# APPLIED MATHEMATICS PH.D.

https://ceps.unh.edu/integrated-applied-mathematics/program/phd/integrated-applied-mathematics

## Description

The IAM Program prepares students for research and teaching careers in the mathematical solution of critical problems in science and engineering. The emphasis of the IAM program is on the use of mathematics and computing to facilitate impactful interdisciplinary research. Accordingly, all students must achieve a high level of training through the required coursework. An IAM Ph.D. candidate is expected to achieve expertise in both applied and computational mathematics as well as one area of specialization including, but not limited to: Fluid Dynamics, Dynamical Systems, Plasma and Space Physics, Mathematical Geo- or Environmental Science, Materials and Solid Mechanics, or Biophysics.

## Admission Requirements

Applicants to the IAM Ph.D. Program are expected to have a bachelor's degree or master's degree in mathematics or an appropriate science or engineering field.

## Applying

Please visit the Graduate School website for detailed instructions about applying to the program.

## Requirements

| Code | Title | Credits |
|---|---|---|
| **Required Courses** | | |
| PHYS 931 | Mathematical Physics | 3 |
| IAM 830 | Graduate Ordinary Differential Equations | 3 |
| IAM 851 | Introduction to High-Performance Computing | 3 |
| IAM 932 | Graduate Partial Differential Equations | 3 |
| IAM 933 | Applied Functional Analysis | 3 |
| IAM 961 | Numerical Analysis I: Numerical Linear Algebra | 3 |
| IAM 962 | Numerical Partial Differential Equations | 3 |
| Select a 2-course specialization sequence: | | 6-7 |
| MATH 847 & IAM 950 | Introduction to Nonlinear Dynamics and Chaos and Spatiotemporal and Turbulent Dynamics | |
| PHYS 953 & PHYS 951 | Magnetohydrodyamics of the Heliosphere and Plasma Physics | |
| ME 807 & ME 909 | Analytical Fluid Dynamics and Viscous Flow | |
| Select a minimum of three technical electives: [1] | | 9 |
| CS 830 | Introduction to Artificial Intelligence | |
| CS 858 | Algorithms | |
| IAM 940 | Asymptotic and Perturbation Methods | |
| ME 812 | Waves in Fluids | |
| ME 922 | Continuum Mechanics | |
| PHYS 812 | Introduction to Space Plasma Physics | |
| PHYS 818 | Introduction to Solid-State Physics | |
| PHYS 941 | Electromagnetic Theory I | |
| PHYS 965 | Advanced Solid-State Physics | |
| **Total Credits** | | **36-37** |

[1] Additional elective as approved by your advisor and program.

## Candidacy Requirements

Students must pass a three part Ph.D. qualifying exam:

- Comprehensive exam in mathematical methods
- Comprehensive exam in scientific computing
- Oral or written exam in a specialization area

Students must select a research adviser and have identified a research topic.

## Dissertation

Students must submit a written thesis proposal and give a seminar presentation summarizing the proposal to a dissertation committee.

Upon completion of research, a student must give a seminar summarizing the research objectives, methods, findings, and significance.

Students must submit a dissertation that includes original research in applied mathematics. The dissertation must comply with all policies put forth by the Graduate School

## Student Learning Outcomes

### Program Learning Outcomes

- Students are skilled at mathematical manipulations and analytic calculations broadly covering the field of applied mathematics.
- Students have developed sufficient mathematical background and understanding of key concepts to have a functional literacy in modern applied mathematics journals.
- Students can use numerical algorithms to approximate solutions to mathematical problems which are intractable by hand calculation and understand the impact of consistency, stability, and accuracy in the context of numerical computing.
- Students have made independent contributions to a significant mathematical research project and have clearly demonstrated the ability to conduct high-level, self-directed research in applied mathematics.
- Students are capable of disseminating the results of their research through written (e.g., journal) publications and oral presentations or seminars.