

Pharmacy, PhD

The College of Pharmacy offers a Doctor of Philosophy degree in pharmacy with subprograms in three areas: drug discovery and experimental therapeutics, health services research, and pharmaceuticals.

The drug discovery and experimental therapeutics subprogram offers a unique educational opportunity for students interested in drug discovery and the development of novel therapeutics. The changing landscape of drug discovery has created a need for scientists with interdisciplinary training to navigate the complex landscape of medicinal chemistry, biotherapeutics, pharmacogenetics/genomics, and basic pharmacology/toxicology.

The health services research subprogram provides an innovative approach to studying the challenges facing the health care system and provides evidence to support policy-based solutions. It combines ideas across several distinct scientific paradigms (sociology, economics, psychology, business, and anthropology) to better understand the factors leading to decisions in health care and the consequences of these decisions. Students gain a broad knowledge of health and pharmaceutical care, informed by theories from economics and social psychology. The subprogram teaches intellectual and practical skills to investigate research questions dealing with current issues.

The pharmaceuticals subprogram provides a multidisciplinary science focus that examines the development, production, and characterization of dosage forms, as well as the disposition and action of drugs in the body. As pharmaceutical scientists have been engaged in the development of novel biomaterials for sophisticated drug delivery systems, they also have expanded into research with applications in the development of medical devices and tissue engineering.

For more information about graduate study, visit the College of Pharmacy website.

Learning Outcomes

Graduates will demonstrate the ability to:

- identify important research problems through the development of subject matter expertise and critical evaluation of the current state of knowledge in that area of expertise;
- develop testable hypotheses and/or research questions, and then utilize sound methodology to design research approaches to address them;
- conduct, analyze, and interpret independent original research that contributes new knowledge to the field of study;
- effectively communicate research results to a range of audiences in both written and oral formats;
- conduct all aspects of research and communication of results with the highest ethical standards; and
- be prepared for a diversity of career options in academia, industry, government, or other relevant fields.

Drug Discovery and Experimental Therapeutics

The Doctor of Philosophy in pharmacy with a subprogram in drug discovery and experimental therapeutics requires 72 s.h. of credit. The degree requires 25 s.h. of didactic coursework,

including 15 s.h. of required courses and a minimum of 10 s.h. of interdisciplinary electives. The remaining hours may be fulfilled by research, seminars, additional electives, and the doctoral dissertation. The typical time to complete the degree is five years. Students must maintain a cumulative grade-point average of at least 3.00.

The curriculum provides a strong foundational base of knowledge along with options for a tailored experience for students. The program prepares scientists capable of bridging the complex landscape of medicinal chemistry, biotherapeutics, pharmacogenetics/genomics, and basic pharmacology/toxicology.

The Doctor of Philosophy in pharmacy with a subprogram in drug discovery and experimental therapeutics requires the following work.

Required Courses

Course #	Title	Hours
All of these to total 15 s.h.:		
PHAR:5510	Pharmaceutical Sciences and Experimental Therapeutics Seminar	1-2
PHAR:5545	Current Medicinal Chemistry	3
PHAR:6515	Perspectives in Drug Discovery	2
PHAR:6820	Drug Discovery and Experimental Therapeutics Research	arr.
BIOS:4120	Introduction to Biostatistics	3
PCOL:4130	Drug Mechanisms and Actions (OR)	3
or PHAR:7101	Principles of Experimental Therapeutics	

Interdisciplinary Electives

Students select a minimum of 10 s.h. of electives chosen from the following courses. Additional electives can be selected from biochemistry, chemistry, genetics, neuroscience, and pharmacology at the discretion of the advisor.

Course #	Title	Hours
PHAR:5512	Drug Discovery and Mechanisms	3
PHAR:5537	Enzymatic Basis of Drug Metabolism	3
PHAR:5541	Total Synthesis of Biologically Active Natural Products	3
PHAR:5549	Analytical Biochemistry	3
PHAR:6501	Principles and Mechanisms of Chemical Toxicology	3
PHAR:6504	Mastering Reproducible Science	1
PHAR:6700	Advanced Pharmacokinetics and Pharmacodynamics	3
PHAR:7101	Principles of Experimental Therapeutics	3
PHAR:7102	Applied Clinical and Translational Science	3
BIOL:5512	Readings in Genetics	2
BIOS:5120/ IGPI:5120/ STAT:5610	Regression Modeling and ANOVA in the Health Sciences	3

CHEM:5321	Spectroscopic Methods in Organic Chemistry	3-4
CHEM:5328	Mechanisms of Organic Reactions	3

Comprehensive Examination

Students take the comprehensive examination between the beginning and end of their third year of graduate study.

Dissertation

The dissertation is defended in a final oral examination.

Health Services Research

The Doctor of Philosophy in pharmacy with a subprogram in health services research requires 74 s.h. of credit. Students must maintain a cumulative grade-point average of at least 3.00.

In the first two years in the program, students participate in ongoing research and complete coursework. In the third year, emphasis is placed on developing a dissertation topic. The following two years are spent on research and writing of the dissertation.

The Doctor of Philosophy in pharmacy with a subprogram in health services research requires the following work.

Core Competencies

Students complete the following coursework before they take the core competency qualifying exam.

Health Services Research

Course #	Title	Hours
All of these:		
PHAR:6320	Health Services Research	arr.
PHAR:6330	Models of Patient Behavior and Choice	3
PHAR:6331	Models of Provider Behavior and Choice	3
HMP:4000	Introduction to the U.S. Health Care System (or equivalent as approved by advisor)	3

Research Methods and Statistics

Course #	Title	Hours
All of these:		
PHAR:5350	Introduction to Research Methods	3
PHAR:5360	Applied Research Methods: Primary Data	2
PHAR:5365	Applied Research Methods: Secondary Data	2
BIOS:4120	Introduction to Biostatistics	3
BIOS:5120/ IGPI:5120/ STAT:5610	Regression Modeling and ANOVA in the Health Sciences	3
Additional statistics coursework (biostatistics, economics, education, psychology, mathematics, or sociobiology)		6

Specialty

The specialty area requires at least 24 s.h. of coursework. With the guidance of their faculty advisor, students develop a plan of study that encompasses an area of expertise or specialty.

Additional Requirements

Students are expected to participate in specific aspects of ongoing research. These research activities are often paid graduate research assistantships; course credit is not available for paid assistantships. By the end of their third year, students are expected to present the results from one completed research project at a regional or national meeting.

Course #	Title	Hours
PHAR:5310	Health Services Research Seminar (students enroll in the seminar for 1 s.h. each semester they are on campus, excluding summer session)	1
BMED:7270	Scholarly Integrity/ Responsible Conduct of Research I (taken in second year)	0
BMED:7271	Scholarly Integrity/ Responsible Conduct of Research II (taken in second year)	0

Pharmaceutics

The Doctor of Philosophy in pharmacy with a subprogram in pharmaceutics requires 72 s.h. of credit. The degree requires 30 s.h. in didactic coursework, including a minimum of 15 s.h. in divisional courses and 15 s.h. of elective coursework. The remaining 42 s.h. can be fulfilled with research (PHAR:6720 Pharmaceutics Research) or electives. Students must maintain a cumulative grade-point average of at least 3.00.

Entering students who do not have basic knowledge in all subjects follow a plan of study in order to complete divisional requirements during their first and second years.

The Doctor of Philosophy in pharmacy with a subprogram in pharmaceutics requires the following work.

Divisional Courses

Course #	Title	Hours
15 s.h. from these:		
PHAR:4146	Drug Disposition and Pharmacokinetics	2
PHAR:4736	Properties of Dosage Forms I (or equivalent)	3
PHAR:4737	Properties of Dosage Forms II	3
PHAR:4800	Chemical and Biophysical Properties of Drugs	2
PHAR:5720	Pharmaceutical Materials and Analysis	3
PHAR:5745	Drug Delivery: Principles and Applications I	arr.
PHAR:5880	Protein Pharmaceuticals	2
PHAR:6700	Advanced Pharmacokinetics and Pharmacodynamics	3

PHAR:6706	Equilibria Processes	3
PHAR:6710	Pharmaceutics Graduate Seminar (enrollment required each semester until completion of comprehensive exam)	1
BMED:7270	Scholarly Integrity/Responsible Conduct of Research I (taken in second year)	0
BMED:7271	Scholarly Integrity/Responsible Conduct of Research II (taken in second year)	0

Elective Courses

Students choose appropriate electives for individual research objectives.

Comprehensive Examination

Students take the comprehensive examination between the beginning and end of their third year of graduate study.

Dissertation

The dissertation is defended in a final oral examination.

Admission

Applicants must meet the admission requirements of the Graduate College. They must:

- hold a bachelor's degree from a U.S. institution or an equivalent degree from another country as determined by the University of Iowa Office of Admissions; and
- have a minimum grade-point average of at least 3.00.

Students may submit a Graduate Record Examination (GRE) General Test score, but that is optional.

Visit Graduate Degree: How to Apply on the College of Pharmacy website for a list of program requirements and application deadlines. Academic requirements for maintaining graduate registration are determined by the Graduate College and by the individual divisions in the College of Pharmacy.

Career Advancement

Advanced study in the pharmaceutical sciences prepares students for research, teaching, and administrative positions in the pharmaceutical industry, in colleges and universities, in government agencies, and in health-related institutions and organizations.

Academic Plans

Sample Plans of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

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DRUG DISCOVERY AND EXPERIMENTAL THERAPEUTICS SUBPROGRAM

Course	Title	Hours
Academic Career		
Any Semester		
72 s.h. must be graduate level coursework; graduate transfer credits allowed upon approval. More information is included in the General Catalog and on department website. ^a		
		Hours
		0
First Year		
Fall		
BIOS:4120	Introduction to Biostatistics	3
PHAR:5510	Pharmaceutical Sciences and Experimental Therapeutics Seminar	1 - 2
PHAR:6820	Drug Discovery and Experimental Therapeutics Research	3
		Hours
		7-8
Spring		
PHAR:5545	Current Medicinal Chemistry	3
PHAR:6515	Perspectives in Drug Discovery	2
PHAR:6820	Drug Discovery and Experimental Therapeutics Research	3
		Hours
		8
Second Year		
Fall		
PCOL:4130 or PHAR:7101	Drug Mechanisms and Actions or Principles of Experimental Therapeutics	3
PHAR:6820	Drug Discovery and Experimental Therapeutics Research	3
Interdisciplinary Elective ^b		2
		Hours
		8
Spring		
PHAR:6820	Drug Discovery and Experimental Therapeutics Research	6
PCOL:4130	Drug Mechanisms and Actions	3
		Hours
		9
Third Year		
Any Semester		
Exam: Doctoral Comprehensive Exam ^c		
		Hours
		0
Fall		
PHAR:6820	Drug Discovery and Experimental Therapeutics Research	3
Interdisciplinary Elective ^b		3
		Hours
		6
Spring		
PHAR:6820	Drug Discovery and Experimental Therapeutics Research	3
Interdisciplinary Elective ^b		2
		Hours
		5

Fourth Year**Fall**

PHAR:6820	Drug Discovery and Experimental Therapeutics Research	6
Interdisciplinary Elective ^b		3
Hours		9

Spring

PHAR:6820	Drug Discovery and Experimental Therapeutics Research	6
Hours		6

Fifth Year**Fall**

PHAR:6820	Drug Discovery and Experimental Therapeutics Research	7
Hours		7

Spring

PHAR:6820	Drug Discovery and Experimental Therapeutics Research	7
Exam: Doctoral Final Exam ^d		7
Hours		7

Total Hours 72-73

a Students must complete specific requirements in the University of Iowa Graduate College after program admission. Refer to the Graduate College website and the Manual of Rules and Regulations for more information.

b Work with faculty advisor to determine appropriate graduate coursework and sequence; see General Catalog and department website for specifics.

c Faculty advisor to determine when this exam will be, but typically by the end of third year.

d Dissertation defense.

Health Services Research Subprogram

Course	Title	Hours
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Academic Career**Any Semester**

74 s.h. must be graduate level coursework; graduate transfer credits allowed upon approval. More information is included in the General Catalog and on department website.^a

Hours 0

First Year**Fall**

BIOS:4120	Introduction to Biostatistics	3
HMP:4000	Introduction to the U.S. Health Care System ^{b, c}	3
PHAR:5310	Health Services Research Seminar ^d	1
PHAR:5350	Introduction to Research Methods ^{b, e}	3
PHAR:6320	Health Services Research	2
Hours		12

Spring

BIOS:5120	Regression Modeling and ANOVA in the Health Sciences	3
PHAR:5310	Health Services Research Seminar ^d	1
PHAR:5360	Applied Research Methods: Primary Data	2

PHAR:5365	Applied Research Methods: Secondary Data	2
PHAR:6320	Health Services Research	1
Research Methods and Statistics Elective ^{b, f, g}		3

Hours 12

Second Year**Fall**

BMED:7270	Scholarly Integrity/Responsible Conduct of Research I	0
PHAR:5310	Health Services Research Seminar ^d	1
PHAR:6320	Health Services Research	2
PHAR:6330	Models of Patient Behavior and Choice ^{b, e}	3
Research Methods and Statistics Elective ^{b, f, g}		3
Specialty Area Elective ^f		3
Hours		12

Spring

BMED:7271	Scholarly Integrity/Responsible Conduct of Research II	0
PHAR:5310	Health Services Research Seminar ^d	1
PHAR:6320	Health Services Research	2
PHAR:6331	Models of Provider Behavior and Choice ^{b, e}	3
Specialty Area Elective ^f		3
Specialty Area Elective ^f		3
Hours		12

Third Year**Any Semester**

Specialty Qualifying Exam ^h		0
Hours		0

Fall

PHAR:5310	Health Services Research Seminar ^d	1
PHAR:6320	Health Services Research	1
Specialty Area Elective ^f		3
Specialty Area Elective ^f		3
Specialty Area Elective ^f		3
Hours		11

Spring

PHAR:5310	Health Services Research Seminar ^d	1
PHAR:6320	Health Services Research	2
Specialty Area Elective ^f		3
Specialty Area Elective ^f		3
Hours		9

Fourth Year**Any Semester**

Exam: Doctoral Comprehensive Exam ⁱ		0
Hours		0

Fall

PHAR:5310	Health Services Research Seminar ^d	1
PHAR:6320	Health Services Research	1
Hours		2

Spring			
PHAR:5310	Health Services Research Seminar ^d		1
PHAR:6320	Health Services Research		1
	Hours		2

Fifth Year

Fall			
PHAR:5310	Health Services Research Seminar ^d		1-2
PHAR:6320	Health Services Research		1
	Hours		2-3

Spring			
PHAR:5310	Health Services Research Seminar ^d		1-2
PHAR:6320	Health Services Research		1
Exam: Doctoral Final Exam ^j			
	Hours		2-3
	Total Hours		76-78

- a Students must complete specific requirements in the University of Iowa Graduate College after program admission. Refer to the Graduate College website and the Manual of Rules and Regulations for more information.
- b Must complete before taking the Core Competency Qualifying Exam.
- c May be waived for students who have had equivalent coursework.
- d Registration required every semester; optional after fourth year.
- e Offered every other year; work with faculty advisor to select appropriate first year classes if entering the program on a year when not taught.
- f Work with faculty advisor to determine appropriate graduate coursework and sequence; see General Catalog and department website for specifics.
- g May be taken in biostatistics, economics, education, psychology, mathematics, or sociobiology.
- h Faculty advisor to determine when this exam will be, but typically by the end of third year.
- i A required Core Competency Qualifying Exam; work with faculty advisor to determine when this exam may be completed (typically during fourth year).
- j Dissertation defense.

Pharmaceutics Subprogram

Course	Title	Hours
Academic Career		
Any Semester		
72 s.h. must be graduate level coursework; graduate transfer credits allowed upon approval. More information is included in the General Catalog and on department website. ^a		
The degree requires 30 s.h. in didactic coursework, including a minimum of 15 s.h. in divisional courses and 15 s.h. of pharmacy or elective coursework; the remaining 42 s.h. can be fulfilled with research or electives.		
	Hours	0

First Year

Fall			
MATH:2560	Engineering Mathematics IV: Differential Equations ^b		3
or MATH:3600	or Introduction to Ordinary Differential Equations		
CHEM:4430	Principles of Physical Chemistry ^b		3
or CHEM:4431	or Chemical Thermodynamics		
PHAR:4736	Properties of Dosage Forms I ^b		3
PHAR:6710	Pharmaceutics Graduate Seminar ^c		1
Elective course ^d			2
	Hours		12

Spring			
PHAR:4737	Properties of Dosage Forms II ^b		3
PHAR:4800	Chemical and Biophysical Properties of Drugs		2
PHAR:6706	Equilibria Processes		3
PHAR:6710	Pharmaceutics Graduate Seminar ^c		1
Elective course ^d			3
	Hours		12

Second Year			
Fall			
PHAR:4146	Drug Disposition and Pharmacokinetics		2
BMED:7270	Scholarly Integrity/Responsible Conduct of Research I		0
PHAR:6720	Pharmaceutics Research		2
PHAR:6710	Pharmaceutics Graduate Seminar ^c		1
Elective course ^d			3
Elective course ^d			3
	Hours		11

Spring			
PHAR:5745	Drug Delivery: Principles and Applications I		3
PHAR:6700	Advanced Pharmacokinetics and Pharmacodynamics		3
BMED:7271	Scholarly Integrity/Responsible Conduct of Research II		0
PHAR:6720	Pharmaceutics Research		2
PHAR:6710	Pharmaceutics Graduate Seminar ^c		1
Elective course ^d			2
	Hours		11

Third Year			
Any Semester			
Exam: Doctoral Comprehensive Exam ^e			
	Hours		0
Fall			
Elective course ^d			3
Elective course ^d			3
PHAR:6720	Pharmaceutics Research		3
	Hours		9
Spring			
Elective course ^d			3
Elective course ^d			3
PHAR:6720	Pharmaceutics Research		3
	Hours		9

Summer

Internship (optional)

Hours **0****Fourth Year****Fall**

PHAR:6720 Pharmaceutics Research 2

Hours **2****Spring**

PHAR:6720 Pharmaceutics Research 2

Hours **2****Summer**

Internship (optional)

Hours **0****Fifth Year****Fall**

PHAR:6720 Pharmaceutics Research 2

Hours **2****Spring**

PHAR:6720 Pharmaceutics Research 2

Exam: Doctoral Final Exam^f

Hours **2**

Total Hours **72**

- a Students must complete specific requirements in the University of Iowa Graduate College after program admission. Refer to the Graduate College website and the Manual of Rules and Regulations for more information.
- b If equivalent course not taken previously; otherwise work with faculty advisor to select relevant elective in Pharmaceutics or outside the department.
- c Enrollment required each semester until completion of comprehensive exam.
- d Work with faculty advisor to determine appropriate graduate coursework and sequence.
- e Written research proposal and oral exam; typically completed by the end of third year.
- f Dissertation defense.