DOCTOR OF PHILOSOPHY IN NATURAL SCIENCES: MATHEMATICS

Student Learning Outcomes

Students graduating from this program will:

- Demonstrate a thorough degree of knowledge in the disciplines
- Demonstrate an ability to use proper investigation techniques for the disciplines
- Use oral and written forms of communication to convey their ideas

Program Structure

Total Credits Required for Graduation: 42*
Residency requirements: Ph.D. students must satisfy the doctoral residency requirement by satisfactory completion of at least 18 credits in no more than 24 consecutive months. When satisfying the residency requirement, all Ph.D. students are subject to the following restrictions:

- The doctoral residency requirement must be satisfied no later than the end of the semester in which the student completes his or her comprehensive examinations.
- Students must achieve a cumulative graduate grade-point average of at least 3.0 in all courses counted toward satisfying the residency requirement.

***** *Specific disciplines may require more credit hours for graduation. See discipline specific coursework requirements for more information on total credit hours required for graduation.*

Program Requirements

The coursework requirements encompass:

- A minimum of 12 credit hours of coursework within the primary area, accompanied by at least 12 dissertation hours. The primary disciplines retain the flexibility to potentially request more than the minimum credit hours.
- A minimum of 9 credit hours within a secondary discipline area, with the secondary discipline also having the option to specify additional credit hours beyond the minimum.
- A minimum of 30 classroom credits is required beyond the baccalaureate, including fundamental and advanced courses along with seminars.
- Any primary area discipline can be combined with any secondary area discipline.

Participating Disciplines
Participating disciplines encompass a range of fields, including:

- Biomedical and Health Informatics
- Cell Biology and Biophysics
- Chemistry
- Geosciences
- Mathematics
- Molecular Biology and Biochemistry
- Oral and Craniofacial Sciences
- Pharmaceutical Science
- Pharmacology
- Physics

Student Learning Outcomes

Students graduating from this program will:

- Demonstrate a thorough degree of knowledge in the discipline
- Demonstrate an ability to use proper investigation techniques for the discipline
- Use oral and written forms of communication to convey their ideas

Mathematics

Primary Discipline Program Requirements

Mathematics focus:

Code	Title	Credits
A minimum of 12 credit hours of coursework, completed with at least a B (3.0) average.		
MATH 5519	Algebra II	3
MATH 5523	Real Variables II	3
MATH 5542	Advanced Numerical Analysis	3
STAT 5576	Probability	3
or STAT 5578	Advanced Mathematical Statistics	
or STAT 5588	Theory of Linear Model	
Dissertation		12

Statistics focus:

Code	Title	Credits
A minimum of 12 credit hours of coursework, completed with at least a B (3.0) average.		12
STAT 5576	Probability	3
STAT 5578	Advanced Mathematical Statistics	3
STAT 5588	Theory of Linear Model	3
MATH 5519	Algebra II	3
or MATH 5523	Real Variables II	
or MATH 5542	Advanced Numerical Analysis	
Dissertation		12

Total Credit Hours: 42

Secondary Discipline Requirements

Code	Title	Credits
At least 9 hours of graduate coursework in Mathematics or Statistics, with at least a B (3.0) average. Up to 3 hours may be at the 400-level.		9
Total Credits		**9**

Admission Requirements

For applicants electing mathematics as the primary discipline: To get full admission, an applicant should have a bachelor's degree or a master's degree in mathematics/statistics (or equivalent) from an accredited college or university. Applicants who do not have a master's degree are expected to provide strong evidence of academic ability and research capability. GRE General scores are required in most cases, but may be waived under extenuating circumstances, provided there are sufficient other indicators of academic ability. Applicants are encouraged to contact the discipline coordinator to inquire whether a waiver can be granted.

A student who is admitted to the Ph.D. program while having not completed all of the qualifying/pre-requisite coursework as described below must complete the missing courses with a GPA of 3.0 or better to be deemed qualified to continue in the Ph.D. program.

For applicants electing mathematics as a co-discipline: To get full admission, an applicant should have a bachelor's degree in mathematics/statistics from an accredited college or university, or a bachelor's degree in another subject including evidence of a strong performance in at least three mathematics courses beyond Calculus I, II, and III.

Applicants may get provisional admission if the above conditions are not fully satisfied at the time of application.

Qualifying Coursework, Mathematics:

Code	Title	Credits
MATH 5509	Algebra I	3
MATH 5513	Real Variables I	3
MATH 5532	Numerical Linear Algebra	3
MATH 5510	Complex Variables I	3
MATH 5521	Differential Equations	3

Qualifying Coursework, Statistics:

Code	Title	Credits
STAT 5501	Statistical Design Of Experiments	3
MATH 5513	Real Variables I	3
STAT 5537	Mathematical Statistics I	3
STAT 5547	Mathematical Statistics II	3
STAT 5551	Applied Statistical Analysis	3
STAT 5565	Regression Analysis	3
STAT 5572	Multivariate Analysis	3

Qualifying Exams

Within a year of completing the doctoral Core Coursework, Ph.D. students with a primary discipline in Mathematics are required to complete qualifying examinations. The written examinations under either focus are based on two of the three doctoral core courses.

- For the Mathematics focus, the written examinations are based on two of the following Doctoral Core Courses: MATH 5519 (https://catalog.umkc.edu/search/?P=MATH%205519), MATH 5523 (https://catalog.umkc.edu/search/?P=MATH%205523), and MATH 5542 (https://catalog.umkc.edu/search/?P=MATH%205542).
- For the Statistics focus, the written examinations are based on two of the following Doctoral Core Courses: STAT 5576 (https://catalog.umkc.edu/search/?P=STAT%205576), STAT 5578 (https://catalog.umkc.edu/search/?P=STAT%205578), and STAT 5588 (https://catalog.umkc.edu/search/?P=STAT%205588).
- The student may take one written examination from the opposite focus if the supervisory committee deems it in the best interest of the student's Plan of Study.
- If a student fails either one or more qualifying exams on the first attempt, they may retake the failed parts from the first attempt after a period of 12 weeks. If the student fails the qualifying examination(s) a second time, they will be terminated from the program.

The Ph.D. Comprehensive Examination

Following the completion of the qualifying examinations, the student is deemed fully qualified to carry out doctoral-level research. At this stage, the student begins his or her doctoral research. Within two years of successful completion of the qualifying examination, the student is required to complete the Ph.D. Comprehensive Examination. The Comprehensive Exam consists of submitting a fully developed proposal of the Ph.D. research topic, together with an oral presentation to the student's full Ph.D. committee. The exact timing and topic of this written and oral comprehensive exam will be determined by the student and their supervisory committee.

Dissertation and Final Oral Examination

Within two years of admission to Candidacy, the student is required to have completed the necessary research and writing to form the Dissertation. Once this is complete, the student must complete the Final Oral Examination. This is a two-hour discussion with the student and the supervisory committee. The student must prepare a presentation that outlines the content of the dissertation. The presentation is a public event, so anyone is free to attend. Following the completion of the presentation is a closed-door session with the student and the Supervisory Committee in which the Candidate fields questions and comments regarding the content of the Dissertation. Following successful completion of the Final Oral Examination, the committee will make recommendations for revisions to the dissertation, and the Candidate is required to address these recommendations in order to complete the Ph.D.

Other Requirements

- All Ph.D. students with mathematics as the primary discipline are required to attend the department graduate seminar at least five times per semester. Those who cannot fulfill this requirement must contact the graduate seminar coordinator.
- The student must satisfy all requirements set forth by the School of Graduate Studies.