PhD in Applied Mathematics

The primary emphases in the doctoral program in applied mathematics are applied mathematics, statistics and applied mathematics-physics.

Admission

Admission to the PhD program in applied mathematics requires completion of an undergraduate degree in mathematics, statistics or physics, including coursework in advanced calculus, linear algebra, numerical methods, and either modern algebra or mechanics, electromagnetism and quantum physics. A grade point average of 3.250 in coursework in mathematics, statistics and physics is required, as well as an overall GPA of 3.000 overall (3.250 if the student has a previous master's degree). The GRE subject test in mathematics or physics is recommended but not required.

Program Requirements

To complete the PhD program in applied mathematics, the student must satisfy the course, language and residency requirements given below; pass the qualifying and preliminary examinations; and write a dissertation containing original research in statistics, applied mathematics-physics or applied mathematics.

Course Requirements

A total of at least 84 hours of graduate credit is required. **The following courses may not be included:**

Course	Title	Hours
MATH 757	Partial Differential Equations for Engineers	3
MATH 758	Complex and Vector Analysis for Engineers	3
PHYS 730	Computational Methods for Physics	3
PHYS 761	Environmental Physics	3
Mathematics, statistics and physics courses numbered below 700		

At least 36 credit hours must be in mathematics, statistics and physics courses numbered above 800 (exclusive of MATH 985, STAT 986 and PHYS 987). Courses used toward a master's degree may be included. A maximum of 36 credit hours may be transferred from another university at the discretion of the student's committee.

Course	Title	Hours
Required Courses		
MATH 743	Real Analysis I	3
MATH 751	Numerical Linear Algebra	3
MATH 985	PhD Dissertation (As determined by specialization)	18
or STAT 986	PhD Dissertation	
or PHYS 987	PhD Dissertation	
Track Options		
Select one of the following options		27
Option 1 - Applied Mathematics Track		
MATH 843	Real Analysis II	
MATH 745 & MATH 845	Complex Analysis I and Complex Analysis II	
MATH 755 & MATH 856	Partial Differential Equations I and Partial Differential Equations II	
MATH 941 & MATH 942	Applied Functional Analysis I and Applied Functional Analysis II	
or MATH 725 & MATH 825	Topology I and Topology II	
MATH 852	Numerical Analysis of Partial Differential Equations	
or MATH 813	Abstract Algebra II	
PHYS 714	Theoretical Physics	
or MATH 713	Abstract Algebra I	
Option 2 - Statistics Track		
STAT 771 & STAT 772	Theory of Statistics I and Theory of Statistics II	
MATH 843	Real Analysis II	
STAT 861 & STAT 862	Theory of Probability I and Theory of Probability II	
STAT 870 & STAT 871	Theory of Statistical Inference I and Theory of Statistical Inference II	
STAT 872 & STAT 873	Theory of Linear Models I and Theory of Linear Models II	
Option 3 - Physics Track		
PHYS 714	Theoretical Physics	
PHYS 821	Classical Mechanics	
PHYS 831	Classical Electricity and Magnetism	
PHYS 811	Quantum Mechanics	
PHYS 812	Advanced Quantum Mechanics	
PHYS 816	Methods in Experimental Physics	
STAT 763	Applied Regression Analysis	
Select two physics specialty subject classes from the following		
PHYS 871	Statistical Mechanics	
PHYS 876	Elementary Particles & Fields	
PHYS 881	Solid State Physics	
PHYS 895	Advanced Astrophysics	
Additional Courses		
Select at least 33 additional graduate credit hours (may include 6 excess dissertation hours with departmental approval)		33
Total Credit Hours		**84**

Professional and Scholarly Integrity Training Requirement

Students are required to take and pass the following four Collaborative Institutional Training Initiative (CITI) modules for the physical sciences: research misconduct; practices and responsible authorship; conflicts of interest and commitment; data acquisition, management sharing and ownership. This should be done during the first year as a student in the program.

Language Requirements

The student must demonstrate proficiency either in two world languages or in one world language and one high-level computer language. The world languages are Chinese, French, German and Russian. The language proficiency will be demonstrated by passing an examination that consists of the translation, with the use of a dictionary, of one or more passages of mathematics text from the world language into English.

Residency Requirement

The student must complete at least one academic year in residence as a full-time student at WSU.

Qualifying Exam

The qualifying exam is a written exam administered near the middle of both the fall and spring semesters. The student will choose to be examined in two of the following six areas:

1. Real analysis;
2. Numerical linear algebra;
3. Algebra;
4. Topology;
5. Statistics;
6. Physics.

Students electing the Option 1 - applied mathematics track are required to take the real analysis part of the exam. Students electing the Option 2 - statistics track are required to take the statistics part of the exam. Students electing the Option 3 - physics track are required to take the physics part of the exam.

A student who does not pass on the first attempt may be permitted to take the exam a second time. A person who retakes the exam must retake the entire exam. The exam may be retaken only once.

PhD Committee

Upon the student passing the qualifying exam, the graduate coordinator, in consultation with the student, recommends to the departmental PhD Advisory Committee a PhD committee for the student. The student's PhD committee consists of the student's dissertation advisor as chair and four other members. At least one, but no more than two, of the committee members shall be from departments outside the department of mathematics, statistics and physics. Within one semester after passing the qualifying exam the student should submit a plan of study to the committee for approval. This committee serves as examining committee for both the preliminary and final exams.

Preliminary Exam

The preliminary exam covers specific topics relevant to the student's research area as determined by his or her PhD advisor. The student should meet as soon as possible with their advisor to set the topics to be covered. For full-time students, the exam should normally be taken about one year after passing the qualifying exam. Before the preliminary exam is taken, one of the two language requirements must be satisfied. A student who fails the preliminary exam may be permitted to retake the exam if the committee so determines.

Dissertation and Final Exam

Upon passing the preliminary exam, the student becomes a candidate for the PhD degree. Soon thereafter the student must submit a written dissertation proposal to his or her committee for approval. Students may utilize 18-24 credit hours of PhD dissertation hours on their Plan of Study and they must be enrolled at the university during each semester after admission to candidacy until completion of the dissertation. After the dissertation is completed, the student must present and defend it before the committee. This defense constitutes the final exam. The dissertation defense is open to the public.

Applied Learning

Students in the PhD in applied mathematics are required to complete an applied learning or research experience to graduate from the program. The requirement can be met by completing the PhD thesis (dissertation) and all remaining criteria and requirements for the program.