

# Pharmaceutical Sciences, BS (Boston)

The Bachelor of Science in Pharmaceutical Sciences is geared toward highly motivated students who are strongly focused on careers in a number of competitive areas:

- Research: biomedical/pharmaceutical research, biomedicine, and/or the pharmaceutical/biotech industries
- Healthcare: curriculum provides opportunities to meet the core requirements requested by medical, veterinary and dental schools, while providing an immersive background in research and the pharmaceutical sciences

The educational approach is an innovative paradigm that immerses students into undergraduate research at the earliest possible time and promotes graduate-style mentorship and experiential learning in the context of an intensive curriculum with specialized educational opportunities. Pharmaceutical sciences are by nature highly interdisciplinary: pharmacology; physiology; structural biology; medicinal chemistry; pharmaceuticals and the allied fields of toxicology, chemical biology, and nanomedicine; and a spectrum of emerging health science disciplines that span classical life sciences, engineering, and biotechnology. All students take courses in basic chemistry, basic biology, organic chemistry, physiology, pharmacology, medicinal chemistry, and pharmaceutical sciences. Students can then further specialize their program of study with elective courses in interest areas aligned with their developing career trajectories.

Graduates of the Bachelor of Science in Pharmaceutical Sciences program will have a solid foundation in the science of drug discovery, delivery, evaluation, and development, as well as specialized training at the undergraduate level in research labs.

The program prepares students to pursue graduate studies, enroll in professional programs such as medical, veterinary or dental school, or enter the biopharmaceutical industry. The BS degree requires a minimum of four years of study and at least one co-op experience. Graduates are positioned to pursue MS and PhD programs in the biomedical sciences, medical schools, and other health professional degree programs.

## Bachelor of Science in Pharmaceutical Sciences—Progression Standards

The Bachelor of Science in Pharmaceutical Sciences requires students to maintain an overall GPA of 3.000 or better to remain in good academic and professional standing to progress towards graduation. A grade of C is the minimal passing grade for any of the required courses in the major.

If a student's cumulative GPA falls below the required 3.000, a student may be on probation for only two semesters, or until the course is offered again, unless the SOPPS ASC approves an action plan that specifies a longer (but definite) period. A student may only be placed on probation twice during enrollment in the program and must correct all deficiencies, as specified, in each respective action plan during the applicable probationary period. Failure to remediate the deficiency within the agreed time may result in dismissal from the program.

The program also requires students to seek out and establish, with program support, research opportunities with a faculty-level mentor. It is advised that students get involved in laboratory research during their first year in the program. Each student must secure a laboratory research opportunity by the fall semester of the second year and complete a course to develop lab based research skills.

## Securing a Laboratory Research Experience

The Bachelor of Science in Pharmaceutical Sciences requires students to earn a minimum of 12 credits for laboratory research through participation in Lab Research Rotation (PHSC 2100) and the writing and completion of an undergraduate thesis, comprised of Senior Thesis (PHSC 4997) and Senior Thesis Continuation (PHSC 4998). Each student must take the initiative to seek out opportunities for undergraduate laboratory research either on campus, off campus at a neighboring university, or in an industry setting accessible to the student, under the direction of a faculty-level mentor. Students are assisted with securing laboratory research experiences through participation in Introduction to Health Science Research (PHSC 2650) and, as needed, through work with a faculty advisor within the Bachelor of Science Pharmaceutical Sciences program. A variety of university resources are also available to assist students in finding opportunities, including the Bouvé College Office of Research, the Northeastern University Office of Undergraduate Research and Fellowships, the Northeastern University Integrated Initiative for Global Health, and various other departmental and college resources across Northeastern University.

## Change of Major

Students are eligible to transfer into the program at any point prior to the third year of the program. Students must have an overall GPA of 3.000 or better.

## Academic Appeals

Students who believe that they were erroneously, capriciously, or otherwise unfairly treated in an academic or cooperative education decision may petition to appeal the decision. Refer to the Bouvé College of Health Sciences Academic Affairs Appeals Process (<https://catalog.northeastern.edu/graduate/health-sciences/academic-policies-procedures/appeals-process/>) and the Northeastern University Appeals Policies and Procedures (<https://catalog.northeastern.edu/undergraduate/academic-policies-procedures/academic-appeals-policies-procedures/>).

## Program Learning Outcomes

Please visit Bouvé College Program Learning Outcomes (<https://bouve.northeastern.edu/bchs/about/learning-outcomes/>) for the specific student learning outcomes for this program.

## Program Requirements

Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified and complete any additional courses needed beyond specific college and major requirements to satisfy graduation credit requirements.

## Universitywide Requirements

All undergraduate students are required to complete the Universitywide Requirements (<https://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/>).

## NUpath Requirements

All undergraduate students are required to complete the NUpath Requirements (<https://catalog.northeastern.edu/undergraduate/university-academics/nupath/>).

## Pharmaceutical Sciences Major Requirements

| Code                       | Title  | Hours |
|----------------------------|--|-------|
| <b>SEMESTER 1</b>          |  |       |
| PHMD 1000                  | College: An Introduction                                   | 1     |
| PHSC 1001                  | Introduction to Contemporary Pharmaceutical Sciences       | 1     |
| <b>SEMESTER 2</b>          |  |       |
| PHSC 2650                  | Introduction to Health Science Research                    | 4     |
| <b>SEMESTER 3</b>          |  |       |
| PHSC 2100                  | Lab Research Rotation                                      | 4     |
| <b>SEMESTER 4</b>          |  |       |
| PHSC 2000                  | Professional Development for Pharmaceutical Sciences Co-op | 1     |
| <b>SEMESTER 5</b>          |  |       |
| PHSC 2301<br>and PHSC 2302 | Human Physiology 1<br>and Human Anatomy Lab                | 4     |
| Elective                   |  | 4     |
| <b>SEMESTER 6</b>          |  |       |
| PHSC 2330                  | Immunology   | 3     |
| PHSC 3411                  | Pharmaceutics 1  | 4     |
| PHSC 3419                  | Pharmaceutics Laboratory                                   | 1     |
| PHSC 3801                  | Principles of Pharmacology and Medicinal Chemistry 1       | 4     |
| PHSC 4995                  | Practicum  | 4     |
| <b>SEMESTER 7</b>          |  |       |
| Elective                   |  | 4     |
| Elective                   |  | 4     |
| <b>SEMESTER 8</b>          |  |       |
| PHSC 2400                  | Research Ethics for Beginning Health Scientists            | 4     |
| PHSC 3802                  | Principles of Pharmacology and Medicinal Chemistry 2       | 4     |
| PHSC 4997                  | Senior Thesis  | 4     |
| <b>SEMESTER 9</b>          |  |       |
| PHSC 3430                  | Pharmacokinetics and Biopharmaceutics                      | 3     |
| PHSC 4998                  | Senior Thesis Continuation                                 | 4     |
| Elective                   |  | 4     |
| Elective                   |  | 4     |

## Supporting Courses

| Code                                      | Title  | Hours |
|---|--|-------|
| <b>SEMESTER 1</b>                         |  |       |
| BIOL 1111<br>and BIOL 1112                | General Biology 1<br>and Lab for BIOL 1111   | 5     |
| MATH 1245<br>or MATH 1241<br>or MATH 1341 | Calculus with Applications<br>Calculus 1<br>Calculus 1 for Science and Engineering | 4     |
| <b>SEMESTER 2</b>                         |  |       |

|   |   |   |
|---|---|---|
| Pharmaceutical Sciences, BS (Boston)        |   | 3 |
| BIOL 1113<br>and BIOL 1114                  | General Biology 2<br>and Lab for BIOL 1113  | 5 |
| CHEM 1161<br>and CHEM 1162<br>and CHEM 1163 | General Chemistry for Science Majors<br>and Lab for CHEM 1161<br>and Recitation for CHEM 1161 | 5 |
| PHTH 2210                                   | Foundations of Biostatistics  | 4 |
| <b>SEMESTER 3</b>                           |   |   |
| BIOL 2301<br>and BIOL 2302                  | Genetics and Molecular Biology<br>and Lab for BIOL 2301                                       | 5 |
| CHEM 2311<br>and CHEM 2312                  | Organic Chemistry 1<br>and Lab for CHEM 2311  | 5 |
| PHYS 1145<br>and PHYS 1146                  | Physics for Life Sciences 1<br>and Lab for PHYS 1145  | 5 |
| <b>SEMESTER 4</b>                           |   |   |
| BIOL 3611<br>and BIOL 3612                  | Biochemistry<br>and Lab for BIOL 3611   | 5 |
| CHEM 2313<br>and CHEM 2314                  | Organic Chemistry 2<br>and Lab for CHEM 2313  | 5 |
| PHYS 1147<br>and PHYS 1148                  | Physics for Life Sciences 2<br>and Lab for PHYS 1147  | 5 |

## Writing Requirement

| Code              | Title                                      | Hours |
|-------------------|--|-------|
| <b>SEMESTER 1</b> |  |       |
| ENGW 1111         | First-Year Writing                         | 4     |
| <b>SEMESTER 8</b> |  |       |
| ENGW 3306         | Advanced Writing in the Health Professions | 4     |

## Program Requirements

Some NUpath requirements are not explicitly satisfied by required courses. Students are responsible for satisfying these requirements with electives.

PreMed students have the opportunity to complete all necessary coursework via required and elective courses in the BS in Pharmaceutical Sciences program. Please refer to Northeastern University's PreMed and PreHealth Advising Program's Academic Preparation guidance (<https://undergraduate.northeastern.edu/prehealth/academics/coursework/>).

Minimum of 135 semester hours required

## Plan of Study

|                          |              |               |              |   |              |   |              |
|--------------------------|--------------|---------------|--------------|---|--------------|---|--------------|
| <b>Year 1</b>            |              |               |              |   |              |   |              |
| <b>Fall</b>              | <b>Hours</b> | <b>Spring</b> | <b>Hours</b> | <b>Summer 1</b>                             | <b>Hours</b> | <b>Summer 2</b>                           | <b>Hours</b> |
| BIOL 1111                |              | 4 BIOL 1113   |              | 4 Vacation or volunteer research experience |              | Vacation or volunteer research experience |              |
| BIOL 1112                |              | 1 BIOL 1114   |              | 1   |              |   |              |
| ENGW 1111                |              | 4 CHEM 1161   |              | 4   |              |   |              |
| MATH 1241, 1231, or 1245 |              | 4 CHEM 1162   |              | 1   |              |   |              |
| PHMD 1000                |              | 1 CHEM 1163   |              | 0   |              |   |              |
| PHSC 1001                |              | 1 PHSC 2650   |              | 4   |              |   |              |
| Elective <sup>1</sup>    |              | 4 PHTH 2210   |              | 4   |              |   |              |
|                          |              | <b>19</b>     |              | <b>18</b>                                   |              | <b>0</b>                                  | <b>0</b>     |
| <b>Year 2</b>            |              |               |              |   |              |   |              |
| <b>Fall</b>              | <b>Hours</b> | <b>Spring</b> | <b>Hours</b> | <b>Summer 1</b>                             | <b>Hours</b> | <b>Summer 2</b>                           | <b>Hours</b> |
| BIOL 2301                |              | 4 BIOL 3611   |              | 4 PHSC 2301                                 |              | 3 Co-op                                   | 0            |
| BIOL 2302                |              | 1 BIOL 3612   |              | 1 PHSC 2302                                 |              | 1   |              |
| CHEM 2311                |              | 4 CHEM 2313   |              | 4 Elective                                  |              | 4   |              |
| CHEM 2312                |              | 1 CHEM 2314   |              | 1   |              |   |              |
| PHSC 2100                |              | 4 PHSC 2000   |              | 1   |              |   |              |
| PHYS 1145                |              | 4 PHYS 1147   |              | 4   |              |   |              |

|                  |       |             |       |            |       |   |       |
|------------------|-------|-------------|-------|------------|-------|---|-------|
| PHYS 1146        | 1     | PHYS 1148   | 1     |            |       |   |       |
|                  | 19    |             | 16    |            | 8     |   | 0     |
| Year 3           |       |             |       |            |       |   |       |
| Fall             | Hours | Spring      | Hours | Summer 1   | Hours | Summer 2                                    | Hours |
| Co-op            | 0     | PHSC 2330   |       | 3 Elective |       | 4 Vacation or volunteer research experience |       |
|                  |       | PHSC 3411   |       | 4 Elective |       | 4   |       |
|                  |       | PHSC 3419   |       | 1          |       |   |       |
|                  |       | PHSC 3801   |       | 4          |       |   |       |
|                  |       | PHSC 4995   |       | 4          |       |   |       |
|                  | 0     |             | 16    |            | 8     |   | 0     |
| Year 4           |       |             |       |            |       |   |       |
| Fall             | Hours | Spring      | Hours |            |       |   |       |
| ENGW 3306        |       | 4 PHSC 3430 |       | 3          |       |   |       |
| PHSC 2400        |       | 4 PHSC 4998 |       | 4          |       |   |       |
| PHSC 3802        |       | 4 Elective  |       | 4          |       |   |       |
| PHSC 4997        |       | 4 Elective  |       | 4          |       |   |       |
|                  | 16    |             | 15    |            |       |   |       |
| Total Hours: 135 |       |             |       |            |       |   |       |