

# Doctor of Philosophy

## Computational and Applied Mathematics with a Concentration in Applied Mathematics (PhD)

A minimum of 78 credit hours beyond the bachelor's degree and 48 hours beyond the master's degree is required. Each student will be assigned an Advisory Committee, and together they will plan a complete program of course work designed to meet the student's objectives and to fulfill a concentration in mathematics of data science, applied mathematics, statistics, or biostatistics. The student is strongly encouraged to select courses in more than one of the concentration areas and in a field of application whenever such courses contribute appropriately to his or her program. Each program, however, must be directed and approved by the student's Advisory committee. A student receiving a grade of C+ or lower in any graduate course may be dismissed from the program.

Students electing the concentration in Applied Mathematics will pursue course work in advanced mathematical analysis, differential equations, numerical methods, transform methods, and data science. They will take electives in other methods of applied mathematics, or in an application area. A PhD thesis project will bring them in contact with the research frontier.

Applicants who appear to be qualified for study at an advanced graduate level may be admitted to the doctoral program in computational and applied mathematics. These will be students with very strong backgrounds in mathematics, statistics, computer science, or application areas with a mathematics component (e.g. physics or engineering).

Students may be admitted directly to the Ph.D. program with either a bachelor's or a master's degree. A grade point average of 3.00 (4.00 scale) in the major and related mathematics courses is required.

Students are required to submit a formal application form, official transcripts, and three letters of recommendation to the Office of Admission.

### Curriculum Requirements

#### Computational and Applied Mathematics Core

Common core courses		
MATH 617	Measure and Integration	3
STAT 626	Statistical Theory for Data Science	3
MATH 898	Research	6
or STAT 898	Research	
<b>Dissertation credits</b>		<b>18</b>
MATH 899	Dissertation	
or STAT 899	Dissertation	
<b>Total Credit Hours</b>		<b>30</b>

#### Applied Mathematics Concentration:

Select 18 credits of the following:		18
MATH 605	Complex Variables I	
MATH 618	Applied Functional Analysis	
MATH 622	Numerical Solutions to Differential Equations	
MATH 637	Tensor Calculus and Differential Geometry	
MATH 638	Mathematical Theories of Continua	
MATH 693	Engineering Analysis III	

MATH 801 & MATH 802	Asymptotic and Perturbation Methods and Integral Equations
MATH 821 & MATH 822	Advanced Applied Numerical Methods I and Advanced Applied Numerical Methods II
MATH 803 or MATH 825	Advanced Applied Mathematics I Computational Fluid Dynamics
BDA 845	Transform Methods for Data Science

**Total Credit Hours**

**18**

### Additional Requirements

#### Colloquium Requirement

In order to develop an appreciation for the breadth of contemporary research in applied mathematics and statistics, all Ph.D. candidates will attend at least 80% and succinctly summarize and evaluate in writing at least 16 professional seminars given by research faculty or external seminar visitors. The Richard F. Barry Colloquium Series is run by the department throughout the academic year. The department also conducts seminars jointly with other departments.

#### Foreign Language

A foreign language is not required.

#### Residency Requirement

An essential feature of doctoral study is the provision of total concentration on the field of study for significant periods of time. Students who wish to pursue a part of their doctoral study on a part-time basis may do so, but all doctoral students shall spend at least two academic years engaged in full-time graduate study.

#### Admission to Candidacy Examination

At the end of the core mathematics or statistics course work and prior to selecting a dissertation advisor, the student must pass an Admission to Candidacy Examination designed to test scholarly competence and knowledge and to give the examiners a basis for constructive recommendations on subsequent study. The written portion of this examination will be based upon an examination syllabus that will be provided to each student. The outcome of this examination will be reported to the vice provost for graduate studies and research as passed, failed, additional work to be completed, or to be re-examined. In the event of a re-examination, the outcome must be reported as passed or failed. This decision is final. The examination must be passed at least eight months prior to the granting of the degree.

#### Dissertation

A doctoral dissertation representing an achievement in research and a significant contribution to the field is required. Students must register for MATH 898 or MATH 899 each semester in which they are doing substantial work on their dissertations. A minimum of 24 hours of such research credit is required.

#### Defense of Dissertation

This examination will be oral and must be completed at least four weeks before the date on which the degree is to be conferred. The dissertation committee members must have the completed dissertation at least two weeks before the date of the oral examination. Under normal circumstances, it is expected that the student will have had a research paper accepted for publication prior to the dissertation defense.