

Pharmaceutics and Drug Delivery, MS

Just as cars are useless without roads, drugs are useless without effective delivery systems. This is especially important in contemporary pharmaceutical research, as new chemical entities may be either too hydrophobic (e.g., many anticancer drugs) or hydrophilic and highly labile (e.g., nucleic acids). The Bouvé College of Health Sciences School of Pharmacy Pharmaceutics and Drug Delivery students and faculty are developing the routes for bringing small-molecule drugs and biological therapies directly to target cells responsible for major diseases.

Our comprehensive Pharmaceutics and Drug Delivery MS program includes faculty members in pharmaceutics and drug development specializing in the use and delivery of therapeutics. The program faculty seeks to improve the understanding and description of how chemical and physical properties of drugs and dosage forms affect drug performance in healthy and diseased systems. Graduate students may choose from programs concentrating in:

- Novel drug delivery systems
- Biopharmaceutics and pharmacokinetics
- Physical pharmacy and polymeric dosage form development
- Drug metabolism

With a strong focus on nanotechnology-based advanced delivery systems that address contemporary therapeutic needs, the pharmaceutical sciences program also gives students opportunities to study with some of the world's top pharmaceutics researchers. Students in the Pharmaceutics and Drug Delivery MS program have the option of performing industrial internships (typically during the summer) in some of the most prestigious pharmaceutical and biotechnology companies in the Boston area.

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

Curriculum Requirements

All MS programs in the Department of Pharmaceutical Sciences require a set of core courses taken by every MS student, regardless of program. In addition, students in each program are required to take a defined set of discipline-specific courses and several general electives. The number of specialized and elective courses differs somewhat among programs. The MS degree may be completed on either a full-time or part-time basis and may include an optional research thesis. International students are required to attend the program on a full-time basis.

Internship Requirements and Regulations for Department of Pharmaceutical Sciences

Internships provide an experiential component of the graduate curriculum that fosters professional development through work in industry and hospitals.

1. In order to participate in an internship, students must complete two semesters with a grade-point average of 3.200 or better; be in good academic and professional standing (i.e., have no Professionalism Concern forms filed); and have no instances of academic dishonesty or blocks on enrollment.
2. In order to be eligible for internship, students must take the Professional Development for Pharmaceutical Sciences (PHSC 5305) course in either the fall or spring semester of their first year.
3. Students are in school full-time in addition to working on their internships.
4. There are no vacations on co-op/internships. Companies' sick time policies may vary. Students should check with their employers.
5. Students are responsible for finding their own internship and must be honest and accurate representing their experiences on their resumés. Prior to looking for an internship, students must have their faculty advisor approve their resumé and ascertain to the best of their ability that the skills and training of students are as presented.
6. Students must not accept more than one position. They must honor the first offer accepted.
7. In order to receive a grade for the course, students must write at least two learning goals and a paper describing what they learned, mid- and end of semester. Supervisors for internships will reply to a questionnaire about students' performance.
8. International students must register for Pharmaceutical Science Internship (PHSC 6401) and follow instructions to receive Curricular Practical Training authorization from the Office of Global Services every semester they work. This applies to part-time jobs and volunteer opportunities. International students cannot engage in full-time CPT authorization totaling more than 52 weeks. Doing so will eliminate the possibility of engaging in the postgraduation benefit of Post-Completion Optional Practical Training.
9. Students receive 1 academic credit per semester for Pharmaceutical Science Internship (PHSC 6401). If students want to do an internship for a fourth semester they may do so, but students will only receive a maximum of 3 credits for Pharmaceutical Science Internship (PHSC 6401). The 4th credit for Pharmaceutical Science Internship (PHSC 6401) will not be added to the student's degree.
10. Taking internship must not extend international students' visas.

General Policies Common to All MS Programs in the Department of Pharmaceutical Sciences

GRADING POLICY

Students are expected to maintain a GPA of 3.000 (B) or higher in all coursework. Students whose cumulative GPA falls below 3.000 will receive written notification from the Bouvé Office of Graduate Student Services that they have been placed on academic probation. A student must clear the deficiency and return to nonprobationary status within one semester, unless the course that must be retaken is not offered during the probationary semester. In such a case, the course to be retaken must be completed during the next semester that it is offered, and the GPA must be restored to at least 3.000. Failure to remediate the deficiencies and return to nonprobationary status within the established time limit will result in dismissal from the MS program. Refer to the Bouvé College of Health Sciences policy on Academic Dismissal (<https://catalog.northeastern.edu/graduate/health-sciences/#graduate-health-sciences-academic-dismissal>) and Academic Probation Policy (<https://catalog.northeastern.edu/graduate/health-sciences/#graduate-health-sciences-academic-probation>) for full details.

PROGRESSION REQUIREMENT

Bouvé College of Health Sciences policy specifies that students register for coursework or continuation credit each semester of the academic year (fall and spring semesters) after they are matriculated as full- or part-time students. Moreover, international students are required to maintain full-time student status during each academic term; consult the Office of Global Services (<https://international.northeastern.edu/ogs/>) for specific requirements. Domestic students who are not able to register for courses during a particular semester must petition the director of graduate studies in the department for exemption in writing and state the reasons for the exemption and their plan for resuming their studies. Approval of the petition will preserve student status in the MS program.

All MS students are expected to complete the degree requirements within two years if enrolled on a full-time basis, or within three to five years if enrolled on a part-time basis. If progress toward the degree is slowed or interrupted for personal reasons, the student so affected must petition the School of Pharmacy and Pharmaceutical Sciences Academic Standing Committee for an extension, detailing the anticipated time to completion. If an extension is approved, the student will be directed to meet with the graduate program director to devise a formal plan to achieve completion of the degree.

Course credits earned in the Bouvé College of Health Sciences Graduate School or accepted for transfer from another institution and not applied to obtain a previous degree are valid for a maximum of seven years. Refer to the Bouvé College of Health Sciences Academic Progression policies and procedures (<https://catalog.northeastern.edu/graduate/health-sciences/#graduate-health-sciences-academic-progression>) for details.

ACADEMIC HONESTY AND RESEARCH INTEGRITY

The Department of Pharmaceutical Sciences has a zero-tolerance policy regarding academic dishonesty and violations of research integrity. It is each student's responsibility to understand and adhere to the School of Pharmacy and Pharmaceutical Sciences Code of Professional Conduct (<https://catalog.northeastern.edu/graduate/health-sciences/academic-policies-procedures/code-conduct-sopps/>) and to Northeastern University's Academic Integrity Policy (<https://catalog.northeastern.edu/handbook/policies-regulations/academic-integrity/>). Definitions of plagiarism, cheating, fabrication, falsification, unauthorized collaboration, and actions that facilitate academic or research dishonesty can be found on the Office of Student Conduct and Conflict Resolution website (<https://osccr.sites.northeastern.edu/>). The lack of knowledge of these definitions does not excuse the student's responsibility for upholding them. Offenses of academic honesty and research integrity are egregious violations of ethical standards and may result in disciplinary actions, including the student's immediate dismissal from the graduate program.

SCHOOL OF PHARMACY AND PHARMACEUTICAL SCIENCES PROFESSIONAL CODE OF CONDUCT

All SOPPS students (BS Pharmaceutical Sciences, Preprofessional, MS, and PhD) are expected to adhere to the SOPPS Code of Professional Conduct.

MASTER OF SCIENCE THESIS OPTION

Students who undertake a thesis are expected to report the results of extended research in a written thesis document and make an original contribution to their field. This work should give evidence of the students' abilities to conduct independent research and interpret their research results in an acceptable manner. Arrangements are made by students interested in the thesis option with individual laboratory directors as to the availability of MS students' research positions and the specific research focus.

Thesis Registration

Students may receive a maximum of 4 semester hours of credit for MS thesis research. Students should register for Thesis (PHSC 6990), twice for 2 SH each during the fall and spring semesters of their second full year of study, or after completing 15 credits of study. If completion of the thesis requires additional time, students should register for Thesis Continuation (PHSC 6996)(0 SH).

Thesis Committee

Each student's thesis committee should be composed of at least three members: two from the sponsoring program and one from outside the student's program. The outside member may be a Northeastern faculty member. The director of graduate studies for the pharmaceutical sciences department may appoint additional members, as considered necessary for student development. The student's major advisor, in whose laboratory the research is being conducted, will serve as committee chair. The student, after consulting with the committee chair, is responsible for calling all thesis committee meetings.

Thesis Proposal

The thesis proposal should be no more than 50 double-spaced pages (12-point font minimum and one-half-inch margins on all sides). This page limit excludes references but includes figures, figure legends, and tables. Aside from these exceptions, the proposal should conform to the format and structure of an NIH grant proposal with four sections: specific aims, background and significance, preliminary studies, and experimental design

and methods. See the Department of Pharmaceutical Sciences "Thesis Proposal" document for detailed instructions on the preparation of a thesis proposal and the required forms located in the School of Pharmacy and Pharmaceutical Sciences Student Portal on Canvas in the module section.

The thesis proposal must be defended orally before the thesis committee and signed by all thesis committee members before the student undertakes the planned research. The signed cover page of the proposal should be submitted to the director of graduate studies, pharmaceutical sciences department, and to the Bouvé College of Health Sciences Graduate Office.

Thesis Final Defense

The final defense is taken after the student completes the thesis research and all other requirements for the MS degree. The defense deals with the subject matter of the thesis, significant developments in the field, and the student's background knowledge in their field of specialization. The thesis committee conducts the final defense.

At least two weeks prior to the expected date of the oral defense, the written thesis must be circulated to the student's thesis committee. After initial committee evaluation, recommendation may be made that the student clarify or rewrite portions of the thesis before scheduling the final defense. After the thesis committee concurs that the thesis is acceptable, a date is chosen for the final oral examination. At least two weeks prior to the defense, the student should inform the director of graduate studies in the pharmaceutical sciences department so that an announcement can be distributed to faculty and students. The final defense is open to anyone who wishes to attend and typically lasts at least two hours. After presentation of the work by the student, and responses to audience and committee questions, the student's committee meets in executive session to decide whether the student has successfully defended the thesis. The committee's decision is then announced to the student. If the committee's vote is favorable, the student incorporates committee suggestions and the thesis is signed off and passed on to the director of graduate studies in the department. Requests for a second defense are unusual but may be permitted if the original oral defense was judged significantly inadequate.

Thesis Deadline

The thesis should be written, defended, and signed at least two weeks before the university commencement deadline. Students must submit signed copies of the thesis to the online site designated by the university.

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

Program Requirements

- Concentrations and course offerings may vary by campus and/or by program modality. Please consult with your advisor or admissions coach for the course availability each term at your campus or within your program modality.
- Certain options within the program may be *required* at certain campuses or for certain program modalities. Please consult with your advisor or admissions coach for requirements at your campus or for your program modality.

Complete all courses and requirements listed below unless otherwise indicated.

Core Requirements

A grade of C– or higher is required in each course.

| Code | Title | Hours |
|--|--|--------------|
| Required Core | | |
| Complete the following courses: | | |
| PHSC 5100 | Concepts in Pharmaceutical Science | 2 |
| PHSC 5102 | Concepts in Pharmaceutical Science 2 | 2 |
| PHSC 5212 | Research Skills and Ethics | 2 |
| or PHSC 6213 | Ethical Problems in Health Sciences Research | |
| PHSC 5300 | Pharmaceutical Biochemistry ¹ | 2 or 4 |
| or PHSC 7010 | Pharmaceutical Sciences Laboratory | |
| PHSC 5310 | Cellular Physiology ¹ | 2 or 4 |
| or PHSC 7010 | Pharmaceutical Sciences Laboratory | |
| PHSC 6214 | Experimental Design and Biostatistics | 2 |
| PHSC 6216 | Human Physiology and Pathophysiology | 2 |
| Pharmaceutics and Drug Delivery | | |
| PMST 6250 | Advanced Physical Pharmacy | 2 |
| PMST 6252 | Pharmacokinetics and Drug Metabolism | 3 |
| PMST 6254 | Advanced Drug Delivery Systems | 3 |

Electives

| Code | Title | Hours |
|---|--------------|--------------|
| Complete 9–11 semester hours from the following subject areas: ¹ | | 9-11 |
| BIOL, BIOT, CHEM, NNMD, PHSC, PMCL, PMST | | |

Thesis Option

Thesis credits may count toward the required elective hours.

| Code | Title | Hours |
|---|---------------------|--------------|
| Thesis research should be taken twice. | | 4 |
| PHSC 6990 | Thesis | 2 |
| Thesis continuation may be taken if additional time is needed to complete the thesis. | | |
| PHSC 6996 | Thesis Continuation | |

¹ Students who opt to complete 4-credit Pharmaceutical Sciences Laboratory (PHSC 7010) in the core requirements may complete the degree with 9 elective credits; all other students must complete 11 elective credits.

Program Credit/GPA Requirements

33 total semester hours required

Minimum 3.000 GPA required