Science Education - Biology Concentration  
College of Science  
2023-2024

Program Progression Guides

Disclaimer: The 2023-2024 Purdue West Lafayette catalog is considered the source for academic and programmatic requirements for students entering programs during the Fall 2023, Spring 2024, and Summer 2024 semesters. The Program Progression Guide assists students in the development of an individualized 8-semester plan. Students are encouraged to use this guide and MyPurduePlan* (online degree auditing tool) as they work with their academic advisor towards the completion of their degree requirements.

Notification: Each student is ultimately responsible for knowing, monitoring and completing all degree requirements.

### University Degree Requirements

| Minimum 2.0 Cumulative GPA | Minimum 120 Credits that fulfill degree requirements | 32 Residency Credits (30000-level and above) at a Purdue University campus |

### University Core Curriculum**

[https://www.purdue.edu/provost/students/s-initiatives/curriculum/courses.html](https://www.purdue.edu/provost/students/s-initiatives/curriculum/courses.html)

- Human Cultures: Behavioral/Social Science
- Human Cultures: Humanities
- Information Literacy
- Oral Communication
- Quantitative Reasoning
- Science
- Science, Technology & Society Selective
- Written Communication

### Civic Literacy Proficiency

[https://www.purdue.edu/provost/about/provostInitiatives/civics/](https://www.purdue.edu/provost/about/provostInitiatives/civics/)

### Required Major Courses (see following pages)

Departmental and Teacher Education Program requirements (including minimum 2.5 GPA for Content Area courses)

Minimum 2.0 cumulative GPA

Must have a 500-level BIOL course (2-3 credit approved BIOL lecture)

### College of Science Core Curriculum

[https://www.purdue.edu/science/Current_Students/curriculum_and_degree_requirements/college-of-science-core-requirements.html](https://www.purdue.edu/science/Current_Students/curriculum_and_degree_requirements/college-of-science-core-requirements.html)

- Freshman Composition – 3 credits
- Technical Writing and Presentation - 3 credits
- Teaming & Collaboration (NC)
- General Education - 9 credits
- Foreign Language & Culture – 9 credits
- Great Issues - 3 credits
- Laboratory Science - 8 credits
- Science, Tech & Society (STS) - 3 credits
- Mathematics - 6-10 credits
- Statistics - 3 credits
- Computing - 3 credits

### Degree Electives

Any Purdue or transfer course approved to meet degree requirements in accordance with individual departmental policies.

Consult the [No Count Course List](https://www.purdue.edu/science/Current_Students/curriculum_and_degree_requirements/college-of-science-core-requirements.html) for courses which may not be used to meet any College of Science degree requirement.

An undergraduate degree in the College of Science requires completion of the following degree requirements.

* This audit is not your academic transcript and it is not official notification of completion of degree or certificate requirements.

** University Core Curriculum Outcomes may be met through completion of the College of Science Core curriculum. Students should consult with their academic advisors and MyPurdue Plan for course selections.
### 2023-2024 Science Education - Biology Concentration Degree Progression Guide

The College of Science has suggested the following degree progression guide for the Science Education – Biology Concentration Degree. Students will work with their advisors to determine their best path to degree completion. Course pre-requisites are specific to this degree plan – not all are shown.

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall 1st Year</th>
<th>Prerequisite</th>
<th>Credits</th>
<th>Spring 1st Year</th>
<th>Prerequisite</th>
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<tr>
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<td>BIOL 12100 (meets Science, Technology, Society requirement for Univ. Core)</td>
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<td>BIOL 13100</td>
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<tr>
<td></td>
<td>CHM 12901 Fall only</td>
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<td>EDCI 28500 Multiculturalism and Education</td>
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<td>EDCI 20500 Exploring Teaching As A Career</td>
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<td>EDCI 35000 Community Issues and App for Ed</td>
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<td>EDST 20010 Ed Policies and Law</td>
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<td>CHM 25500 and CHM 25501</td>
<td>CHM 11600 or 12901</td>
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<td>3-5</td>
<td>Calc I Selective</td>
<td>ALEKS 75 or 85 or SAT/ACT score to meet pre-req</td>
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<td>Free Elective (BIOL 11500)</td>
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<td>16-18</td>
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<td>BIOL 24200</td>
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<td>EDCI 28600</td>
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<td>2</td>
<td>EDCI 37001 Teaching and Learning ESL</td>
<td>Co-req: EDCI 36400 and EDCI 36500; Pre-req EDCI 20500 (min grade C-) and EDCI 28500 (min grade C-)</td>
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<td>EDCI 24800 - Differentiating Curriculum And Instruction</td>
<td>Co-req EDCI/EDPS 20001 and EDPS 26501</td>
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<td>1</td>
<td>EPDS 24000 - Children With Gifts, Creativity, And Talents</td>
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<td>EPDS 26501 - The Inclusive Classroom</td>
<td>Co req: EDCI/EDPS 20001 and EDPS 26501</td>
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<td>2</td>
<td>EPDS 36201 Positive Behavioral Supports</td>
<td>Co-req: EDCI/EDPS 20001 and EDPS 27001; Pre-req EDPS 26500</td>
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<td>EDCI 35000 Community Issues and App for Ed</td>
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<td>CHM 25600 and CHM 26501 Organic II Lecture &amp; Lab</td>
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<td>Varies</td>
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<td>3-4</td>
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<td>EDCI 20001 (or EDPS 20001)</td>
<td>Co-req: EDPS 24800 and EDPS 26501</td>
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<tr>
<td>1</td>
<td>EDCI 27000 - Introduction To Educational Technology And Computing</td>
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<td>CS 15900 - C Programming or CS 17700 - Programming With Multimedia Objects</td>
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<td>2</td>
<td>EDCI 30900 - Reading In Middle And Secondary Schools: Methods And Problems</td>
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<td>2-3</td>
<td>EDCI 42800 - Teaching Science In The Middle And Junior High School OR EDCI 55800 - Integrated Science, Technology, Engineering And Mathematics (STEM) Education Methods-Secondary</td>
<td>EDCI 42800: Pre-req: EDCI 20500 and 28500 and EDPS 23500 and BIOL 35900 or 19900 or higher plus EDCI 42100 or EDCI 42400 or CHM 50200 (min grade C-) EDCI 55800: Pre-req: EDCI 39800 (may be taken concurrently)</td>
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<td>PHYS I Selective</td>
<td>Varies</td>
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<td>PHYS II Selective</td>
<td>PHYS I</td>
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<td>Intermediate Biology Selective</td>
<td>Varies</td>
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<td>Group B Selective</td>
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<td>Group A Selective</td>
<td>Varies</td>
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<td>*EDCI 31900 or 52600 or 55900 or EDPS 21100 or 54200 or 54500</td>
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<td>17-19</td>
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<td>3</td>
<td>STAT 50300</td>
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<td>EDCI 49800 Supervised Teaching</td>
<td>EDCI 20500, 28500 AND EDPS 23500, 26500 (C- or better)</td>
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<td>3</td>
<td>EDCI 42100 Fall only (Multidisciplinary Experience)</td>
<td>EDCI 20500, 28500 AND EDPS 23500, 26500 (C- or better)</td>
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<td>EPDS 32700 - Classroom Assessment</td>
<td>Pre-req: EDPS 23500</td>
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<td>EPDS 43010 - Secondary Creating And Managing Learning Environments</td>
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<td>2-4</td>
<td>Base Lab Requirement</td>
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<td>3-4</td>
<td>500-Level Biology Selective</td>
<td>Varies</td>
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<td>17-20</td>
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</table>
## Science Core Curriculum Options

(one course needed for each requirement unless otherwise noted)

<table>
<thead>
<tr>
<th>Options recommended for first- and second-year students</th>
<th>Options recommended for third- and fourth-year students</th>
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<tr>
<td>Freshman Composition(^UC)</td>
<td>Technical Writing and Presentation(^UC) (COM 217 recommended)</td>
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<td>General Education(^UC) (2 courses + EDPS 23500)</td>
<td>Statistics (STAT 50300)</td>
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<tr>
<td>Foreign Language and Culture(^UC) (2 courses + EDCI 28500)</td>
<td>Computing (CS 17700 or CS 18000 also meet Teambuilding)</td>
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<tr>
<td>STS(^UC) (BIOL 12100)</td>
<td>Great Issues</td>
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</table>

\(^UC\) Select courses may also satisfy a University Core Curriculum requirement; see the University Core Requirement [course list](#) for approved courses. Students must have 32 credits at the 30000 level or above taken at Purdue.

(continued next page)
SCIENCE EDUCATION with Biology Concentration
Fall 2023

Graduation Requirements:
- A minimum 2.0 average in all biology courses required for this major
- At least one approved 2-3 credit 500-level Biology course is required (excludes lab only courses such as BIOL 54200 & 5xxxx lab modules)
- A minimum of 32 credits at or above the 300-level completed at a Purdue campus
- 120 Total Credits

BIOLOGY CORE (19 credits):
1. BIOL 12100  Biology I: Diversity, Ecology and Behavior (2 cr.; fall)
2. BIOL 13100  Biology II: Development, Structure, and Function of Organisms (3 cr.; spring)
3. BIOL 13500  1st Year Biology Lab (2 cr.; both) or
   BIOL 19500  Year I Bio Lab: Diet, Disease & the Immune System (2 cr.; spring) or
   BIOL 19500  Year I Bio Lab: Disease Ecology (2 cr.; alternate fall) or
   BIOL 19500  Year I Bio Lab: Phages to Folds (2 cr.; fall) or
4. BIOL 23100  Biology III: Cell Structure and Function (3 cr.; fall)
5. BIOL 23200  Laboratory in Biology III: Cell Structure and Function (2 cr.; fall)
6. BIOL 24100  Biology IV: Genetics and Molecular Biology (3 cr.; spring)
7. BIOL 24200  Laboratory in Genetics and Molecular Biology (2 cr.; spring)
8. BIOL 28600  Intro. to Ecology & Evolution (2 cr.; spring)

UPPER-LEVEL BIOLOGY COURSEWORK (10-12 credits):
Must have at least 10 credits of coursework, including courses which meet each of the following categories: "Intermediate," "Group A," "Group B," "BIOL 500-level," and "Base Lab Requirement." Courses may double-dip among requirements. If a course is used multiple places, the credits will only count once towards the required 10 credits of Upper-Level Biology Coursework. Excess Upper-Level Biology Coursework beyond 12 credits will count as "free electives." (also see Footnotes on the last page).

9. Intermediate Biology Selective: Choose one of these eight options:
   A. BIOL 32800 1,2 Principles of Physiology (4 cr.; spring)
   B. BIOL 36700 3 Principles of Development (2 cr.; fall)
   C. BIOL 39500 3 Macromolecules (2 cr.; fall)
   D. BIOL 41500 3 Intro to Molecular Biology (3 cr.; spring)
   E. BIOL 41600 3 Viruses & Viral Diseases (3 cr.; spring)
   F. BIOL 42000 3 Eukaryotic Cell Biology (3 cr.; fall)
   G. BIOL 43600 3 Neurobiology (3 cr.; fall)
   H. BIOL 43800 2,3 General Microbiology (3 cr.; fall)

10. Biology Selectives: see note above for “Upper-Level Biology Coursework”

Group A Selectives:
BIOL 39500 3 Macromolecules (2 cr.; fall)
BIOL 41500 3 Intro. to Molecular Biology (3 cr.; spring)
BIOL 41600 3 Viruses and Viral Diseases (3 cr.; spring)
BIOL 42000 3 Eukaryotic Cell Biology (3 cr.; fall)
BIOL 43600 3 Neurobiology (3 cr.; fall)
BIOL 43800 2,3 General Microbiology (3 cr.; fall)
BIOL 43900 2,4 Microbiology Lab (2 cr.; fall)
BIOL 44400 3 Human Medical Genetics (3 cr.; spring)
BIOL 47800 3 Intro to Bioinformatics (3 cr.; fall)
BIOL 48100 3 Eukaryotic Genetics (3 cr.; spring)
BIOL 49500 3 RNA World, CRISPR and Coronavirus (2 cr.; spring)
BIOL 51600 3 Molecular Biology of Cancer (3 cr.; spring)
BIOL 51700 3 Molecular Biology: Proteins (2 cr.; alt spring)
BIOL 52900 3 Bacterial Physiology (3 cr.; spring)
BIOL 53300 3 Medical Microbiology (3 cr.; fall)
BIOL 53601 3 Biological & Structural Aspects of Drug Design & Action (3 cr.; spring)
BIOL 53800 3 Molecular, Cellular & Developmental Neurobiology (3 cr.; spring)
BIOL 56200 3 Neural Systems (3 cr.; spring)
BIOL 56310 3 Protein Bioinformatics (3 cr.; alt spring)
BIOL 59500 3 Cellular Biology of Plants (3 cr.; fall)
BIOL 59500 3 CRISPR Mechanisms & Applications (3 cr.; spring)
BIOL 59500 3 Immuno of Cancer & Infectious Disease (3 cr.; spring)
BIOL 59500 3 Intro. to X-Ray Crystallography (3 cr.; spring)
BIOL 59500 3 Methods & Measurement in Physical Biochemistry (3 cr.; fall)
BIOL 59500 4 Neural Mech in Health & Disease (3 cr.; alt spring)
BIOL 59500 3 Neurobiology of Learning and Memory (3 cr.; alt fall)
BIOL 59500 3 Practical Bioinformatics (3 cr.; spring)
BIOL 59500 4 Theory of Molecular Methods (3 cr.; fall)
BCHM 43400 3 Medical Topics in Biochemistry (3 cr.; spring)
BCHM 56100 3 General Biochemistry I (3 cr.; fall)
BCHM 56200 3 General Biochemistry II (3 cr.; spring)
CHM 33900 3 Biochemistry: A Molecular Approach (3 cr.; spring)
CHM 43300 3 Introductory Biochemistry (3 cr.; fall)

Group B Selectives:
BIOL 32800 3,6 Principles of Physiology (4 cr.; spring)
BIOL 36700 3 Principles of Development (2 cr.; spring)
BIOL 39500 3 Experimental Design & Quantitative Analysis (3 cr.; summer)
BIOL 48300 3 Environmental & Conservation Biology (3 cr.; alt spring)
BIOL 49500 6 Biodiversity & Museum Research (3 cr.; fall)
BIOL 49500 6 Data Science for Biologists (3 cr.; fall)
BIOL 53700 3 Immunobiology (3 cr.; fall)
BIOL 58000 3 Evolution (3 cr.; spring)
BIOL 58210 3 Ecological Statistics (3 cr.; fall)
BIOL 58705 3 Animal Communication (3 cr.; alt fall)
BIOL 59100 3 Field Ecology (4 cr.; alt fall)
BIOL 59200 3 Evolution of Behavior (3 cr.; alt spring)
BIOL 59500 6 Building the Tree of Life: Phylogenetics (3 cr.; spring)
BIOL 59500 3 Disease Ecology (3 cr.; spring)
BIOL 59500 2 Ecology (3 cr.; fall)
HORT 30100 2 Plant Physiology (4 cr.; spring)

Lab Requirement: Must meet Base Lab requirement as described on the next page. If undergraduate research is used to meet this requirement, only two credits may count toward the 10 credit requirement.

Other Credits that will count toward the 10 credits but not toward the A or B requirement:
Research (BIOL 49400 or BIOL 49900, max of 2 credits) BIOL 49500 3 Topics in Endocrinology & Cancer (2 cr.; spring)
BIOL 44100 3 Senior Seminar in Genetics (1 cr.; fall) BIOL 59500 3 Laboratory in Ecology (1 cr.; fall)
Any BIOL 442xx or 54200 lab module (1-2 cr.; both) BCHM 52100 3 Comparative Genomics (3 cr.; spring)
Base Laboratory Requirement (BLR) for all Biology Majors

1. Students must complete one of the “Required” courses in the chart below. Undergraduate research cannot be used to meet this requirement.
2. Students must also complete Objectives A and B as listed in the chart below with courses or research or a combination of the two.
3. Descriptions of Objectives A and B (not all tasks must be met to satisfy an objective):
   a. **Objective A** – Demonstrate the ability to plan and design hypothesis-driven experiments, simulations or discovery/observational experiments
      i. Conduct an appropriate literature review for a specific scientific topic.
      ii. Generate an applicable hypothesis (-es) for your research project
      iii. Identify techniques to be used in your project, with justification of those techniques.
      iv. Write a formal research proposal.
      v. Write a detailed outline of experiments
   b. **Objective B** - Develop the ability to appropriately analyze, critically evaluate, and depict data. Demonstrate the ability to effectively communicate scientific information orally and in writing, including synthesizing and evaluating scientific literature and putting experimental results in their appropriate scientific context.
      i. Analyze data
      ii. Use appropriate ways to depict and communicate data (e.g., graphs, movies, images, etc.). Present the research at lab meetings, in a talk, or at a poster session.
      iii. Write a summary (or summaries) of the data.
4. If research is used, the research director will be the one who decides if the research meets Obj A and/or Obj B.
5. If research is used, it must include at least four credits of BIOL 49400 or 49900. (BIOL 29400, non-BIOL research, and research for pay will not count toward the BLR.)
6. Students who successfully complete a Biology Honors Research Thesis automatically meet Objectives A and B with the approved thesis but must still complete a “Required Course.”
7. The “Microbiology” and the “Health & Disease” majors must use BIOL 43900 Micro Lab for the BLR; the “Ecology, Evolution and Environmental Biology” majors must use BIOL 59500 Laboratory in Ecology for the BLR.

### Base Laboratory Requirement Chart

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Required Course</th>
<th>Obj. A</th>
<th>Obj. B</th>
<th>Usually Offered</th>
<th>Format</th>
<th>Pre-Req (PR) or Co-Req (CR) beyond core courses</th>
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<tr>
<td>BIOL 32800</td>
<td>Principles of Physiology (4cr)</td>
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<td>BIOL 39500DIST</td>
<td>Exper Design &amp; Quant Analysis (3cr)</td>
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<td>BIOL 43900</td>
<td>Microbiology Lab (2cr)</td>
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<td>BIOL 44212</td>
<td>Microscopy &amp; Cell Bio (1cr)</td>
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<td>BIOL 48300</td>
<td>Environmental &amp; Conservation Biology (3cr)</td>
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<td>BIOL 49500BMR</td>
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<td>BIOL 49500DSB</td>
<td>Data Science for Biologists (3cr)</td>
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<td>Neurophysiology (1cr)</td>
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<td>BIOL 58210</td>
<td>Ecological Statistics (3cr)</td>
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<td>Field Ecology (4cr)</td>
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<td>Building the Tree of Life: Phylogenetics (3cr)</td>
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<td>BIOL 59500CRYO</td>
<td>CryoEM 3D Reconstruction (3cr)</td>
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<td>Data Analysis in Neuroscience (1cr)</td>
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<td>Neural Mechanisms in Health &amp; Disease (3cr)</td>
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<td>alt Spring '23</td>
<td>PR=32800 or 43600; CR=56200</td>
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<tr>
<td>BIOL 59500SBL</td>
<td>Structural Biology Lab (1cr)</td>
<td>X X</td>
<td></td>
<td></td>
<td>Spring</td>
<td>5-wk module</td>
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<tr>
<td>BIOL 59500TMM</td>
<td>Theory of Molecular Methods (3cr)</td>
<td>X X</td>
<td></td>
<td></td>
<td>alt Spring</td>
<td>molecular biology</td>
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</table>
CHEMISTRY (13 credits) -- complete all of the following:

1. General Chemistry (5 credits):
   CHM 12901 General Chemistry with a Biological Focus (5 cr.; fall)

2. Organic Chemistry (8 credits):
   CHM 25500 Organic Chemistry I (3 cr.; both) and
   CHM 25501 Organic Chemistry Lab I (1 cr.; both) and
   CHM 25600 Organic Chemistry II (3 cr.; both) and
   CHM 25601 Organic Chemistry Lab II (1 cr.; both)

PHYSICS (8 credits) -- One of these two options — (PHYS 23300+23400 are recommended):

1. PHYS 23300 Physics for Life Sciences I (4 cr.; both) and
   PHYS 23400 Physics for Life Sciences II (4 cr.; both)

2. PHYS 17200 Modern Mechanics (4 cr.; both) and one of the following two choices:
   A. PHYS 27200 Electric and Magnetic Interactions (4 cr.; both)
   B. PHYS 24100 Electricity and Optics (3 cr.; both) and PHYS 25200 Electricity and Optics Laboratory (1 cr.; spring)

EDUCATION

1. EDCI 20001 Special Populations Sem.: Students with Disabilities and Differentiation Approaches (1 cr.; spring) (ALSO EDPS 20001)
2. EDCI 20002 Special Populations Sem: English Lang Learners & Students with Gifts & Talents (1 cr.; spring) (ALSO EDPS 20002)
3. EDCI 20500 Exploring Teaching as a Career (2 cr.; both)
4. EDCI 27000 Introduction to Educational Technology and Computing (1 cr.; both)
5. EDCI 28500 Multiculturalism and Education (2 cr.; both)
6. EDCI 30900 Reading in Middle and Secondary Schools: Methods & Problems (1 cr.; both)
7. EDCI 35000 Community Issues & Applications for Educators (1 cr.; both)
8. EDCI 37001 Teaching & Learning English as a New Language (2 cr.; fall)
9. EDCI 42100 The Teaching of Biology in Secondary Schools (3 cr.; fall)
10. EDCI 42800 Teaching Science in the Middle and Junior High School (2 cr.; spring) or EDCI 55800, Integrated STEM Education Methods Secondary (3 cr.; fall)
11. EDCI 49800 Supervised Teaching Life Science Education (12 cr.; both)
12. EDPS 23500 Learning and Motivation (2 cr.; both)
13. EDPS 24000 Children with Gifts, Creativity & Talents (1 cr.; spring)
14. EDPS 24800 Differentiating Curriculum & Instruction (1 cr.; both)
15. EDPS 26501 The Inclusive Classroom (2 cr.; both)
16. EDPS 32700 Assessment Literacy (1 cr.)
17. EDPS 43010 Secondary Create & Manage Learning Environment (2 cr.)
18. EDST 20010 Educational Policies and Laws (1 cr.)

TEACHER EDUCATION PROGRAM (TEP) REQUIREMENTS

Science Education (Biology) majors must also apply for the "Teacher Education Program" (TEP) and complete all requirements. Talk with your Academic Advisor about how to proceed and review the "Biology Education Candidate Checklist" regularly to stay on track with key Milestones.
https://www.education.purdue.edu/licensure/undergraduate/programs/

OTHER: all University Core, College of Science Core, and Civics Literacy Requirements must also be completed.

FREE ELECTIVES approximately 0-2 credits

1. This may count for the Intermediate Biology Selective and as a Group B course and as the CoS Teambuilding & Collaboration requirement.
2. These courses are recommended for teaching majors.
3. Courses chosen for the Intermediate Biology Selective may satisfy #9 and still count as part of the 10 credit requirement (#10).
4. This course may count for a Group A course and towards the Base Lab requirement, but a total of 10 credits of Biology Selectives must be completed.
5. This course may count for the Group B course and as the College of Science Great Issues requirement and toward the Base Lab Requirement.
6. This course may count for a Group B course and towards the Base Lab requirement, but a total of 10 credits of Biology Selectives must be completed.

BIED 6/2023