



Northeastern University
Bouvé College of Health Sciences

2013-2014

GUIDEBOOK
for
Graduate Students in Pharmaceutical Science
at Northeastern University

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Graduate Programs in Pharmaceutical Science

Master of Science (M.S.)

- Pharmaceutics and Drug Delivery Systems
- Pharmacology
- Medicinal Chemistry
- Interdisciplinary Pharmaceutical Science
- Professional Science Masters (PSM) in Biomedical Nanotechnology

Doctor of Philosophy (Ph.D.)

- Pharmaceutics and Drug Delivery Systems
- Pharmacology
- Medicinal Chemistry and Drug Discovery
- Interdisciplinary Pharmaceutical Science

This Guidebook describes the curriculum, requirements, policies and procedures for the M.S. and Ph.D. programs in Pharmaceutical Science at Northeastern University. Policies and regulations applying to all graduate programs are established by the University Graduate Council. Additionally, each graduate degree-granting unit has further discretion for establishing discipline-specific policies within the limits defined by the University Graduate Council and the Graduate School of the College in which the program resides. The policies contained in this Guidebook for the M.S. and Ph.D. programs in Pharmaceutical Science are consistent with, and extend, those stipulated by the *Northeastern University Graduate Student Handbook* and the *Bouve College of Health Sciences Graduate Policies and Regulations*. The student should consult these sources for general regulations, policies and procedures covering such matters as credit requirements, student responsibilities, code of conduct, academic and co-curricular life, faculty rights and responsibilities, personnel policies, benefits, and services. If any information contained in this booklet conflicts with the general University policy, then the University policy will prevail. The University reserves the right to change the information contained in this document.

(Revised April, 2014)

The Master of Science in Pharmaceutical Science

Admissions Requirements

- A baccalaureate degree or equivalent in biology, chemistry, medical technology, pharmacy, chemical engineering, or related field.
- At least two semesters (2 semesters) undergraduate courses (or their equivalent) in each of the following: mathematics (including calculus), biology, physics, and organic chemistry.
- A minimum (undergraduate) grade-point average (GPA) of 3.000 or better.
- Test of English as a Foreign Language (TOEFL) must be taken by students whose native language is not English (minimum score: 100 internet based test).
- Official copy of score from the Graduate Record Examination (GRE). This test must have been taken in the last five years.
- Admissions are for the fall semester only.

Applicants with deficiencies in any of these areas may be admitted to the Master of Science level of study and allowed to take undergraduate courses at Northeastern University concurrently with certain graduate courses. Students admitted with deficiencies must remediate them during the first year of graduate work. Failure to do so will result in dismissal from the program. Applicants for the Master of Science Program can request full- or part-time study. However, an I-20 visa requires that a student be enrolled full-time. Full-time status means that a student must be registered for 8 SH credit each semester of the academic year or be taking a course that confers full-time status.

Curriculum Requirements

All M.S. programs in pharmaceutical science require a set of common courses taken by all students in the degree program. In addition, students in each specialization track are required to take a defined set of discipline-specific courses and a number of general electives. The number of specialization and elective courses differs slightly between tracks. The MS degree may be completed on either a full-time or part-time basis and may include a research / thesis option.

Pharmaceutical Science common courses – 5-7 SH

- PHSC 5100 Concepts in Pharmaceutical Science 2 SH
- PHSC 6210 Drug Design, Evaluation and Development 2 SH
- PHSC 6212 Research Skills and Ethics 1 SH OR
BIOL 6381 Ethics in Biological Research 2 SH OR
CHEM 5600 Research Skills and Ethics in Chemistry 3 SH

Specialization Courses – 16-20 SH

A minimum of six semester hours is required in this category depending on specialization. Students should consult with their advisor when selecting these courses. See details below for courses required for each specialization.

General Electives - 6–12 SH

Thesis credit of four semester hours (when available) may be used to partly fulfill this requirement.

Total number of credits 33 SH

M.S. in Pharmaceutics and Drug Delivery Systems

Pharmaceutical Science Common Courses – 5-7 SH

Pharmaceutics / Drug Delivery Specialization Courses – 16-20 SH

- PHSC 6214 Experimental Design and Biometrics 2 SH
- PHSC 6216 Human Physiology and Pathophysiology 2 SH
- PMST 6250 Advanced Physical Pharmacy 2 SH
- PMST 6252 Pharmacokinetics and Drug Metabolism 3 SH
- PMST 6254 Advanced Drug Delivery System 3 SH

- BIOL 6300 Graduate Biochemistry 4 SH OR
- PHSC 5300 Pharmaceutical Biochemistry 2 SH

- BIOL 6301 Molecular Cell Biology 4 SH OR
- PHSC 5310 Cellular Physiology 2 SH

General Electives – 6-12 SH

Advisor consultation is required when choosing electives.

Total number of credits 33 SH

M.S. in Pharmacology

Pharmaceutical Science Common Courses – 5-7 SH

Pharmacology Specialization Courses – 14-18 SH

- PHSC 6214 Experimental Design and Biometrics 2 SH
- PHSC 6216 Human Physiology and Pathophysiology 2 SH
- PMCL 6205 Pharmacology 1 2 SH
- PMCL 6206 Pharmacology 2 2 SH
- PMCL 6262 Receptor Pharmacology 2 SH

- BIOL 6300 Graduate Biochemistry 4 SH OR
- PHSC 5300 Pharmaceutical Biochemistry 2 SH

- BIOL 6301 Molecular Cell Biology 4 SH OR
- PHSC 5310 Cellular Physiology 2 SH

General Electives – 8-14 SH

Advisor consultation is required when choosing electives.

Total number of credits 33 SH

Interdisciplinary Specialization

Pharmaceutical Science Common Courses – 5-7 SH

Interdisciplinary Courses – 8-12 SH

- PHSC 6214 Experimental Design and Biometrics 2 SH
- PHSC 6216 Human Physiology and Pathophysiology 2 SH

- BIOL 6300 Graduate Biochemistry 4 SH OR
- PHSC 5300 Pharmaceutical Biochemistry 2 SH

- BIOL 6301 Molecular Cell Biology 4 SH OR
- PHSC 5310 Cellular Physiology 2 SH

Plus at least 10 SH from the following list of options:

- Any PHSC, PMCL, or PMST course
- Any BIOL or CHEM course (with permission of the advisor)

General Electives – 4-6 SH

Advisor consultation is required when choosing electives.

Total number of credits 33 SH

M.S. in Medicinal Chemistry

Pharmaceutical Science Common Courses – 5-7 SH

Medicinal Chemistry Specialization Courses – 24-28 SH

- PHSC 6214 Experimental Design and Biometrics 2 SH
- PHSC 6216 Human Physiology and Pathophysiology 2 SH
- CHEM 5626 Organic Synthesis 1 3 SH
- CHEM 5672 Organic Synthesis 2 3 SH
- PHSC 6222 Chemistry and Biology of Drugs of Abuse 3 SH
- PHSC 6224 Behavioral Pharmacology and Drug Discovery 2 SH
- PHSC 6226 Imaging in Medicine and Drug Discovery 2 SH
- CHEM 5676 Bioorganic Chemistry 3 SH

- BIOL 6300 Graduate Biochemistry 4 SH OR
- PHSC 5300 Pharmaceutical Biochemistry 2 SH

- BIOL 6301 Molecular Cell Biology 4 SH OR
- PHSC 5310 Cellular Physiology 2 SH

General Electives – 2-4 SH

Advisor consultation is required when choosing electives.

Total number of credits 33 SH

PSM in Biomedical Nanotechnology

Admission Prerequisites:

Calculus, Organic Chemistry, Biochemistry, Physiology

Year 1: Fall Semester

PHSC 5100 Concepts in Pharmaceutical Science 2SH

PHSC 5305 Professional Development in Pharmaceutical Sciences 1SH

NNMD 7270 Intro to Nanomedicine Science and Technology 3SH

PHSC 5300 Pharmaceutical Biochemistry 2SH

Year 1: Spring Semester

PHSC 6210 Drug Design, Evaluation, and Development 2SH

PHSC 7010 Pharmaceutical Sciences Laboratory 4SH

IDSC 7370 Nanosystems Design for Biology and Medicine 2SH

Year 1: Summer Semester

PHSC 6212 Research Skills and Ethics 1SH

Year 2: Fall Semester

PMST 6254 Advanced Drug Delivery Systems 3SH

ENTR 6200 Innovation and Enterprise Growth 3SH

LAW 7369 Intellectual Property Law 2SH

Year 2: Spring Semester

EECE 5698 Special Topics in Bio-Nanotechnology 4SH

TBD Special Topics in Nanotechnology and Law 1SH

ENTR 6212 New Venture Creation 3SH

Year 2: Summer Semester

PHSC 6401 Internship 1SH

Total number of credits 34 SH

Other requirements for the Master of Science:

Master of Science Thesis Option

Students who undertake a thesis are expected to document the results of extended research and make an original contribution to their field. This work should give evidence of the candidates' ability to conduct independent investigation and to interpret the results of their research in an acceptable manner.

- *Thesis Registration*

Students may receive a maximum of four semester hours of credit for M.S. thesis research. Students should register for PHSC 6990, Thesis, 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, the student should register for PHSC 6996 (0 SH) Thesis Continuation.

- *Thesis Committee*

The thesis committee should be composed of at least three members: two from the sponsoring program and the third from outside the student's program. The outside member may be a Northeastern University faculty member. The Director of the graduate programs in Pharmaceutical Science appoints any additional members considered necessary to this committee. The student's major adviser serves as the committee chairperson. The student, after consulting with the chairperson, is responsible for calling all 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 otherwise 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 form pages. The thesis proposal must be defended orally before the dissertation committee and signed by all dissertation committee members *before the student undertakes their planned research*. The signed facepage of the proposal should be submitted to the Director of the graduate program in Pharmaceutical Science and to the Bouve College graduate office.

- *Thesis Final Defense*

The final defense is taken after the student completes the thesis research and all other requirements for M.S. degree. The defense deals with the subject matter of the dissertation/ thesis, significant developments in the field, and the student's background knowledge in her/his field of specialization. The Dissertation/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 careful examination by the committee, recommendations may be made that the student clarify or rewrite portions of the thesis *before the final defense is scheduled*. Once the thesis committee concurs that the thesis is acceptable, a date is chosen for the final oral examination. At least one week prior to the defense, the student should inform the Graduate Program so that an announcement can be posted on the Department of Pharmaceutical Science website and distributed to faculty and students. The final defense is open to anyone who wishes to attend. The final defense typically lasts at least two hours. After presentation of the work by the student and responses to audience and committee questions, the committee meets in executive session to decide whether the student successfully defended the thesis. The committee's decision is then announced to the student. If the committee's vote has been favorable, the student incorporates committee suggestions and corrects any typographical errors, and the dissertation is signed and passed on to the Director of the Pharmaceutical Science graduate program. Requests for a second defense are unusual, irregular occurrences but may be permitted in the event that the previous oral defense was judged by the Committee to be inadequate.

- *Thesis Deadline*

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

General Policies Common to all M.S. Specializations

Grading policy

Students are expected to maintain a grade-point average of 3.0 (B) or better in all course work. Students whose cumulative grade-point average falls below 3.000 will receive written notification by the Graduate Committee that they have been placed on academic probation. Students on probation must meet with their academic advisor to devise a plan to clear the deficiency and return to non-probationary status. A student must clear the deficiency and return to non-probationary 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 with a grade of B or better. Moreover, any new courses taken during the intervening time must also be passed with a grade of B or better. Bouve College policy stipulates that a student may repeat a course only once to achieve a passing grade, and may repeat only two required courses during his/her entire program of study. A student may only be placed on probation twice during enrollment, and must correct the deficiencies as specified in the plan agreed upon with the advisor. Failure to remediate the deficiency and return to non-probationary status within the agreed upon time limit will result in the student's dismissal from the M.S. program.

Progression requirement

Bouve College policy expects that students register for coursework or continuation credit each semester of the academic year (fall and spring semesters) once they are matriculated as full- or part-time students. Moreover, international students are required to maintain full-time student status during the fall and spring semesters. Non-international students who are not able to register for courses during a particular semester must inform the Graduate Program Director in writing and state when they plan to resume their curriculum. Approval of this petition retains the student's status in the M.S. program. M.S. students are expected to complete all degree requirements within two to three years if enrolled on a full-time basis, or within three to five years on a part-time basis. If

progress toward the degree is slowed or interrupted for personal reasons, the student must petition the Pharmaceutical Sciences Graduate Committee for an extension of the expected time to completion. If an extension is approved, the student will be directed to meet with his/her academic advisor to devise a 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, are valid for a maximum of seven years between the time taken and the completion of degree requirements, unless the Graduate Committee grants an extension.

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 the student's responsibility to understand and uphold these policies. Definitions of plagiarism, cheating, fabrication, falsification, unauthorized collaboration, and actions that facilitate academic or research dishonesty are provided in *The Northeastern University Graduate Student Handbook* (<http://www.neu.edu/handbook/studenthandbook.pdf>) and the *Bouve College of Health Sciences Graduate Policies and Regulations*. The lack of knowledge of these definitions does not void the student's responsibility for upholding them. Offenses of academic honesty and research integrity are egregious violations of ethical standards and may result in the student's immediate dismissal from the graduate program.

Financial Information

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time. A listing of fees can be obtained from Student Accounts, 120 Hayden Hall, 617.373. 2270M.S. students are generally not eligible for stipended graduate assistantships (SGA's) but may be considered for part-time research support provided by faculty research grants.

Student Status and Registration

Applicants may be accepted as regular, provisional, or conditional students, and must confirm acceptance within the period designated in the acceptance letter. Students will be assigned an advisor from their program, and must confer with the advisor regarding an approved program of studies and course selection prior to registration. Registration is required for all courses, and entry is granted on a first-come, first-served basis.

The Doctor of Philosophy in Pharmaceutical Science

Admissions Requirements

- A baccalaureate degree or equivalent in biology, chemistry, medical technology, pharmacy, chemical engineering, or related field.
- At least two semesters (2 semesters) undergraduate courses (or their equivalent) in each of the following: mathematics (including calculus), biology, physics, and organic chemistry.
- A minimum (undergraduate) grade-point average (GPA) of 3.000 or better.
- Test of English as a Foreign Language (TOEFL) must be taken by students whose native language is not English (minimum score: 100 internet based test).
- Official copy of scores from the Graduate Record Examination (GRE) general portion. This test must have been taken in the last five years. Applicants who have received an M.S. degree from an accredited U.S. institution may waive the GRE requirement.
- Applicants for the Doctor of Philosophy must apply for full-time study only.
- Admissions are for the fall semester only.

Curriculum Requirements

The Doctor of Philosophy (Ph.D.) program is a full-time program of study requiring successful completion of coursework, a qualifying examination, and a research thesis. All specializations within Pharmaceutical Science require a common core curriculum. The remaining coursework may differ slightly as specialization and general elective requirements differ between the concentrations. All Ph.D. students must be enrolled full-time, requiring that students must register for 8 SH each semester (excluding summers) or else register for a course that confers full-time status.

Pharmaceutical Science common courses – 5-7 SH

- PHSC 5100 Concepts in Pharmaceutical Science 2 SH
- PHSC 6210 Drug Design, Evaluation and Development 2 SH
- PHSC 6212 Research Skills and Ethics 1 SH OR
BIOL 6381 Ethics in Biological Research 2 SH OR
CHEM 5600 Research Skills and Ethics in Chemistry 3 SH

Specialization Courses – 12-28 SH

A minimum of twelve semester hours is required in this category depending on specialization. Students should consult their advisor when selecting these courses. **NOTE:** The specialty portion of the Ph.D. Qualifying Examination is based on these courses. See details below for courses required for each specialization.

General Electives - 0-16 SH

Ph.D. Courses - 12 SH minimum

- PHSC 6300 Pharmaceutical Science Seminar 1 SH (must be taken at least 2x)
- PHSC 9681 Doctoral Proposal 2 SH
- PHSC 8940 Doctoral Training 1 SH
- PHSC 9810 Pharmaceutical Science Colloquium 1 SH
- PHSC 9892 Dissertation 3 SH (must be taken at least twice)

Total number of credits 45 SH

Specialization in Pharmaceutics and Drug Delivery Systems

Pharmaceutical Science Common Courses – 5-7 SH

Pharmaceutics / Drug Delivery Specialization Courses – 16-20 SH

- PHSC 6214 Experimental Design and Biometrics 2 SH
- PHSC 6216 Human Physiology and Pathophysiology 2 SH
- PMST 6250 Advanced Physical Pharmacy 2 SH
- PMST 6252 Pharmacokinetics and Drug Metabolism 3 SH
- PMST 6254 Advanced Drug Delivery System 3 SH

- BIOL 6300 Graduate Biochemistry 4 SH OR
- PHSC 5300 Pharmaceutical Biochemistry 2 SH

- BIOL 6301 Molecular Cell Biology 4 SH OR
- PHSC 5310 Cellular Physiology 2 SH

General Electives – 6-12 SH

Advisor consultation is required when choosing electives.

Ph.D. Core - 12 SH

Total number of credits 45 SH

Specialization-specific non-course requirements:

- Participation in the weekly Pharmaceutics Seminar / Journal Club

Ph.D. in Pharmacology

Pharmaceutical Science Common Courses – 5-7 SH

Pharmacology Specialization Courses – 14-18 SH

- PHSC 6214 Experimental Design and Biometrics 2 SH
- PHSC 6216 Human Physiology and Pathophysiology 2 SH
- PMCL 6205 Pharmacology 1 2 SH
- PMCL 6206 Pharmacology 2 2 SH
- PMCL 6262 Receptor Pharmacology 2 SH

- BIOL 6300 Graduate Biochemistry 4 SH OR
- PHSC 5300 Pharmaceutical Biochemistry 2 SH

- BIOL 6301 Molecular Cell Biology 4 SH OR
- PHSC 5310 Cellular Physiology 2 SH

General Electives – 8-14 SH

Advisor consultation is required when choosing electives.

Ph.D. Core - 12 SH

Total number of credits 45 SH

Specialization-specific non-course requirements:

- Participation in the weekly Pharmacology Journal Club

Ph.D. in Medicinal Chemistry and Drug Discovery

Pharmaceutical Science Common Courses – 5-7 SH

Medicinal Chemistry / Drug Discovery Specialization Courses – 10 SH

- PHSC 6222 Chemistry and Biology of Drugs of Abuse 3 SH
- PHSC 6224 Behavioral Pharmacology and Drug Discovery 2 SH
- PHSC 6226 Imaging in Medicine and Drug Discovery 2 SH
- CHEM 5676 Bioorganic Chemistry 3 SH

General Electives – 18-20 SH

Advisor consultation is required when choosing electives.

Ph.D. Core - 12 SH

Total number of credits 45 SH

Specialization-specific non-course requirements:

- Participation in Medicinal Chemistry and Drug Discovery Journal Club

Interdisciplinary Specialization

The interdisciplinary Ph.D. specialization is intended to meet the needs of students interested in combining courses and skills from different areas of specialization. At least one of the specialization areas must come from within the Department of Pharmaceutical Sciences. The second area may come from a department in another College at Northeastern University, such as biology, chemistry, or engineering, or from a different institution. The areas of academic concentration are reflected in the coursework, qualifying examinations, and dissertation work undertaken by the student. The thesis advisor must be a tenured or tenure-track member of the Department of Pharmaceutical Sciences.

The Pharmaceutical Science Common courses are required. Specialization and General Elective courses are selected and approved by the student in conjunction with the advisor. Students electing the interdisciplinary option must fulfill the same requirements as all other PhD candidates.

Pharmaceutical Science Common Courses – 5-7 SH

Interdisciplinary Courses – 8-12 SH

- PHSC 6214 Experimental Design and Biometrics 2 SH
- PHSC 6216 Human Physiology and Pathophysiology 2 SH

- BIOL 6300 Graduate Biochemistry 4 SH OR
- PHSC 5300 Pharmaceutical Biochemistry 2 SH

- BIOL 6301 Molecular Cell Biology 4 SH OR
- PHSC 5310 Cellular Physiology 2 SH

Plus at least 10 SH from the following list of options:

- Any PHSC, PMCL, or PMST course
- Any BIOL or CHEM course (with permission of the advisor)

General Electives – 4-6 SH

Advisor consultation is required when choosing electives.

Ph.D. Core - 12 SH

Total number of credits 45 SH

Specialization-specific non-course requirements:

- Weekly participation in one of the Department's Journal Clubs, e.g. the Pharmacology/Toxicology Journal Club, Pharmaceutics Journal Club, or the Medicinal Chemistry and Drug Discovery Journal Club

General Policies Common to all Ph.D. Specializations

Grading policy

Students are expected to maintain a grade-point average of 3.0 (B) or better in all course work. Students who receive an F grade in required courses will be dismissed from the PhD program and may petition the Graduate Committee for admittance to the master's level of study. Students whose cumulative grade-point average falls below 3.000, or who receive a grade of C in a core course, will receive written notification by the Graduate Committee that they have been placed on academic probation. Students on probation must meet with their academic advisor to devise a plan to clear the deficiency and return to non-probationary status. A student must clear the deficiency and return to non-probationary 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 with a grade of B or better. Moreover, any new courses taken during the intervening time must also be passed with a grade of B or better. Bouve College policy stipulates that a student may repeat a course only once to achieve a passing grade, and may repeat only two required courses during his/her entire program of study. A student may only be placed on probation twice during enrollment, and must correct the deficiencies as specified in the plan agreed upon with the advisor. Failure to remediate the deficiency and return to non-probationary status within the agreed upon time will result in the student's dismissal from the Ph.D. program.

Colloquium attendance

All Ph.D. students are required to attend the weekly Pharmaceutical Science Colloquium series. Announcements of times and locations of these seminars are listed on the Department web site, distributed weekly to students mailboxes and by e-mail to their University e-mail addresses. Attendance is monitored by sign-up sheet at each Colloquium. One excused absence is permitted per semester. Failure to regularly attend Colloquia may result in sanctions such as probation or dismissal from the Ph.D. program.

Journal Club participation

Each field of specialization sponsors a weekly Journal Club at which students present and evaluate the current scientific literature of their field. Students in Pharmaceutics and Drug Delivery are required to attend the weekly Pharmaceutics Journal Club, whereas student in the Pharmacology specialization are required to attend the Pharmacology Journal Club. Students in the Medicinal Chemistry and Drug Discovery specialization are required to attend Journal Club in the Center for Drug Discovery. Students in the Interdisciplinary Ph.D. program must also attend one of these. Attendance at one of these Journal Clubs is required each academic semester. Further, each student is required to participate in Journal Club for course credit (**PHSC 6300** Pharmaceutical Science Seminar) at least twice during their course of study. Failure to regularly attend Journal Club may result in sanctions such as probation or dismissal from the Ph.D. program.

Doctor of Philosophy Qualifying Examination

Students are expected to take the Ph.D. qualifying examination after completion of their second year in the program. The qualifying examination tests students' knowledge and skills in both required courses and specific content areas. This examination is composed of two parts: a series of written examinations in the student's field of specialization, and a general oral examination. The dates of the written examinations will be announced at least 2 months before the exams and all students qualified to sit for the examinations will be expected to take the exam at the times announced. The oral examination for each student will be scheduled within approximately two weeks after successful completion of the written part.

Students are required to pass two of a maximum of three written examinations on different content areas within their specialization. No fewer than three faculty will contribute questions for the written examinations for each student, and no faculty will write more than the equivalent of one entire exam. The Graduate Committee proposes to the Graduate Director the examiners, the topics and dates of the written exams, and the Graduate Director then informs the students and faculty involved at least 2 months in advance. The format for the written examinations may vary between specializations, e.g. faculty in some disciplines may ask a series of comprehensive essay questions, whereas others may provide a research paper from the biomedical literature and ask questions based upon its content. The written examinations are scheduled within two weeks of each other and graded by the providers of the question(s). A score of 70 or above is a passing grade for each written exam. A student who fails to pass 2 written exams will be required to withdraw from the PhD program. Students must pass the written portion of the exam prior to taking the oral examination. The oral qualifying exam should be scheduled and completed within 2 months of completing the written qualifying exam.

The oral examining committee consists of at least four faculty: the dissertation advisor; at least two other members of the Pharmaceutical Sciences faculty; and at least one member from outside the Department. Members are selected by the advisor and/or Program Director, in consultation with the student. The oral exam is graded on a pass/fail basis. Students who fail the oral examination on the first attempt may retake the exam within a time period designated by the oral examining committee, but not to exceed 6 months. Those who fail twice will be dismissed from the program. The two parts of the qualifying examination must be completed before the thesis proposal is defended.

Doctoral Candidacy

Doctoral students who have completed a minimum of 33 hours of graduate credit beyond the bachelor's degree and who have passed the written and oral qualifying examinations are admitted to candidacy for the doctoral degree.

Doctoral Dissertation

Doctoral students must complete a dissertation that embodies the results of extended research and makes an original contribution to their field. This work should give evidence of candidates' ability to conduct independent investigation and interpret the results of their research in an acceptable manner. The doctoral dissertation advisor serves as chairperson of the Dissertation Committee, which consists of no fewer than five members. Selection of an advisor is by mutual consent of the student and a member of the faculty, with approval by the Director of the Pharmaceutical Science graduate program. At least two members of the committee must

be Pharmaceutical Sciences faculty members. At least one member is to be selected from outside the Department. Individuals are chosen for their expertise in the student's area of research. Doctoral students should select a dissertation advisor in the second year of the program and are expected to begin research and demonstrate satisfactory proficiency in the laboratory before taking the Ph.D. qualifying examination.

- *Dissertation Proposal Defense*

Within a year after completion of the qualifying examination, but not later than the beginning of the fall semester of the fourth year, students should prepare and defend a written proposal detailing their planned thesis project. Failure to do so will be regarded as failure to progress in the Ph.D. program and will result in a warning from the Graduate Director. Students who do not correct the deficiency within one semester will be placed on probation. The student on probation must complete the thesis proposal defense and return to non-probationary status within one semester or will be dismissed from the Ph.D. Program.

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 otherwise 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 form pages. The thesis proposal must be defended orally before the dissertation committee and signed by all dissertation committee members *before the student undertakes their planned research*. A copy of the signed facepage of the proposal should be submitted to the Director of the graduate program in Pharmaceutical Science and to the Bouve College graduate office.

- *Progress Reports*

The dissertation committee meets at 6 month intervals, but not less than once a year, to evaluate the student's research progress and to be presented with written and oral progress reports on the direction and status of the research. The progress report should be written in a brief format, identical to that described for the formal thesis (see *Instructions for Preparation of the Thesis*). Low productivity or unsatisfactory work provides the basis for a warning by the dissertation committee and/or the Graduate Education Committee. Two such warnings will result in a student's dismissal from the program.

- *Registration for Dissertation*

Advisor consent and completion of all course work (with the exception of the Colloquium course) must be documented before students register for the first dissertation course. Students must register for PSC G892, "Dissertation," for at least two semesters and up to a maximum of three semesters, and then for PSC G899, "Dissertation Continuation," each semester thereafter until the thesis has been successfully defended. Students are given a maximum of five years after establishing degree candidacy to complete the degree requirements.

- *Publications and Presentations*

Prior to completion of PhD training, the candidate must present his/her thesis research either as a poster or podium presentation at a regional or national (off-campus) scientific conference. Also prior to completion, the candidate's thesis data must be included in at least one submitted (preferably published) peer-reviewed manuscript

- *Ph.D Thesis Preparation*

Detailed guidelines for the format and content of the written dissertation are given in *Instructions for Preparation of the Thesis*. The completed thesis document should be reviewed first by the thesis advisor. Feedback from the advisor should be incorporated into the thesis before distribution of the document to the dissertation committee. The completed thesis should be delivered to dissertation committee members not less than two weeks before the scheduled oral defense.

- *Oral Defense*

The final oral examination is taken after the student completes the Ph.D. thesis research and all other requirements for Ph.D. degree. The defense deals with the subject matter of the dissertation/ thesis, significant developments in the field, and the student's background knowledge in her/his field of specialization. The Dissertation/Thesis Committee conducts the final defense. The committee may recommend that the student clarify or rewrite portions of the thesis *before the final defense is scheduled*. Once the committee concurs that that thesis is acceptable, a date is chosen for the final oral examination. At least one week prior to the defense, the student should inform the Graduate Program Director so that an announcement can be posted on the Department of Pharmaceutical Science website and distributed to faculty and students. The final defense is open to anyone who wishes to attend. The final defense typically lasts at least two hours. After presentation of the work by the student and responses to audience and committee questions, the committee meets in executive session to decide whether the student successfully defended the thesis. The committee's decision is then announced to the student. If the committee's vote has been favorable, the student incorporates committee suggestions and corrects any typographical errors, and the dissertation is signed and passed on to the Director of the Pharmaceutical Science graduate program. Requests for a second defense are unusual, irregular occurrences but may be permitted in the event that the previous oral defense was judged by the Committee to be inadequate.

- *Deadline*

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

Pharmaceutical Science Colloquium

Each Ph.D. candidate nearing completion of their research is required to present their thesis findings at a Pharmaceutical Sciences Colloquium. This presentation should be scheduled at least 6 months before the anticipated completion of the thesis. The student

must register for PSC G892 Pharmaceutical Sciences Colloquium during the semester that the colloquium presentation is to be given.

Time for Completion of Program

The time required for a student to complete the Ph.D. varies, depending on the individual, specialization and advisor. Students are expected to complete their degrees in four to six years, depending on their motivation and the progress of their research. If progress toward the degree is slowed or interrupted for personal reasons, the student must petition the Pharmaceutical Sciences Graduate Committee for an extension of the expected time to completion. If an extension is approved, the student will be directed to meet with his/her academic advisor to plan an alternate plan for completion of the degree. Course credits earned in the Bouvé College of Health Sciences Graduate School, or accepted for transfer from another institution, are valid for a maximum of seven years between the time taken and the completion of degree requirements, unless the Graduate Committee grants an extension.

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 the student's responsibility to understand and uphold these policies. Definitions of plagiarism, cheating, fabrication, falsification, unauthorized collaboration, and actions that facilitate academic or research dishonesty are provided in *The Northeastern University Graduate Student Handbook* (<http://www.neu.edu/handbook/studenthandbook.pdf>) and the *Bouvé College of Health Sciences Graduate Policies and Regulations*. The lack of knowledge of these definitions does not void the student's responsibility for upholding them. Academic dishonesty and misconduct in research are regarded as egregious violations of ethical standards and may result in the student's immediate dismissal from the graduate program.

Assistantships

Northeastern University offers a variety of forms of financial assistance to help graduate students defray the costs of their education.

- *Stipended Graduate Assistantship (SGA)*

Stipended Graduate Assistantships are a category of financial aid provided to Ph.D. students at Northeastern University. SGA's provide non-taxable tuition remission and a taxable cash stipend. Awards do not cover University fees other than tuition; all non-tuition fees must be paid by award recipients. Each recipient receives a contract letter detailing the terms of their specific assignment. Only full-time graduate students are eligible to receive SGA awards. To be eligible for an SGA, a student must request SGA support, accept the conditions of the award, and be in good academic standing. Acceptance of an SGA requires a work commitment of 20 hours per week. The balance of the student's full-time effort is expected to be devoted to pursuit of degree requirements, e.g. coursework and thesis research.

The SGA's awarded to students in Pharmaceutical Sciences may be either teaching assistantships (TA's) or research assistantships (RA's), depending on the source of the funds and the work to be performed by the student. Students who are supported by Teaching Assistantships and Research Assistantships are employees of Northeastern University during the term of their award, and they work under the direction of the faculty member who is designated as their supervisor.

Teaching Assistants provide help to a faculty member in teaching undergraduate courses. The assignment of TA's to specific courses or faculty is made by the Director of the Graduate Program upon consultation with the Graduate Education Committee. TA's may be asked to grade examinations, supervise student laboratory exercises, prepare for laboratory exercises, proctor examinations, tutor students or offer review sessions. Supervisors report the performance of TA's to the Graduate Committee. Students who fail to meet their obligations as TA's will receive a warning from the Graduate Committee. The Graduate Director retains the authority to withdraw the stipend for a TA whose performance is unreliable, inadequate or unsatisfactory.

Research Assistants are supported on a research grant provided by a faculty member and are offered by the faculty member holding the grant. The term of support, amount of the stipend, and specific duties are stipulated by the research plan and the budget allocated in the grant, and are at the discretion of the faculty member. The duties involve meeting the goals of the grant-funded research project and may or may not overlap the student's thesis research. The supervisor retains the right to discontinue support if the student fails to meet obligations, or performs in an unsatisfactory manner in conducting the research.

Financial Information

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time. A listing of fees can be obtained from Student Accounts, 120 Hayden Hall, 617.373. 2270. Ph.D. students are exempted from tuition unless requested otherwise by the student, and will receive a stipend for living expenses and health insurance coverage.

Student Status and Registration

Applicants may be accepted as regular, provisional, or conditional students, and must confirm acceptance within the period designated in the acceptance letter. Students will be assigned an advisor from their program, and must confer with the advisor regarding an approved program of studies and course selection prior to registration. Registration is required for all courses, and entry is granted on a first-come, first-served basis.

Non-traditional PhD Policies

- 1) Prospective PhD student entering through the non-traditional pathway will first require a faculty sponsor/mentor.
- 2) There will be no departmental financial aid available to PhD students who enter through the non-traditional pathway.
- 3) Transcripts and other application material need to be submitted by the candidate and will be reviewed by the Graduate Committee. The Graduate Committee will serve as a primary screen for eligibility of the candidate into our doctoral program.
- 4) A prior MS degree in Pharmaceutical Sciences or a related field (as determined by the Graduate Committee) is required. If the degree is awarded from Northeastern University, the candidate will be exempt from didactic courses. If the degree is awarded from another institution, the Graduate Committee will review the transcripts to evaluate any deficiencies and proper coursework for progress.. All students will take the following:
 - Ph.D. Courses - 12 SH minimum
 - PHSC 6300 Pharmaceutical Science Seminar 1 SH (must be taken more than once)
 - PHSC 8940 Doctoral Training and Research 1 SH
 - PHSC 9681 Doctoral Proposal 2 SH
 - PHSC 6810 Pharmaceutical Science Colloquium 1 SH
 - PHSC 9990 Dissertation 2 SH (must be taken at least twice)
- 5) If the candidate meets our admission requirements, he/she will be asked to visit the campus and meet with the faculty mentor. The supervisor/sponsor from the company will also join this meeting.
- 6) At this meeting, the candidate and sponsor from industry will work with the faculty mentor to develop a student progression plan and preliminary dissertation research proposal. Tuition and research expenses will be included in the student progression plan.
- 7) The progression plan and doctoral proposal will be formally presented to the University through the Technology Transfer Office. Any confidentiality/IP issues will be addressed through the Technology Transfer Office and the company lawyer(s). The dissertation work must be open to publication and presentation.
- 8) Upon completion of the agreement between the University and the company, the progression plan and the dissertation proposal will be submitted to the Graduate Committee.
- 9) The student will be formally accepted into the doctoral program.
- 10) The candidate will be expected to meet the departmental requirements and pass the qualifying exam, defend the dissertation research proposal, attend departmental seminars, provide progress reports, and successfully defend the dissertation within a period of **3 years or less**.
- 11) Every 6 months, the Graduate Committee will request that the faculty mentor provide a written status of the candidate's progress towards PhD.

Course Descriptions Pharmaceutical Science

PHSC 5100 Concepts in Pharmaceutical Science 2 SH

This course will introduce new students in the Pharmaceutical Science Graduate Program to important concepts in medicinal and combinatorial chemistry as they relate to drug discovery, and a brief overview of pharmacology, drug metabolism, pharmacokinetics, and toxicology. In addition, the students will be introduced to the major drug receptor families and their signaling pathways.

PHSC 5200 Advanced Immunology and Immunological Therapies 2 SH

Offers an interactive course about molecular principles of immunity and ways to manipulate it. Provides instructive overview of molecular and cellular bases of the immunological diseases. Highlights the problems of modern clinical immunology and immunotherapies. Summarizes the molecular and cellular mechanisms by which the immune system protects the host from disease. Studies clinical cases of examples of the failure of immunity to some infections and, on the other hand, how inappropriate immune responses can themselves cause disease, such as with allergy and autoimmunity. Describes the pharmacological and physiological regulation of immune response and explains biotechnological approaches to develop new effective vaccines and immunotherapies.

PHSC 5300 Pharmaceutical Biochemistry 2 SH

Offers students an opportunity to obtain an understanding of the principles of physiological chemistry. Focuses in-depth on the major topics of physiological chemistry, including general chemistry and biomolecules, peptide synthesis and protein structure, carbohydrates and nucleic acids, thermodynamics and kinetics of molecular interactions, and colloids and micelles. Relates biochemical information to the specific areas of pharmacology, pharmaceuticals, and drug discovery/development.

PHSC 5305 Professional Development for Pharmaceutical Sciences 1 SH

Introduces and examines the goals, expectations, policies, and procedures of the Masters' in Pharmaceutical Sciences internship program and professionalism in the field. Discusses the role and involvement of internship employers. Offers students an opportunity to develop job search and career management skills; assess their workplace skills, interests, and values; discuss how those qualities impact career decisions; prepare a professional resumé; and learn proper interviewing techniques. Issues of ethics and professionalism are designed to inform students of issues they will face in the pharmaceutical field. Content of this course is geared to students' participation in the internship program and overall professional development in pharmaceutical sciences

PHSC 5310 Cellular Physiology 2 SH

Focuses in-depth on the major cellular physiological mechanisms, including physiology of the cell membrane, ion channels and transport phenomena, energy production, signal transduction, synapses, and physiological processes in the cytosol. Relates physiological information on the specific areas of pharmacology, pharmaceuticals, and drug discovery/development. Offers students an opportunity to obtain an understanding of the principles of cellular physiology.

PHSC 6210 Drug Design, Evaluation and Development 2 SH

This course will teach students the concepts of using immunological, genomic, and proteomic techniques to find novel drug targets. In addition, the students will be introduced to the concepts of drug targeting and dosage forms, *in vivo/in vitro* drug screening, and the importance of pharmacogenetics to explain variability in drug reactions. *Prereq. PHSC 5100.*

PHSC 6212 Research Skills and Ethics 1 SH

This course will teach students the basics of laboratory safety, safekeeping\ laboratory data, and the process of writing a grant proposal. In addition, case studies will explore the concepts of data distortion or fabrication, conflicts of interest, confidentiality, ethical aspects of peer review, and the attribution of credit in science.

PHSC 6214 Experimental Design and Biometrics 2 SH

Discusses fundamental principles of experimental design and statistical analysis, with particular emphasis on clinical research. Topics include descriptive statistics, hypothesis testing, analysis of variance, correlation, regression, chi square test, and non-parametric methods.

PHSC 6216 Human Physiology and Pathophysiology 2 SH

Introduces major topics in human physiology, emphasizing knowledge essential to health-related laboratory research. Topics include neurophysiology, immunology, cardiovascular, respiratory, renal and gastrointestinal physiology, and endocrinology.

PHSC 6218 Biomedical Chemical Analysis 2 SH

Presents the modern reagents, techniques, and instrumentation used to analyze biological samples and purify their components (e.g. drugs, metabolites, hormones, macro-molecules, organelles, and cells) in health and disease. Emphasizes basic concepts and mechanisms at the molecular level, and applications to human samples. *Prereq. BIOL 6300 and BILO 6301.*

PHSC 6222 The Chemistry and Biology of Drugs of Abuse 2 SH

This course provides an interdisciplinary introduction to substance abuse including the medicinal chemistry and neurobiology of drugs that act through the opioid, dopamine, acetylcholine, and cannabinoid systems. Neurochemical mechanisms that are common to many addictive agents, and those that are specific to individual drug classes, are compared and contrasted. The involvement of the brain dopamine system is highlighted, and differences and similarities between the pharmacology of abused and therapeutic drugs are discussed, together with the development of medications for treating drug dependence. The course includes lectures by experts on particular topics on their own recent research. Students are introduced to key aspects of biological and chemical research as they pertain to drug abuse and its treatment.

PHSC 6224 Behavioral Pharmacology and Drug Discovery 2 SH

This course prepares students to understand the advantages, shortcomings and pitfalls of the use of live, behaving animals in drug discovery. The material covered includes an in-depth analysis of ethical issues in animal research. Other general topics include: aspects of animal behavioral models; behavior and brain biochemistry, and methods of behavioral analysis. Specific topics include: psychopharmacology; fear and anxiety; pain and stress; depression and reward; general arousal, and tolerance, drug abuse and habitual behaviors. The ways in which animal behaviors can be described in a quantitative manner and the effects of medications and abused drugs quantified and related to human diseases and drug responses, are an important component of the course.

Prereq. PHSC 5100 and CHEM 6200 or PHSC 6212

PHSC 6226 Imaging in Medicine and Drug Discovery 2 SH

This course prepares students to understand modern non-invasive medical imaging modalities, principally positron emission tomography (PET) and magnetic resonance imaging (MRI), used in metabolic and functional studies. The course reviews the basic science of magnetic resonance and radioactivity and radiation measurement, as well as tracer kinetics, but concentrates on applications. Topics covered include a survey of clinical radiological studies; clinical and preclinical human drug discovery and development research involving imaging, and the development and uses of radiopharmaceuticals and other contrast agents for imaging modalities including x-rays and ultrasound as well as PET and MRI.

PHSC 6290 Biophysical Methods in Drug Discovery 2 SH

Provides an interdisciplinary introduction to biophysical methods used in modern drug discovery, including hit generation and lead optimization. Emphasizes key experimental methods, including nuclear magnetic resonance (NMR) spectroscopy and X-ray crystallography, as well as computer modeling as applied to ligand- and structure-based drug design. Includes lectures by experts on related topics from their recent drug-discovery research. Presented under the auspices of the Center for Drug Discovery

PHSC 6300 Pharmaceutical Science Seminar 1 SH

A Journal Club format teaches the students to critically evaluate the scientific literature. Several sections may be offered each semester to accommodate different specializations or interest groups. Students normally register twice in their 3rd year.

PHSC 6314 Special Topics of Pharmaceutical Science 2 SH

Course content depends on the instructor.

PHSC 7010 Pharmaceutical Sciences Laboratory 4 SH

Offers a hands-on graduate laboratory course that introduces students to the investigative approaches and laboratory methods used in contemporary pharmaceutical sciences research. Laboratory exercises have a practical relationship to essential techniques in modern drug discovery, drug targeting and delivery and determining mechanisms of drug action. These exercises are designed to provide the student with (1) basic laboratory skills, (2) the rationale for and application of standard laboratory methods, (3) training in the use of equipment and techniques central to pharmaceutical sciences research, (4) maintaining a laboratory notebook, (5) statistical analysis and interpretation of data, and (6) presentation of research results in technical laboratory reports. Prereq. BIOL 6300; pharmaceutical sciences and biotechnology students only.

Prereq. BIOL 6300; pharmaceutical sciences and biotechnology students only

PHSC7020 Scientific Writing: Thesis Proposal 2 SH

Presents the principles of writing a proposal based on the NIH R01 grant proposal template used by the department. Participants develop their own proposal in collaboration with their faculty advisor or the immediate project supervisor designated by their faculty advisor (the project principle investigator). Offers students an opportunity to meet with their own project principle investigators to develop content and map out the project aims and experimental design and to produce a revised draft of their thesis proposal.

Prereq. Each student must have initiated MS or PhD thesis research and have some preliminary data; PhD students must have passed their qualifying exam; MS students must petition the graduate committee in writing for permission to enroll; pharmaceutical sciences students only.

PHSC 7030 Working with Radioactive Drugs 1 SH

Offers students an opportunity to learn through a combination of lectures, readings, and hands-on laboratory work how to conduct experiments with radioactive drugs and other radio-labeled compounds in a manner that is safe, that is compliant with federal and state regulations, and that generates scientific data of high quality.

PHSC 6401 Pharmaceutical Science Internship 1 SH

An experiential component of the graduate curriculum that fosters professional development through summer internship in drug discovery, development, and/or regulatory affairs in pharmaceutical or biotechnology companies. Students will engage in pharmaceutical science research or work in an environment outside the university but under the supervision of a faculty instructor.

Prereq. Permission of program director.

PMCL 6260 Pharmacology 1 2 SH

Surveys the chemical and pharmacological basis of the major classes of drugs and their use in the treatment of disease. Characteristics of drugs studied include indications, adverse reactions, contraindications, structure-activity relationships, metabolism, mechanism of action, and clinically significant interactions. *Prereq. PHSC 5100 and PHSC 6216 or permission of instructor.*

PMCL 6261 Pharmacology 2 2 SH

Continues Pharmacology 1, although in a format that is not contingent that Pharmacology 1 precedes this course.

Prereq. PHSC 5100 and PHSC 6216 or permission of instructor.

PMCL 6262 Receptor Pharmacology 2 SH

Reviews receptors for drug substances and for endogenous ligands in a format that combines lecture presentations and discussion. Focuses on the evaluation of current literature. Covers techniques available to study receptors, various models for receptor-ligand interactions, stereochemical aspects of receptor interactions, receptor mediated coupling mechanisms, and evaluation of several specific receptor systems.

Prereq. PHSC 5100 or permission of instructor.

PSMT 6250 Advanced Physical Pharmacy 2 SH

This course covers the physical and chemical principles in drug formulation design with emphasis on topics such as solutions of non-electrolytes and electrolytes, ionic equilibria, drug complexation, reaction kinetics, mass transport, and interfacial phenomena.

Prereq. Permission of instructor.

PMST 6252 Pharmacokinetics and Drug Metabolism 3 SH

This course will focus on concepts of one- and two-compartment linear and non-linear pharmacokinetics and compartmental modeling with plasma and/or urinary data. Principles and methods of metabolic biotransformation and disposition of xenobiotics in biological system will be discussed. *Prereq. Permission of the instructor.*

PMST 6254 Advanced Drug Delivery System 3 SH

This course will examine in depth the role of sustained, controlled, and site-specific delivery systems for drugs and genetic materials using polymeric systems, colloidal drug delivery systems, and vectors for gene therapy.

Prereq. Permission of the instructor.

PMST 6256 Advanced Pharmacokinetics 2 SH

Topics include derivation of general equations for linear and nonlinear mammillary models by using Laplace transform, input-disposition functions and general partial fraction theorem. Explores development of compartmental, physiological, and stochastic models.

PMST 6258 Advanced Pharmacokinetics and Toxicology 3 SH

Focuses on expanding prior basic pharmacokinetics to more advanced topics required for specialized work in research, clinical, and industrial settings. Using presentation and class participation, offers students an opportunity to become familiar with various analyses and modeling techniques, including compartmental/physiologic models, pharmacokinetic-pharmacodynamic analysis and modeling, and toxicokinetics/toxicodynamics. *Prereq. PMST 6252 or equivalent graduate pharmacokinetics course with calculus.*

PHSC 5976 Directed Study 1 SH

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. *Prereq. PHSC 5100 with a grade of C and junior, senior, or graduate standing*

PHSC 6984 Pharmaceutical Science Research 2 SH

Students will engage in laboratory research under the guidance of an adviser.

PHSC 6990 Thesis 2 SH

Students will engage in a thesis project under the guidance of an adviser

PHSC 7661 Pharmaceutical Science Research 2 2 SH

Continues Pharmaceutical Science Research 1.

PHSC 8669 Master's Full-time Research 0 SH

Student is expected to conduct full-time research in an adviser's laboratory. Confers full-time status

PHSC 9681 Doctoral Proposal 2 SH

Offers preparation of PhD dissertation proposal and proposal defense before dissertation committee.

PHSC 6990 Thesis 2 SH

Research/experimental work for Master's thesis. Students may register twice. *Prereq. Permission from program director.*

PHSC 6996 Thesis Continuation 0 SH

Continued registration while student completes Master's thesis or other research project to meet the research requirement in Pharmaceutical Science. Confers full-time status.

PHSC 7760 Doctoral Pharmaceutical Science Research 1 2 SH**PHSC 7761 Doctoral Pharmaceutical Science Research 2 2 SH****PHSC 8940 Doctoral Training and Research 0 SH**

Intended to show full-time status for pharmaceutical science PhD students in the semester in which they are taking the comprehensive exam. In addition to successfully completing the comprehensive exam, students are expected to perform research in preparation for the doctoral proposal; the grade for this course documents successful performance. *Prereq. Restricted to pharmaceutical science PhD students wishing to establish doctoral candidacy.*

PHSC 9810 Pharmaceutical Science Colloquium 1 SH

Intended to show full-time status during the semester students present one formal seminar on their research. This presentation will be open to all those interested. Confers full-time status.
Prereq. Permission of program director and completion of PHSC 9892 at least twice.

PHSC 9869 Doctoral Full-time Research 0 SH

Student is expected to conduct full-time research in an adviser's laboratory. Confers full-time status

PHSC 9892 Dissertation 2 SH

Research/experimental work for PhD thesis. Students may register three times. Confers full-time status
Prereq. PHSC 8681, permission of program director.

PHSC 9899 Dissertation Continuation 0 SH

Continuation of PhD dissertation research. Confers full-time status
Prereq. Permission of program director and completion of PHSC G9892 three times.

Requirements and Regulations for Department of Pharmaceutical Science Internships

In order to enhance the practical training of our programs, Internship provides an experiential component of the graduate curriculum that fosters professional development through work in drug discovery, development, and/or regulatory affairs in pharmaceutical, medical device or biotechnology companies. Students engage in pharmaceutical science research or work in an environment outside the University but under the supervision of a faculty advisor.

Internship Rules:

1. Taking internship must not extend an international student's visa
2. The student must have completed two semesters with a GPA of 3.0 or better, be in good academic standing and have no instances of academic dishonesty, no blocks on enrollment, and no repeated courses.
3. Students are responsible for finding their own internship, but they are prohibited from misrepresenting their CV (Resume). This requires that prior to looking for an internship, their faculty advisor must approve their CV and ascertain to the best of his/her ability that the skills and training of the student are as presented.
4. Students must register for the Internship course PHSC 8401 and get signed approvals from a) the Graduate Program Director, b) the Bouve Graduate Office, and c) the ISSI (only if the student is on a visa), in that order. If the student is on an international student visa, the student is also required to file the paperwork for Curricular Practical Training.
5. MS Students may take internship in either or both summer sessions of the full-time program. Students with a GPA greater than 3.2 may petition the graduate committee to take internship during academic semesters (fall or spring). PhD candidates (post qualifying exam) are exempt from the GPA requirement, but require approval of their academic advisor. PhD students may not take internship during semesters they are supported by an SGA. International students are reminded that internships totaling more than 52 weeks will eliminate the possibility of post-graduation OPT (Optional Practical Training).
6. In order to receive a grade for the course, the student must write at least a two page paper describing what they did for their internship and what they learned from it. In addition, the supervisor for the internship will be asked to reply to a questionnaire about the student's performance.
7. Internship gives full-time status to the student, but can be taken with other courses if these do not conflict with the internship.

Other Information

The following numbers are listed for your convenience so that you may contact these offices for further information:

Office of Graduate Financial Aid 617.373.5899

Department of Residential Life 617.373.2814

Bouvé College of Health Sciences Graduate Programs Office 617.373.2708, or check the Website at www.northeastern.edu/bouve/gradstudent/index.html

The Disability Resource Center provides a variety of disability-related services and accommodations to Northeastern University's students and employees with disabilities. Northeastern University's compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 are coordinated by the dean and director of the Disability Resource Center. Persons requiring information regarding the Disability Resource Center should contact 617.373.2675 (voice) or 617.373.2730 (TTY).

Northeastern University assumes no liability for delay or failure to provide educational or other services or facilities due to causes beyond its reasonable control. Causes include, without limitation, power failure, fire, strikes by University employees or others, damage by natural elements, and acts of public authorities. The University will, however, exert reasonable efforts, when it judges them to be appropriate, to provide comparable services, facilities, or performance; but its inability or failure to do so shall not subject the University to liability.

Northeastern University is an equal opportunity/affirmative action educational institution and employer.

Northeastern University is committed to assisting all members of the University community in providing for their own safety and security. Information regarding campus security and personal safety, including topics such as crime prevention, University Police law-enforcement authority, crime reporting policies, crime statistics for the most recent three-year period, and disciplinary procedures, is available upon request from the Northeastern University Director of Public Safety, 360 Huntington Avenue, Boston, MA 02115 or by calling 617.373.2696 or in an emergency on campus, dial x3333.