Doctor of Philosophy in Mathematics

Why study mathematics?
Because mathematics is a framework upon which humanity builds an understanding of the world.

Mission of the Graduate Program:
The mission of the Graduate Program of the Department of Mathematics is to prepare students for leadership roles in meeting the mathematical needs of our society and to produce professional mathematicians for positions in universities, colleges, industry, governmental agencies, and research centers.

Doctor of Philosophy in Mathematics:
The Mathematics Department offers the degree of Doctor of Philosophy (Ph.D.) in Mathematics. The Ph.D. program provides broad and deep expertise in mathematics, culminating in a dissertation that includes significant original work. It is intended for students with a strong mathematical background who plan a career in research in academia or industry. A broad range of specialties is possible; research interests of department faculty include algebra, analysis, combinatorics, control theory, dynamical systems, geometry, numerical analysis, partial differential equations, probability, and statistics. There are two tracks: Pure Mathematics and Applied Mathematics. The requirements for each track are listed in the section Degree Requirements. College-wide requirements for graduate students may be found in the Graduate School Catalog (http://catalog.ku.edu/liberal-arts-sciences/#graduatetext).

Admission to Graduate Studies
An applicant seeking to pursue graduate study in the College may be admitted as either a degree-seeking or non-degree seeking student. Policies and procedures of Graduate Studies govern the process of Graduate admission. These may be found in the Graduate Studies (http://catalog.ku.edu/graduate-studies) section of the online catalog.

Please consult the Departments & Programs (http://catalog.ku.edu/liberal-arts-sciences) section of the online catalog for information regarding program-specific admissions criteria and requirements. Special admissions requirements pertain to Interdisciplinary Studies degrees, which may be found in the Graduate Studies section of the online catalog.

Graduate Admission
The minimum prerequisites for admission are an undergraduate degree from an accredited institution with a program of study in mathematics and a record of achievements that shows strong promise of success in graduate school. A 3.0 cumulative grade-point average in undergraduate studies and a 3.0 grade-point average in mathematics are required for admission.

A prospective student should have taken courses in mathematics at the undergraduate level in abstract algebra, linear algebra, and advanced calculus or introduction to analysis. Such courses should be comparable to KU courses numbered MATH 500, MATH 558, and MATH 590. It is also beneficial to students if they have minimum preparation in probability/statistics or numerical analysis (like KU courses MATH 627/MATH 628 and/or MATH 581). We also recommend that you take introductory courses in complex analysis, differential equations, and/or topology before considering graduate work in mathematics at KU (see for example KU courses numbered MATH 646 and MATH 647).

The department requires the general Graduate Record Examination (GRE) for all incoming students. International students whose native language is not English also must fulfill English language requirements specified by university policies.

Applicants must submit a graduate application online. (http://graduate.ku.edu/application-process) In addition the following required materials must be submitted online:

- Transcript from each college or university the applicant has attended (an official transcript must be sent upon acceptance and completion of degree),
- Applicant’s résumé/curriculum vitae,
- A list of the textbooks used in the mathematics courses beyond the calculus level that the applicant has taken,
- A statement of purpose indicating the applicant’s mathematical preferences and interests, and
- 3 letters of reference.

Official GRE scores must be sent to the department. Non-native speakers of English must meet English proficiency requirements as described here (http://graduate.ku.edu/english-proficiency-requirements).

Incomplete applications will not be considered. The minimum admission requirements do not guarantee admission. The graduate committee of the Department of Mathematics evaluates candidates and makes recommendations to the Office of Graduate Studies regarding admission. The number of students admitted to the program changes from year to year, and admissions are competitive based on all application materials.

There are no additional application forms for financial support. Students are considered for support based on merit. Most of the students accepted by the program receive an offer of financial support in the form of a Graduate Teaching Assistantship. The number of GTAs available is limited. Further information about applications and admission (http://www.math.ku.edu/academics/graduate/admissions.html) is available online.

Contact the department:

The University of Kansas
Department of Mathematics
Graduate Admissions Director
Snow Hall
1460 Jayhawk Blvd., Room 405
Lawrence, KS 66045
mathadmit@math.ku.edu (mathadmit@ku.edu)

Ph.D. Degree Requirements
In addition to general requirements, the department requires the student to meet the following requirements before being admitted to the comprehensive examination.

1. Pass 2 written qualifying examinations, 1 exam in either algebra or analysis and a second exam in either numerical analysis or probability/statistics and complete the required qualifying exam coursework. The qualifying examinations must be completed by the beginning of the student’s fifth semester. The qual course requirement must be met before taking the preliminary exam.
2. Pass 1 preliminary examination in an area close to the focus of the eventual doctoral dissertation. The preliminary examination must be completed by the beginning of the student’s eighth semester.

3. Satisfy the research skills and responsible scholarship requirement by demonstrating a working knowledge of a programming language such as C++ or FORTRAN and by completing the departmental training in responsible scholarship. To meet the research skills requirement students must complete an introductory programming language course approved by the graduate committee. Alternately, students may complete an approved computing project demonstrating competence in either a programming language or the use of specialized software that supports the student’s research.

4. Pass a set of required courses, differing in different tracks.

Note: Contact your department or program for more information about the qualifying exam coursework requirement, the research skills and responsible scholarship, and the current requirements for doctoral students. Current policies on Doctoral Research Skills and Responsible Scholarship are listed in the Graduate Studies section of the online catalog and in the KU Policy Library.

## Pure Mathematics

This track requires:

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MATH 800</td>
<td>Complex Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 810</td>
<td>Real Analysis and Measure Theory I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 830</td>
<td>Abstract Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 820</td>
<td>Introduction to Topology</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 821</td>
<td>Algebraic Topology I</td>
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Select an approved course in geometry, e.g.:

- MATH 840 Differentiable Manifolds
- MATH 910 Algebraic Curves
- MATH 920 Lie Groups and Lie Algebras

## Applied Mathematics

This track requires:

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MATH 727</td>
<td>Probability Theory (or the corresponding qualifying examination)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 781</td>
<td>Numerical Analysis I (or the corresponding qualifying examination)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 800</td>
<td>Complex Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 810</td>
<td>Real Analysis and Measure Theory I</td>
<td>3</td>
</tr>
</tbody>
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Select one of the following:

- MATH 881 Advanced Numerical Linear Algebra
- MATH 882 Advanced Numerical Differential Equations
- MATH 865 Stochastic Processes I
- MATH 866 Stochastic Processes II
- MATH 850 Differential Equations and Dynamical Systems
- MATH 851 Topics in Dynamical Systems

Select one of the following:

- MATH 840 Differentiable Manifolds

## Examination Preparation

Normally the work required to prepare a student for the oral comprehensive examination (and to do research) includes 1 or more semesters of advanced courses, directed readings, and seminars. In the oral comprehensive examination, a student must show proficiency in the chosen area of mathematics. Precise areas of responsibility on this examination are discussed in detail with the advisory committee (the student’s advisor and two other members of the department’s Graduate Faculty).

The student must complete 4 additional courses at the 800 level or above before the final examination. Mathematics courses numbered 896, 899, 990, 993 and 999 may not be used to satisfy this requirement.