

# MATHEMATICS - DOCTOR OF PHILOSOPHY

Candidates for the Ph.D. degree in the Department of Mathematical Sciences must pass

- a qualifying examination,
- a basic comprehensive written examination,
- an advanced comprehensive examination with written and oral components, and
- a final oral doctoral thesis examination.

These are briefly described below. For more information, see the Graduate School requirements in this catalog, and the Mathematics Graduate Student handbook at [www.math.nmsu.edu](http://www.math.nmsu.edu) (<https://math.nmsu.edu/>).

## Course Requirements

Prefix	Title	Credits
<b>Core Requirements</b>		
MATH 581	Abstract Algebra II: Fields, Rings and Modules	3
MATH 593	Measure and Integration	3
MATH 594	Real Analysis	3
MATH 595	Introduction to Functional Analysis	3

In addition to the core requirements, each student must complete one of the following four options.

Prefix	Title	Credits
<b>Option 1</b>		
MATH 541	Topology I	3
MATH 542	Topology II	3
MATH 582	Module Theory and Homological Algebra	3
MATH 583	Introduction to Commutative Algebra and Algebraic Geometry	3
MATH 551	Mathematical Structures in Logic	3
MATH 552	Universal Algebra and Model Theory	3
<b>Option 2</b>		
MATH 571	Partial Differential Equations I	3
MATH 572	Partial Differential Equations II	3
Choose two from the following:		6
MATH 582	Module Theory and Homological Algebra	
MATH 583	Introduction to Commutative Algebra and Algebraic Geometry	
MATH 551	Mathematical Structures in Logic	
MATH 552	Universal Algebra and Model Theory	
<b>Option 3</b>		
STAT 562	Foundations of Probability	3
STAT 571	Continuous Multivariate Analysis	3
STAT 572	Linear Models	3
Choose two from the following:		6
MATH 582	Module Theory and Homological Algebra	
MATH 583	Introduction to Commutative Algebra and Algebraic Geometry	
MATH 551	Mathematical Structures in Logic	
MATH 552	Universal Algebra and Model Theory	
<b>Option 4</b>		
STAT 562	Foundations of Probability	3

STAT 581	Advanced Theory of Statistics I	3
STAT 582	Advanced Theory of Statistics II	3
Choose two from the following:		6
MATH 582	Module Theory and Homological Algebra	
MATH 583	Introduction to Commutative Algebra and Algebraic Geometry	
MATH 551	Mathematical Structures in Logic	
MATH 552	Universal Algebra and Model Theory	

## Additional Course Requirements

A full time graduate student is required to register each semester for at least two Math/Stat graduate courses above MATH 530 Special Topics/STAT 525 Statistics: Theory and Applications. With the exception of the final semester, of these two, only one may be MATH 600 Doctoral Research or MATH 700 Doctoral Dissertation. Moreover, these two courses **must not** include:

Prefix	Title	Credits
MATH 540	Directed Reading	1-6
MATH 562	History and Theories of Mathematics Education	3
MATH 563	Algebra with Connections	3
MATH 564	From Number to Algebra	3
MATH 566	Data Analysis with Applications	3
MATH 567	From Measurement to Geometry	3
MATH 568	Using Number Throughout the Curriculum	3
MATH 569	Geometry with Connections	3
MATH 599	Master's Thesis	15
STAT 540	Directed Reading	1-6
STAT 598	Special Research Problems	1-3

## Qualifying Examination

Every student admitted to the Ph.D. program must pass a written qualifying examination. Students who complete their mathematics Master's degree at NMSU may request that the Master's written examination also fulfill the Ph.D. qualifying examination requirement. In all other cases, the student takes a written Ph.D. qualifying exam. This exam is identical to the Master's written exam (based on the courses 525/527) and is administered and graded at the same time, but a higher passing score is required than for a Master's student. Ph.D. candidates need to pass the exam within their first year.

## Basic Comprehensive Examinations

Every Ph.D. student must pass a Basic Comprehensive Exam, either in Algebra or in Analysis. The Algebra exam is based on the courses MATH 526 Abstract Algebra I: Groups and Rings and MATH 581 Abstract Algebra II: Fields, Rings and Modules and the Analysis exam is based on the courses MATH 528 Introduction to Real Analysis II and MATH 593 Measure and Integration.

These exams are offered every August and January. A student choosing to take the exam in Algebra must pass the exam within fourteen months of completing Math 581; similarly, a student taking the exam in Analysis must pass the exam within fourteen months of completing MATH 593. Students failing to pass the exams within this period of time may be removed from the program. Students will normally not be given more than two attempts at any one exam.

## **Advanced Comprehensive Examinations**

Candidates for the Ph.D. must pass an advanced comprehensive examination in their chosen research area. The examination has a written and an oral component. The written exam, which is written and administered by the student's committee, is based on two of the student's courses, normally among those listed in Options 1-4, chosen by the student in consultation with his/her committee and approved by the Graduate Studies Committee. Full-time students should complete the written component of the Advanced Comprehensive Exam after passing the Basic Comprehensive Exam and in the first two years. Those who have not made substantial progress towards completion of their written exams at the start of the fifth semester may be removed from the program. Students who have not completed the written exams by the start of the sixth semester will normally have any departmental funding revoked. The student must take the oral part of the exam at the end of the semester after completing the advanced written comprehensive exam. For the oral exam, the student should present a proposed direction for thesis work.

## **Final Oral Exam**

This is an exam over the student's thesis. It is administered by the student's thesis committee.