

Pharmaceutical Science Course Layout

Pharmaceutics is concerned with the strategies by which biologically active compounds are presented to the body so as to elicit an optimal response. Included are the design, preparation and testing of drug-delivery systems. Major areas of research in pharmaceutics at Rutgers are drug formulation, physical/industrial pharmacy, mechanisms and modeling of drug transport, and pharmacokinetics. In course work, emphasis is placed on the fundamentals underlying these subject areas. **Biopharmaceutics** is the study of the absorption, distribution, metabolism, and excretion (ADME) of drugs, toxins, and their metabolites. **Pharmacokinetics** is the study of the time dependencies of ADME once a drug or toxin is introduced into the body. This includes the rate and extent of absorption, distribution, metabolism, and excretion, as well as the relationship between the concentration of drug at various sites in the body and the level of pharmacological or toxicological effect. Mathematical models are used to aid interpretation of experimental data and to explore basic biological mechanisms for drug disposition.

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

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

Academic Requirements for the MS. Degree: Masters 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

Required credits: 3 credits required from the following courses:

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
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".