PHARMACEUTICAL SCIENCES, M.S.

The pharmaceutical sciences division (https://pharmacy.wisc.edu/psd) at the School of Pharmacy offers the doctor of philosophy (Ph.D.) degree in pharmaceutical sciences (students are accepted only for the Ph.D. program; the master of science degree is awarded only under special circumstances). The program provides a rigorous background in a range of scientific disciplines that are critical to the success of modern pharmaceutical scientists. The program's interdisciplinary design combines pharmaceutically relevant aspects of classical disciplines such as chemistry, biology, and engineering. Students concentrate in one of three research cores: drug discovery, drug action, or drug delivery. Extensive communication and collaboration occur between these cores, mirroring the importance of interdisciplinary research teams in the pharmaceutical field.

To enhance a required core curriculum (https://pharmacy.wisc.edu/programs/pharmsci/curriculum), an individualized course of study is planned with a faculty advisor. A list of pharmaceutical sciences graduate faculty and their respective areas of research specialization is available from the division website (https://pharmacy.wisc.edu/psd/faculty-research) and related links. The pharmaceutical sciences graduate program has educated generations of scientists for challenging positions in industry, academia, and government.

Research in drug discovery (https://pharmacy.wisc.edu/psd/drug-discovery-core) focuses on areas related to medicinal chemistry, such as small molecule development, natural products isolation and characterization, organic synthesis, chemical biology, and rational drug design.

Drug action (https://pharmacy.wisc.edu/psd/drug-action-core) focuses on areas related to pharmacology, toxicology, cellular differentiation, development, and disease. Interests include the impact of drugs and toxins on biological systems, mechanisms of normal biology, and mechanisms of disease. These are studied at the cellular, genetic, molecular, and biochemical levels using diverse model systems.

Drug delivery (https://pharmacy.wisc.edu/psd/drug-delivery-core) (pharmaceutics) emphasizes principles in physical chemistry and drug transport, aiming for advances in formulation, drug targeting, and multimodal therapy. Delivery research includes the solid-state chemistry of drugs, nano-pharmacy, biocompatibility, molecular recognition, computational chemistry, pharmacokinetics, and molecular imaging.

POSTGRADUATE INFORMATION

Recent program graduates have found employment in a variety of industrial, academic, and regulatory positions. These vary from research and development and other scientific roles for pharmaceutical, chemical, and biotechnology companies to academic research positions; some graduates eventually achieve faculty positions at small colleges or at larger research institutions. By partnering with other career services units on campus, the program has increased career services such that students can sharpen their professional and communication skills and reach a larger network of potential employers. The program graduated 37 Ph.D.s from 2011 to 2015; over 90 percent of these recent alumni were professionally placed within six months of graduation. For more information on first professional placement following graduation, see employers of recent pharmsci graduates on the program website (https://pharmacy.wisc.edu/programs/pharmsci/student-outcomes). Faculty and the school's graduate programs coordinator can be consulted for specific career information (both initial placement and longer-term employment information regarding Ph.D. alumni).

FUNDING

Financial support is provided to all graduate students in pharmaceutical sciences through a combined mechanism of fellowships, teaching assistantships, research assistantships, and project assistantships. Funding packages for first-year students in the Ph.D. program are provided by the School of Pharmacy and consist of a mixture of fellowships and/or teaching assistant support. In addition, first-year students earn $1500 in flexible funds to aid in the transition to Madison. After the first academic year, students are supported by their thesis advisor through research assistantship or teaching assistantship appointments. All students receive a stipend (the recommended minimum level for students in the division is $24,000 for 2015–16), full tuition remission (waiver), and reasonably priced, comprehensive health insurance for the duration of their Ph.D. studies, if they retain good academic standing and a faculty advisor.

REQUIREMENTS

MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

MASTER’S DEGREES

M.S.

MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT

30 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT

16 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT

At least half of degree coursework (15 credits out of 30 total credits) must be in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS

With program approval, students are allowed to count no more than 9 credits of graduate coursework from other institutions (the student must have graduate student status on the other institution's transcript at the time the courses were taken). coursework should be presented to the SoP graduate dean in the first semester of enrollment for consideration.
Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE
With program approval, students are allowed to count no more than 7 credits of UW–Madison courses numbered 500 or above (earned as a UW–Madison undergraduate) toward the M.S. degree. Coursework should be presented to the SoP graduate dean in the first semester of enrollment for consideration. Coursework earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNIVERSITY SPECIAL
With program approval, students are allowed to count no more than 9 credits of coursework numbered 500 or above taken as a UW–Madison special student. coursework should be presented to the SoP graduate dean in the first semester of enrollment for consideration. Coursework earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

CREDITS PER TERM ALLOWED
15 credits (fall and spring); 12 credits summer

PROGRAM-SPECIFIC COURSES REQUIRED

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHM SCI 780</td>
<td>Principles of Pharmaceutical Sciences</td>
<td>3</td>
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</table>

Select at least two of the following core courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHM SCI 768</td>
<td>Pharmacokinetics</td>
<td></td>
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<tr>
<td>PHM SCI 786</td>
<td>Natural Product Synthesis, Biosynthesis and Drug Discovery</td>
<td></td>
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<tr>
<td>BIOCHEM/PHMCOL-M/</td>
<td>Cellular Signal Transduction</td>
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<tr>
<td>ZOOLOGY 630</td>
<td>Mechanisms</td>
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Research ethics/responsible conduct of research course 1

At least one additional graduate course in pharmaceutical sciences or in a field related to one’s research (field choice is at the discretion of the thesis advisor) 3

Complete a Research course (PHM SCI 718-PHM SCI 990) 1-12

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHM SCI 931</td>
<td>Pharmaceutical Sciences Seminar (required every fall term during enrollment as a graduate student in the program)</td>
<td>1</td>
</tr>
<tr>
<td>PHM SCI 932</td>
<td>Pharmaceutical Sciences Seminar (required every spring during enrollment as a graduate student in the program)</td>
<td>1</td>
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Total Credits 10-21

Thesis advisors have the option to require additional courses beyond the minimum requirements listed above.

OVERALL GRADUATE GPA REQUIREMENT
An overall minimum GPA of 3.0 in graduate level (300 level or higher, non-research) courses is required, unless conditions for probationary status require higher grades.

OTHER GRADE REQUIREMENTS
Candidates will be dropped from the program if they receive more than 7 credits of grades at the BC level or lower. This applies to formal courses and research credits.

PROBATION POLICY
The status of a student can be one of three options:

1. Good standing (progressing according to standards; any funding guarantee remains in place).
2. Probation (not progressing according to standards but permitted to enroll; loss of funding guarantee; specific plan with dates and deadlines in place in regard to removal of probationary status).
3. Unsatisfactory progress (not progressing according to standards; not permitted to enroll, dismissal, leave of absence or change of advisor or program).

ADVISOR / COMMITTEE
Students are required to maintain a pharmaceutical sciences faculty member as an M.S. advisor through the duration of their studies. Typically a permanent advisor is found by the end of one’s first semester.

An M.S. thesis committee in the Pharmaceutical Sciences Division (PSD) consists of at least three graduate faculty members of the PSD (one of whom is the student’s thesis advisor).

ASSESSMENTS AND EXAMINATIONS
The program expects the M.S. candidate to engage in a research project of a scope appropriate to the time devoted to earning the degree. The results of the research must be described in an M.S. thesis. The thesis must be both presented and defended before the student’s M.S. thesis committee.

TIME CONSTRAINTS
Master's degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence; that coursework may not count toward Graduate School credit requirements.

LANGUAGE REQUIREMENTS
No language requirements.

ADMISSIONS
This master's program is offered for work leading to the Ph.D. Students may not apply directly for the master's, and should instead see the admissions information for the Ph.D.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS
- Demonstrate critical knowledge and in-depth understanding of principles in the student’s area of expertise.
- Identify important research questions, formulate testable hypotheses, and design experiments to test those hypotheses.
- Conduct original research that contributes to the student’s field of study.
• Communicate scientific knowledge and research results effectively to a range of audiences.
• Demonstrates breadth within their learning experiences.
• Advances contributions of the field of study to society.

PROFESSIONAL CONDUCT

• Apply ethical principles in conducting scientific research.