Pharmaceutical Science Course Layout

The Graduate Program in Pharmaceutical Science, Ernest Mario School of Pharmacy

The future of Pharmaceutical Science lies in a better integration of the fundamentals of pharmaceutics (physical and biological pharmacy) and basic cellular and molecular biology. The current Pharmaceutical Science graduate program at Rutgers is at the forefront of pharmaceutical science research. Research avenues for pharmaceutical scientists—from drug discovery, drug delivery, drug development (pharmacokinetics, pharmacodynamics, PK-PD modeling and clinical trials) to basic cellular signaling of disease states and pharmaceuticals—are wide open. The graduate program in pharmaceutical science at Rutgers' Ernest Mario School of Pharmacy, ranked among the top programs in this field in the 2010 National Research Council ratings.

Here students find a research environment in which competitive, funded, and cutting-edge work is conducted with a multidisciplinary faculty of respected scientists. Students learn the skills and knowledge demanded by the modern needs of our field, mastering the ability to both:

Advance current knowledge in traditional pharmaceutical science and

Integrate the great strides being made in genomics, molecular/cellular biology, and Big Data capability into a new understanding of pharmaceutical science.

Scientists graduating from our program enjoy a competitive advantage in pursuing successful careers in academia, regulatory agencies, and the pharmaceutical and biotechnology industries.

The program for the M.S. and Ph.D. degree consists of a defined core of courses required of all students in the program, electives which fit individual needs, and original research under the supervision of a major advisor.

Academic Requirements for the Ph.D. Degree: Ph.D. level studies require a minimum of 27 credits of coursework and 45 credits of research.

Required credits: 9 credits required from the following courses:

Course Name	Course Number	Credits
Advanced Pharmaceutics /Physical Pharmacy (Sinko)	16:720:507	3
Advanced Pharmacokinetics /Dynamics (Kong)	16:720:509	3
Molecular and Cellular Pharmaceutics (Minko)	16:720:614	3
Molecular and Functional Genomic Aspects of Membrane Transport (You)	16:720:609	3
Dermaceutics (Michniak-Kohn)	16:720:523	3
Genetically Engineered Drug Delivery Systems (Hatefi)	16:720:549	3
Molecular Toxicology	16:963:505	4

Fundamentals of Molecular Biosciences	16:695:538	6
Molecular Biology & Biochemistry	16:115:511, or 01:694:407	3
Pharmacogenomics and Precision Medicine	30:158:409	2

Required credits: 6 credits required from the following courses:

Course Name	Course Number	Credits
Independent Research Proposal (NIH proposal)	16:720:540	3
Seminar in Pharmaceutical Science	16:720:601,602	2
Ethical Scientific Conduct	16:115:556	1

Required electives: 12 credits required from the following courses:

Course Name	Course Number	Credits
Design of Experiments	16:960:590	3
Principles of Toxicology	16:963:501	3
Colloidal Chemistry of Food	16:400:612	3
Nanotechnology and Its Applications in Biotechnology and Food	16:400:613	3
Cellular & Molecular Pharmacology: Principles of Drug Action and Targeting	16:718:680	3
Medicinal Chemistry: Research Techniques and Principles	16:663:501	3
Principles of Drug Design	16:663:502	3
Strategies and Tactics in Synthetic Medicinal Chemistry	16:663:504	3
Drugs: Structure and Function	16:663:505	3
Basic Statistics for Research	01:960:401	3
Introduction to Molecular Modeling	16:160:510	3
Molecular Biology and Biochemistry I	16:115:511	3
Molecular Biology and Biochemistry II	16:115:512	3

Regression Analysis	16:960:563	**3**
Special Topics: Innovation & Entrepreneurship (Cross listed with 14:125:492:Y2-special program BME)	16:125:629	**3**
Pharmaceutical Process Design II (Unit Operations)	16:155:546	3
Introduction to Biopharmaceutics and Pharmacokinetics	30:721:430	4
Pharmaceutical Organic Nanotechnology	16:155:544	3
Advanced Engineering Pharmaceutical Kinetics, Thermodynamics and Transport Process	16:155:549	3
Recent Advances In Organic Chemistry	16:160:504	3
Advanced Organic Synthesis	16:160:506	3

*Other electives that are approved by thesis advisor and graduate director may be accepted.

* **The formats of Prelim/Qualifying Exams for PhD students in the Graduate Program in Pharmaceutical Science:** The objective of the prelim/qualifying exam is to evaluate the competency of the student to conduct PhD level of thesis research at an early stage so that students who are not capable of performing PhD level of research will be dismissed from the graduate program to avoid the unnecessary financial burden of the thesis advisors and the students. Following the discussions of the Academic Committee, the new formats of the Prelim/Qualifying Exam will be as follow. • The Prelim/Qualifying exam will be moved to an earlier stage (before the end of 2nd or 3rd year. Special circumstances will be given to the PhD thesis advisor to give the Prelim/Qualifying exam at a later time. • In Part 1 of the Prelim/Qualifying exam, the PhD thesis advisor and 3 other thesis committee members will ask any lab-related questions (lab skills, science behind lab instruments, science behind each experiment, what is the alternative strategy to obtain certain experimental results, among others). Each committee member will give an independent score (1-10 scale with an average of 6 or better will consider "Pass"). Only the students who pass the Part 1, can proceed to Part 2 (NIH proposal). Special circumstances will be given to the PhD thesis advisor to administer other alternatives such as writing review manuscripts instead of testing lab skill at the end of 2nd year. • Part 2 of the Prelim/Qualifying exam will consist of an NIH proposal analogous to an NIH R03/R21 (6-page) grant application. The student should get approval from her/his PhD thesis advisor on the content of the proposal before embarking on the proposal. The student should send the research proposal to the Thesis committee 2 weeks prior to the closed-door oral defense exam. During the exam, the thesis committee, especially the PhD thesis advisor, "can ask" any questions "pertaining to Pharmaceutical Sciences" and test the student's competency. Each committee member will give an independent score (1-10 scale with an average of 6 or better will consider "Pass"). If the student fails the Prelim/Qualifying Exam In the event the student fails the Prelim/Qualifying Exam (Part 1 or Part 2) the first time, the student will receive a "warning letter" and will be given another opportunity to defend with the committee within 3- 6 months. If the student fails the second time, the student will be dismissed from the Graduate Program in Pharmaceutical Science at Rutgers University.

Academic Requirements for the MS. Thesis Degree: Master's thesis level studies consist of a minimum of 24 credits of coursework and 6 credits of research.

Required credits: 9 credits required from the following courses:

Course Name	Course Number	Credits

Advanced Pharmaceutics /Physical Pharmacy (Sinko)	16:720:507	3
Advanced Pharmacokinetics /Dynamics (Kong)	16:720:509	3
Molecular and Cellular Pharmaceutics (Minko)	16:720:614	3
Molecular and Functional Genomic Aspects of Membrane Transport (You)	16:720:609	3
Dermaceutics (Michniak-Kohn)	16:720:523	3
Genetically Engineered Drug Delivery Systems (Hatefi)	16:720:549	3
Molecular Toxicology	16:963:505	4
Fundamentals of Molecular Biosciences	16:695:538	6
Molecular Biology & Biochemistry	16:115:511, or 01:694:407	3
Pharmacogenomics and Precision Medicine	30:158:409 2	2

Required credits: 2 credit required from the following courses:

Seminar in Pharmaceutical Science	16:720:601,602	1
Ethical Scientific Conduct	16:115:556	1

Required electives: 13 credits required from the following courses:

Course Name	Course Number	Credits
Design of Experiments	16:960:590	3
General Toxicology I	16:963:501	2
Biochemical Toxicology	16:963:505	4
Molecular Toxicology	16:963:633	2
Colloidal Chemistry of Food	16:400:612	3
Nanotechnology and Its Applications in Biotechnology and Food	16:400:613	3
Cellular & Molecular Pharmacology: Principles of Drug Action and Targeting	16:718:680	3
Medicinal Chemistry: Research Techniques and Principles	16:663:501	3
Principles of Drug Design	16:663:502	3

Strategies and Tactics in Synthetic Medicinal Chemistry	16:663:504	3
Drugs: Structure and Function	16:663:505	3
Basic Statistics for Research	01:960:401	3
Introduction to Molecular Modeling	16:160:510	3
Molecular Biology and Biochemistry I	16:115:511	3
Molecular Biology and Biochemistry II	16:115:512	3
Regression Analysis	16:960:563	**3**
Special Topics: Innovation & Entrepreneurship (Cross listed with 14:125:492:Y2-special program BME)	16:125:629	**3**
Pharmaceutical Process Design II (Unit Operations)	16:155:546	3
Introduction to Biopharmaceutics and Pharmacokinetics	30:721:430	4
Pharmaceutical Organic Nanotechnology	16:155:544	3
Advanced Engineering Pharmaceutical Kinetics, Thermodynamics and Transport Process	16:155:549	3
Recent Advances In Organic Chemistry	16:160:504	3
Advanced Organic Synthesis	16:160:506	3

*Other electives that are approved by thesis advisor and graduate director may be accepted.

Academic Requirements for the MS. Non-Thesis Degree: Master's Non-thesis level studies consist of a total of 30 course credits.

Required credits: 9 credits required from the following courses:

Course Name	Course Number	Credits
Advanced Pharmaceutics /Physical Pharmacy (Sinko)	16:720:507	3
Advanced Pharmacokinetics /Dynamics (Kong)	16:720:509	3
Molecular and Cellular Pharmaceutics (Minko)	16:720:614	3
Molecular and Functional Genomic Aspects of Membrane Transport (You)	16:720:609	3
Dermaceutics (Michniak-Kohn)	16:720:523	3
Genetically Engineered Drug Delivery Systems (Hatefi)	16:720:549	3

Molecular Toxicology	16:963:505	4
Fundamentals of Molecular Biosciences	16:695:538	6
Molecular Biology & Biochemistry	16:115:511, or 01:694:407	3
Pharmacogenomics and Precision Medicine	30:158:409 2	2

Required credits: 2 credit required from the following courses:

Seminar in Pharmaceutical Science	16:720:601,602	1
Ethical Scientific Conduct	16:115:556	1

Required electives: 19 credits required from the following courses:

Course Name	Course Number	Credits
Design of Experiments	16:960:590	3
General Toxicology I	16:963:501	2
Biochemical Toxicology	16:963:505	4
Molecular Toxicology	16:963:633	2
Colloidal Chemistry of Food	16:400:612	3
Nanotechnology and Its Applications in Biotechnology and Food	16:400:613	3
Cellular & Molecular Pharmacology: Principles of Drug Action and Targeting	16:718:680	3
Medicinal Chemistry: Research Techniques and Principles	16:663:501	3
Principles of Drug Design	16:663:502	3
Strategies and Tactics in Synthetic Medicinal Chemistry	16:663:504	3
Drugs: Structure and Function	16:663:505	3
Basic Statistics for Research	01:960:401	3
Introduction to Molecular Modeling	16:160:510	3
Molecular Biology and Biochemistry I	16:115:511	3
Molecular Biology and Biochemistry II	16:115:512	3

Regression Analysis	16:960:563	**3**
Special Topics: Innovation & Entrepreneurship (Cross listed with 14:125:492:Y2-special program BME)	16:125:629	**3**
Pharmaceutical Process Design II (Unit Operations)	16:155:546	3
Introduction to Biopharmaceutics and Pharmacokinetics	30:721:430	4
Pharmaceutical Organic Nanotechnology	16:155:544	3
Advanced Engineering Pharmaceutical Kinetics, Thermodynamics and Transport Process	16:155:549	3
Recent Advances In Organic Chemistry	16:160:504	3
Advanced Organic Synthesis	16:160:506	3

*Other electives that are approved by thesis advisor and graduate director may be accepted.

Upon admission to the program, students and major advisor will then plan a program of study and select a Thesis (Master of Science) or Dissertation (Doctor of Philosophy) Committee. Master's candidates who have completed their course and research requirements are required to prepare a written thesis and are then examined by their Thesis Committee as a final requirement in the M.S. degree program. Students in the Ph.D. program after satisfactorily completing a significant amount of course credits must prepare a written original research proposal which they must then defend before their Dissertation Committee. Once these requirements are fulfilled the student becomes a candidate for the Ph.D. degree. Upon completion of all coursework and the research project the candidate prepares a written Dissertation which must be defended before their committee. Specific details of all requirements for both the M.S. and Ph.D degree program are outlined in the "Policy Statement on Procedures for Granting or Denying Graduate Degrees in Pharmaceutical Science".