The Biological Sciences Program at the University of Maryland offers a degree program in Physiology and Neurobiology (PHNB) at the Universities at Shady Grove. The Biological Sciences Program at Shady Grove offers the Advanced Program courses normally taken in the junior and senior years.

All Biological Sciences majors complete a common sequence of introductory and supporting courses referred to as the Basic Program. For students matriculating at the Universities at Shady Grove most of these introductory and supporting courses are taken at a community college or at another four-year institution prior to admission to the Biological Sciences Program. Depending on space available, students who matriculated at College Park may transfer to the Shady Grove Program in their junior year, where they may complete the Advanced Program in Physiology and Neurobiology.

Program Learning Outcomes

1. Students should have mastered the critical knowledge at each level in the curriculum that is necessary to move on to the next level in the curriculum.

2. Students should demonstrate an ability to use and apply quantitative methods, especially: interpretation of graphical or tabular data; expression of physical, chemical, or biological process in mathematical form; solving equations to determine the value of physical, chemical, or biological variables.

3. Students at the lower level should demonstrate an ability to carry out key experimental techniques used in the chemical and life sciences disciplines.

4. Students at the lower level should have a basic understanding of how to express questions as a hypothesis, how to design a test of a hypothesis, and how to gather and analyze simple data.

5. Students at the upper level should be able to integrate and apply a relevant body of basic knowledge to the evaluation of existing scientific studies and to design studies to test specific hypotheses that includes design elements typically found in a specific field of the chemical and life sciences.

6. Students should effectively communicate in writing the processes of science and the results of scientific inquiry.

### REQUIREMENTS

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BSCI170 &amp; BSCI171</td>
<td>Principles of Molecular &amp; Cellular Biology and Principles of Molecular &amp; Cellular Biology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BSCI160 &amp; BSCI161</td>
<td>Principles of Ecology and Evolution and Principles of Ecology and Evolution Lab</td>
<td>4</td>
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<tr>
<td>BSCI223</td>
<td>General Microbiology</td>
<td>4</td>
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<tr>
<td>BSCI222</td>
<td>Principles of Genetics</td>
<td>4</td>
</tr>
<tr>
<td>MATH130 or MATH140</td>
<td>Calculus I for the Life Sciences</td>
<td>4</td>
</tr>
<tr>
<td>MATH131 or MATH141</td>
<td>Calculus II for Life Sciences</td>
<td>4</td>
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<tr>
<td>CHEM131 &amp; CHEM132</td>
<td>Chemistry I - Fundamentals of General Chemistry and General Chemistry I Laboratory</td>
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<tr>
<td>CHEM231 &amp; CHEM232</td>
<td>Organic Chemistry I and Organic Chemistry Laboratory I</td>
<td>4</td>
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<tr>
<td>CHEM241 &amp; CHEM242</td>
<td>Organic Chemistry II and Organic Chemistry Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM271 &amp; CHEM272</td>
<td>General Chemistry and Energetics and General Bioanalytical Chemistry Laboratory</td>
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#### Courses taken at the Universities at Shady Grove

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>PHYS131 or PHYS331</td>
<td>Fundamentals of Physics for Life Sciences</td>
<td>4</td>
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<tr>
<td>PHYS132 or PHYS332</td>
<td>Fundamentals of Physics for Life Sciences II</td>
<td>4</td>
</tr>
<tr>
<td>PHNB</td>
<td>Advanced Program in Physiology and Neurobiology</td>
<td>27</td>
</tr>
<tr>
<td>ELECT</td>
<td>Electives</td>
<td>22</td>
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</table>

Total Credits 97

1. Courses equivalent to be taken at an institution that offers lower level course work.

2. CHEM272 is not offered at most institutions. Students accepted into the UMCP Shady Grove Biological Sciences may substitute a General Chemistry II Lab for this course.

### Advanced Program in Physiology and Neurobiology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM461 or BCHM463</td>
<td>Biochemistry I</td>
<td>3</td>
</tr>
<tr>
<td>BSCI330</td>
<td>Cell Biology and Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BSCI353</td>
<td>Principles of Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>BSCI450</td>
<td>Mammalian Systems Physiology</td>
<td>3</td>
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</table>

#### Physiology and Neurobiology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BSCI338</td>
<td>Special Topics in Biology (BSCI338E: Neuroethology)</td>
<td>11</td>
</tr>
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</table>
BSCI338 Special Topics in Biology (BSCI338G: Seminar on Deregulated Cell Growth in Cancer and Drug Development)

BSCI338 Special Topics in Biology (BSCI338P: Pathophysiology of the Circulatory System)

BSCI338 Special Topics in Biology (BSCI338R: Darwinian Medicine)

BSCI339 Selected Topics in Biology (BSCI339D: Biology of Chemosensory Systems)

BSCI339 Selected Topics in Biology (BSCI339F: Neurophysiology of Cells and Circuits)

BSCI339 Selected Topics in Biology (BSCI339G: Advanced Physiology)

BSCI339 Selected Topics in Biology (BSCI339I: Cellular Mechanisms of Aging and Disease)

BSCI339 Selected Topics in Biology (BSCI339Q: Diseases Due to Dysfunctional Cell Organelles)

BSCI339 Selected Topics in Biology (BSCI339W: Molecular Neuroethology)

BSCI339 Selected Topics in Biology (BSCI339X: Advanced Cellular Neuroscience)

BSCI348 Special Topics in Cell Biology and Molecular Genetics (BSCI348C: Cell Biology Lab)

BSCI355

BSCI360 Principles of Animal Behavior

BSCI370 Principles of Evolution

BSCI374 Mathematical Modeling in Biology

BSCI401 Animal Communication

BSCI402 Genomics of Sensory Systems

BSCI403 Biology of Vision

BSCI406 Membranes and Biological Interfaces

BSCI407 Behavioral Genetics

BSCI410 Molecular Genetics

BSCI414 Recombinant DNA Laboratory

BSCI416 Human Genetics

BSCI420 Cell Biology Lectures

BSCI421 Cell Biology

BSCI422 Principles of Immunology

BSCI423 Immunology Laboratory

BSCI430 Developmental Biology

BSCI433 Biology of Cancer

BSCI434

BSCI442 Plant Physiology

BSCI443 Microbial Physiology

BSCI446 Neural Systems

BSCI447 General Endocrinology

BSCI452 Diseases of the Nervous System

BSCI454 Neurobiology Laboratory

BSCI462 Population Ecology

BSCI464 Microbial Ecology

BSCI465 Behavioral Ecology

Statistics, one course maximum

BIOM301 Introduction to Biometrics

STAT400 Applied Probability and Statistics I

STAT464 Introduction to Biostatistics

Special Topics Courses

BSCI328 Special Topics in Entomology

BSCI338 Special Topics in Biology

BSCI339 Selected Topics in Biology

BSCI348 Special Topics in Cell Biology and Molecular Genetics

Departmental Honors Seminar

BSCI378H Cell Biology and Molecular Genetics Department Honors Seminar

BSCI398H Biology Department Honors Seminar

Enrichment

Minimum 3 credits from any 300- or 400-level BSCI, CHEM, or BCHM course.

Total Credits 40

ADVISING

Advising is mandatory during each pre-registration period for all Biological Sciences majors. Advising for students interested in or enrolled in the Shady Grove Program is available from the director. Call 301-738-6007 for an advising appointment.