XXIX)

**BIOL 661** (Comparative Anatomy of Vascular Plants XXX)

**BIOL 662** (Comparative Anatomy of Vascular Plants XXXI)

**BIOL 663** (Comparative Anatomy of Vascular Plants XXXII)

**BIOL 664** (Comparative Anatomy of Vascular Plants XXXIII)

**BIOL 665** (Comparative Anatomy of Vascular Plants XXXIV)

**BIOL 666** (Comparative Anatomy of Vascular Plants XXXV)

**BIOL 667** (Comparative Anatomy of Vascular Plants XXXVI)

**BIOL 668** (Comparative Anatomy of Vascular Plants XXXVII)

**BIOL 669** (Comparative Anatomy of Vascular Plants XXXVIII)

**BIOL 670** (Comparative Anatomy of Vascular Plants XXXIX)

**BIOL 671** (Comparative Anatomy of Vascular Plants XL)

**BIOL 672** (Comparative Anatomy of Vascular Plants XLI)

**BIOL 673** (Comparative Anatomy of Vascular Plants XLII)

**BIOL 674** (Comparative Anatomy of Vascular Plants XLIII)

**BIOL 675** (Comparative Anatomy of Vascular Plants XLIV)

**BIOL 676** (Comparative Anatomy of Vascular Plants XLV)

**BIOL 677** (Comparative Anatomy of Vascular Plants XLVI)

**BIOL 678** (Comparative Anatomy of Vascular Plants XLVII)

**BIOL 679** (Comparative Anatomy of Vascular Plants XLVIII)

**BIOL 680** (Comparative Anatomy of Vascular Plants XLIX)

**BIOL 681** (Comparative Anatomy of Vascular Plants L)

**BIOL 682** (Comparative Anatomy of Vascular Plants LI)

**BIOL 683** (Comparative Anatomy of Vascular Plants LII)

**BIOL 684** (Comparative Anatomy of Vascular Plants LIII)

**BIOL 685** (Comparative Anatomy of Vascular Plants LIV)

**BIOL 686** (Comparative Anatomy of Vascular Plants LV)

**BIOL 687** (Comparative Anatomy of Vascular Plants LVII)

**BIOL 688** (Comparative Anatomy of Vascular Plants LVIII)

**BIOL 689** (Comparative Anatomy of Vascular Plants LIX)

**BIOL 690** (Comparative Anatomy of Vascular Plants L)
Bachelor of Science in Biology: Concentration in Physiology

| Mathematics/Quantitative Reasoning | LD | 3 | B4 |
| Arts | LD | 3 | C1 |
| Arts or Humanities | LD | 3 | C1 or C2 |
| Humanities: Literature | LD | 3 | C3 |
| Social Sciences | LD | 3 | D1 |
| Social Sciences: US History | LD | 3 | D2 |
| Social Sciences: US & CA Government | LD | 3 | D3 |
| Lifelong Learning and Self-Development (LLD) | LD or UD | 3 | E |
| Physical and/or Life Science | UD | 3 | UD-B |
| Arts and/or Humanities | UD | 3 | UD-C |
| Social Sciences | UD | 3 | UD-D |

**SF State Studies**

Courses certified as meeting the SF State Studies requirements may be upper or lower division in General Education (GE), in a major or minor, or an elective.

| American Ethnic and Racial Minorities (AERM) | LD or UD | 3 |
| Environmental Sustainability (ES) | LD or UD | 3 |
| Global Perspectives (GP) | LD or UD | 3 |
| Social Justice (SJ) | LD or UD | 3 |

Note: LD = Lower Division; UD = Upper Division.

First-Time Student Roadmap

This roadmap opens in a new tab. (bulletin.sfsu.edu/colleges/science-engineering/biology/bs-biology-concentration-physiology/roadmap.html)

Transfer Student Roadmap

For students with an AS-T in Biology. This roadmap opens in a new tab. (bulletin.sfsu.edu/colleges/science-engineering/biology/bs-biology-concentration-physiology/adt-roadmap.html)

This degree program is an approved pathway (“similar” major) for students earning the ADT in Biology

California legislation SB 1440 (2009) mandated the creation of the Associate Degree for Transfer (ADT) to be awarded by the California Community Colleges. Two types of ADTs are awarded: Associate in Arts for Transfer (AA-T) and Associate in Science for Transfer (AS-T). Note: no specific degree is required for admission as an upper-division student. However, the ADT includes specific guarantees related to admission and graduation, and is designed to clarify the transfer process and strengthen lower-division preparation for the major.

An ADT totals 60 units and includes completion of all lower-division General Education requirements and at least 18 units in a specific major. Students pursuing an ADT are guaranteed admission to the CSU if minimum eligibility requirements are met, though not necessarily to the CSU campus of primary choice.

Upon verification that the ADT has been awarded prior to matriculation at SF State, students are guaranteed B.A. or B.S. completion in 60 units if pursuing a “similar” major after transfer. Determinations about “similar” majors at SF State are made by faculty in the discipline.

Degree completion in 60 units cannot be guaranteed when a student simultaneously pursues an additional major, a minor, certificate, or credential.

A sample advising roadmap for students who have earned an ADT and continue in a “similar” major at SF State is available on the Roadmaps tab and displays:

- How many lower-division units required for the major have been completed upon entry based on award of a specific ADT;
- Which lower-division requirements are considered complete upon entry based on award of a specific ADT;
- How to complete the remaining 60 units for the degree in four semesters.

Students who have earned an ADT should seek advising in the major department during the first semester of attendance.

General Advising Information for Transfer Students

1. Before transfer, complete as many lower division requirements or electives for this major as possible.
2. The following courses are not required for admission, but are required for graduation. Students are strongly encouraged to complete these units before transfer; doing so will provide more flexibility in course selection after transfer.
   - a course in U.S. History
   - a course in U.S. & California Government
   - a 2nd-semester course in written English composition

For information about satisfying the requirements described in (1) and (2) above at a California Community College (CCC), please visit http://www.assist.org. Check any geographically accessible CCCs; sometimes options include more than one college. Use ASSIST to determine:

- Which courses at a CCC satisfy any lower division major requirements for this major, including 2nd-semester composition;

Remedial courses are not transferable and do not apply to the minimum 60 units/90 quarters required for admission.
Additional units for courses that are repeated do not apply to the minimum 60 units required for upper division transfer (for example, if course was not passed on the first attempt, or was taken to earn a better grade).

Before leaving the last California community college of attendance, obtain a summary of completion of lower division General Education units (IGETC or CSU GE Breadth). This is often referred to as a GE certification worksheet. SF State does not require delivery of this certification to Admissions, but students should retain this document for verifying degree progress after transfer.

Credit for Advanced Placement, International Baccalaureate, or College-Level Examination Program courses: AP/IB/CLEP credit is not automatically transferred from the previous institution. Units are transferred only when an official score report is delivered to SF State. Credit is based on the academic year during which exams were taken. Refer to the University Bulletin in effect during the year of AP/IB/CLEP examination(s) for details regarding the award of credit for AP/IB/CLEP.

Students pursuing majors in science, technology, engineering and mathematics (STEM) disciplines often defer 6-9 units of lower division general education in areas C and D until after transfer in order to focus on preparation courses for the major. (This advice does not apply to students pursuing associate degree completion before transfer.)

Transferring from institutions other than CCCs or CSUs

Review SF State’s lower division General Education requirements. Note that, as described below, the four basic skills courses required for admission meet A1, A2, A3, and B4 in the SF State GE pattern. Courses that fulfill the remaining areas of SF State’s lower division GE pattern are available at most two-year and four-year colleges and universities.

Of the four required basic skills courses, a course in critical thinking (GE A3) may not be widely offered outside the CCC and CSU systems. Students should attempt to identify and take an appropriate course no later than the term of application to the CSU. To review more information about the A3 requirement, please visit http://bulletin.sfsu.edu/undergraduate-education/general-education/lower-division/#AAEL.

Identify and complete a 2nd-semester written English composition course before transfer. This is usually the next course after the typical “freshman comp” course, with a focus on writing, reading and critical analytical skills for academic purposes, and developing skills in composing, revising, and the use of rhetorical strategies.

Waiting until after transfer to take a single course at SF State that meets both US and CA/local government requirements may be an appropriate option, particularly if transferring from outside of California.

All students must meet the transfer eligibility requirements outlined below for admission.

For more information, visit the Undergraduate Admissions section.

• Complete 60 or more transferable semester units or 90 or more quarter units
• Earn a college grade point average of 2.00 or better in all transferable courses. Non-local area residents may be held to a higher GPA standard.

• Be in good standing at the last college or university attended
• Complete 30 semester units (45 quarter units) of general education, including four basic skills courses:
  a. One course in oral communication (same as CSU GE area A1)
  b. One course in written composition (same as CSU GE area A2)
  c. One course in critical thinking (same as CSU GE area A3)
  d. One course in mathematics or quantitative reasoning, with intermediate algebra as a prerequisite (same as CSU GE area B4)
• The four basic skills courses and a minimum of 60 transferable semester units (90 quarter units) must be completed by the spring semester prior to fall admission, or by the fall semester prior to spring admission. Earn a "C" or better grade in each basic skills course.