Graduate education in pharmacology embodies the principles and mechanisms of drug action in biological systems. Through coursework, seminars, and conferences, students in the pharmacology MS program gain exposure to both classical and recent approaches that have led to the development of current theories of drug action and therapeutic application. Pharmacology should not be confused with pharmacy programs or training, which lead to professional licensure as a pharmacist and involve medication management.

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.

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-student research positions and the specific research focus.

THESIS REGISTRATION
Students may receive a maximum of 4 semester hours (SH) 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).

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 University faculty member. The director of graduate studies for the pharmaceutical sciences department may appoint additional members, as considered necessary for student development. The students’ major adviser, in whose laboratory the research is being conducted, will serve as committee chairperson. 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 on the Pharmaceutical Sciences homepage (https://bouve.northeastern.edu/pharmsci/).

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 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 dissertation 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.

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 (GPA) of 3.200 or better, be in good academic standing, and have no instances of academic dishonesty, no blocks on enrollment, and no repeated courses.
2. Students are in school full-time in addition to working on their internships.
3. There are no vacations on co-op/internships. Companies’ sick time policies may vary. Students should check with their employers.
4. 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 adviser approve their resumé and ascertain to
the best of his or her ability that the skills and training of students are as presented.
5. Students must not accept more than one position. They must honor first offer accepted.
6. 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.
7. International students must register for PHSC 6401 Pharmaceutical Science Internship and follow instructions to receive Curricular Practical Training (CPT) 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 post-graduation benefit of Post-Completion Optional Practical Training (Post-OPT).
8. 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 grade-point average 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 (http://catalog.northeastern.edu/graduate/health-sciences/academic-policies-procedures/academic-dismissal/) and Academic Probation Policy (http://catalog.northeastern.edu/graduate/health-sciences/academic-policies-procedures/academic-probation/) for full details.

PROGRESSION REQUIREMENT
Bouvé College of Health Science 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 pharmaceutical sciences department graduate committee for an extension, detailing the anticipated time to completion. If an extension is approved, the student will be directed to meet with his or her academic adviser 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 Academic Progression Policies and Procedures (http://catalog.northeastern.edu/graduate/health-sciences/academic-policies-procedures/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 Northeastern University’s Academic Integrity Policy (http://www.northeastern.edu/osccr/academic-integrity-policy/). 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 (http://www.northeastern.edu/osccr/). 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.

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

Program Requirements
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 14–16 semester hours from the following: 14-16
PHSC 5100 Concepts in Pharmaceutical Science
PHSC 5102 Concepts in Pharmaceutical Science 2
PHSC 5212 Research Skills and Ethics
or PHSC 6213 Ethical Problems in Health Sciences Research
PHSC 5300 Pharmaceutical Biochemistry 3
or PHSC 7010 Pharmaceutical Sciences Laboratory
PHSC 5310 Cellular Physiology
PHSC 6214 Experimental Design and Biostatistics
PHSC 6216 Human Physiology and Pathophysiology

Pharmacology
PMCL 6260 Pharmacology 1 2
PMCL 6261 Pharmacology 2 2
PMCL 6262 Receptor Pharmacology 1 2

Electives
Complete 11–13 semester hours from the following subject areas: 3
BIOL, BIOT, CHEM, NNMD, PHSC, PMCL, PMST

Thesis Option
Thesis credits may count toward the required elective hours.
Pharmacology, MS

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<th>Code</th>
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<td>PHSC 6990</td>
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1. Pharmacology 1 (PMCL 6260) and Receptor Pharmacology (PMCL 6262) are only offered in even-numbered years in spring semester (example: Spring 2020).
2. Pharmacology 2 (PMCL 6261) is only offered in odd-numbered years in spring semester (example: Spring 2021). Pharmacology 1 does not have to be taken before Pharmacology 2.
3. Students who opt to complete 4-credit Pharmaceutical Sciences Laboratory (PHSC 7010) in the core requirements may complete the degree with 11 elective credits; all other students must complete 13 elective credits.
4. Thesis Continuation (PHSC 6996) can be taken if additional time is needed to complete the thesis.

**Program Credit/GPA Requirements**

33 total semester hours required  
Minimum 3.000 GPA required