

Biology Major, Genomics and Computational Biology Specialization

Program Requirements

- **Total units required:** 58

Required Courses

| Code | Title | Units |
|--|--|-----------|
| Biol 2960 | Principles of Biology I | 4 |
| Biol 2970 | Principles of Biology II | 4 |
| Chem 111A or Chem 105 | General Chemistry I Principles of General Chemistry I | 3 |
| Chem 112A or Chem 106 | General Chemistry II Principles of General Chemistry II | 3 |
| Chem 151 | General Chemistry Laboratory I | 2 |
| Chem 152 | General Chemistry Laboratory II | 2 |
| Chem 261 | Organic Chemistry I with Lab | 4 |
| Chem 262 | Organic Chemistry II with Lab | 4 |
| Math 132 | Calculus II | 3 |
| SDS 2200 or Math 233 or SDS 3200 | Elementary Probability and Statistics Calculus III Elementary to Intermediate Statistics and Data Analysis | 3 |
| Physics 191 or Physics 193 | Physics I Focused Physics I | 3 |
| Physics 191L or Physics 193L | Physics I Laboratory Focused Physics I Laboratory | 1 |
| Physics 192 or Physics 194 | Physics II Focused Physics II | 3 |
| Physics 192L or Physics 194L | Physics II Laboratory Physics II Laboratory | 1 |
| Total Units | | 40 |

Students may substitute Chem 401 Physical Chemistry I for Chem 262 Organic Chemistry II with Lab. Students who plan to take physical chemistry must take Math 233 Calculus III. SDS 2200 Elementary Probability and Statistics (required for the tracks in ecology and evolution and in genomics and computational biology) and Math 233 Calculus III are valuable, particularly for students interested in research.

Students who have taken Math 233 may take SDS 3200 Elementary to Intermediate Statistics and Data Analysis rather than SDS 2200 Elementary Probability and Statistics for a more advanced treatment of statistics.

At least 18 units in advanced biology courses (numbered 300 or above) are required. These 18 units may not include Biol 303A, Biol 307A, Biol 3160, Biol 3180, Biol 343A, Biol 363, Biol 387, Biol 388, Biol 3900, Biol 4202, Biol 4582, Biol 487, or Biol 488; cross-listed courses originating in other departments (except Biol 354, Biol 360, Biol 4540, Biol 4580, Biol 4810, Biol 4820, and Biol 4833, which count as biology major credit despite external origins); courses in the School of Continuing & Professional Studies; or more than 3 units of history-of-science courses. Up to 6 units of Biol 500 may be counted toward the 18 advanced biology units, and up to 3 units of Biol 49XX seminar courses may be counted toward the 18 advanced biology units.

Majors are required to take at least one course from each of the following three areas:

Area A: Cellular and Molecular Biology

| Code | Title | Units |
|-----------|---|-------|
| Biol 324 | Human Genetics | 3 |
| Biol 334 | Cell Biology | 3 |
| Biol 3371 | Eukaryotic Genomes | 4 |
| Biol 3481 | Parasitology | 3 |
| Biol 349 | Microbiology | 4 |
| Biol 424 | Immunology | 4 |
| Biol 4344 | Epigenetics | 3 |
| Biol 4492 | Infectious Diseases: History, Pathology, and Prevention | 3 |
| Biol 451 | General Biochemistry | 4 |
| Biol 4810 | General Biochemistry I | 3 |
| Biol 4820 | General Biochemistry II | 3 |

Area B: Organismal Biology

| Code | Title | Units |
|-----------|---|-------|
| Biol 3057 | Physiological Control Systems | 3 |
| Biol 3151 | Endocrinology | 3 |
| Biol 328 | Principles in Human Physiology | 4 |
| Biol 3411 | Principles of the Nervous System | 3 |
| Biol 3421 | Introduction to Neuroethology | 3 |
| Biol 3422 | Genes, Brains, and Behavior | 3 |
| Biol 3424 | Great Discoveries in Neuroscience | 3 |
| Biol 4023 | How Plants Work: Physiology, Growth, and Metabolism | 3 |
| Biol 4030 | Biological Clocks | 3 |
| Biol 4071 | Developmental Biology | 3 |
| Biol 4072 | Regenerative and Stem Cell Biology | 3 |

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| Biol 4381 | Cell-Based Tissue Engineering and Regenerative Medicine | 3 |
| Biol 4580 | Principles of Human Anatomy and Development | 3 |

Area C: Evolution, Ecology and Population Biology

| Code | Title | Units |
|-----------|--|-------|
| Biol 3220 | Woody Plants of Missouri | 3 |
| Biol 3221 | Research and Public Education in the Arboretum | 3 |
| Biol 347 | Darwin and Evolutionary Controversies | 3 |
| Biol 3494 | Microbes and the Environment | 4 |
| Biol 3501 | Evolution | 4 |
| Biol 370 | Animal Behavior | 3 |
| Biol 381 | Introduction to Ecology | 3 |
| Biol 4181 | Population Genetics (and Microevolution) | 3 |
| Biol 4182 | Macroevolution | 3 |
| Biol 4183 | Molecular Evolution | 3 |
| Biol 419 | Community Ecology | 3 |
| Biol 4195 | Disease Ecology | 4 |
| Biol 472 | Behavioral Ecology | 4 |

Majors also must take an advanced laboratory course from the following list:

| Code | Title | Units |
|-----------|---|-------|
| Biol 3110 | Vertebrate Structure Laboratory | 4 |
| Biol 3423 | Behavioral Genetics Laboratory | 3 |
| Biol 3491 | Microbiology Laboratory | 3 |
| Biol 3492 | Laboratory Experiments with Eukaryotic Microbes | 3 |
| Biol 3493 | Bacterial Bioprospecting and Biotechnology | 3 |
| Biol 360 | Biophysics Laboratory | 3 |
| Biol 404 | Laboratory of Neurophysiology | 4 |
| Biol 4193 | Experimental Ecology Laboratory | 4 |
| Biol 4220 | Practical Bioinformatics | 4 |
| Biol 4342 | Research Explorations in Genomics | 4 |
| Biol 434W | Research Explorations in Genomics (Writing-Intensive) | 4 |
| Biol 4522 | Laboratory in Protein Analysis, Proteomics, and Protein Structure | 3 |
| Biol 4523 | Molecular Methods in Enzyme Analysis | 4 |
| Biol 4525 | Structural Bioinformatics of Proteins (Writing Intensive) | 4 |

All courses to be counted toward a major in biology must be taken for a letter grade if a letter grade is offered. A grade of C- or better must be earned in all of these courses.

In special cases, students may earn credit for graduate courses offered by the Division of Biology & Biomedical Sciences.

Specialization Requirements

- **Total units required (including the biology major requirements): 64**

Additional requirements include an advanced genomics/computational biology elective (Biol 324, Biol 4183, Biol 4344, Biol 548, or Biol 5488); statistics (SDS 2200 or SDS 3200); and two outside electives (CSE 131 and CSE 247). CSE 240 is strongly recommended as well. The course used to fulfill the advanced laboratory requirement for the major must be Biol 3492, Biol 3493, Biol 4220, Biol 4342, Biol 434W, or Biol 4525. Biology courses recommended for students in this track include Biol 334, Biol 3422, Biol 349, Biol 3491, Biol 4030, Biol 4181, Biol 4183, and Biol 4810. Recommended mathematics electives include Math 217 and Math 309.

Additional Information

Research

Research opportunities are available during the student's first and second years through Biol 200; such opportunities are available during the third and fourth years through Biol 500. A research emphasis in the major requires at least 6 credits (two semesters) of Biol 500 research and an approved senior thesis on this research, which is presented at the undergraduate symposium. The research emphasis is acknowledged on the degree as a research milestone.

Senior Honors

Biology majors are encouraged to work for senior honors, which require a 3.30 grade point average in biology, a 3.30 GPA in nonbiological sciences (mathematics, chemistry and physics courses), and a 3.65 overall GPA at the time of graduation. Also required are 6 units of Biol 500 research and an approved thesis from this work, equivalent to the research emphasis described in the preceding paragraph. Students interested in senior honors should begin Biol 500 no later than the spring of their junior year.

The Department of Biology awards the Marian Smith Spector Prize to an undergraduate who has an excellent academic record and who submits an outstanding honors thesis; it also awards the Ralph S. Quatrano Prize to the student whose thesis shows the greatest evidence of creativity in design, research methodology and/or broader scientific implications. The Harrison D. Stalker Prize is awarded to a graduating senior whose college career is distinguished by scholarship, service and breadth of interest.

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