

Applied Math for the Life and Social Sciences (Complex Adaptive Systems Science), PhD

LAAMLCPHD

With the complex adaptive systems science concentration, you'll use theory and analytical approaches from applied mathematics to solve the complicated, dynamic issues that inevitably arise from human interactions at different scales, such as land degradation, urban growth, disease and natural disaster response.

Program description

Degree awarded: PHD Applied Mathematics for the Life and Social Sciences (Complex Adaptive Systems Science)

The PhD program in applied mathematics for the life and social sciences focuses on training researchers to analyze scientific questions at the intersection of the mathematical, life and social sciences. Graduates of the program make innovative and far-reaching scientific contributions that rely on the advanced computational mathematical and modeling approaches.

This program focuses on producing quantitative scientists and applied mathematicians who conduct high-level transdisciplinary research. The program's faculty include mathematicians, statisticians, theoretical biologists and social scientists from five different schools at Arizona State University.

There is a high demand for first-rate scientists, researchers and faculty interested in meeting the challenges faced by communities in today's world. Institutional research and planning programs create the space and opportunity to address such challenges on a global scale. The health, environmental and natural resource challenges in Arizona and the nation are urgently in need of a large pool of researchers with these transdisciplinary skills.

There are three tracks a student can follow. Applied mathematics is a more in-depth focus on the tools applied to the life and social sciences, such as dynamical systems, computational and numerical methods, simulation and mathematical analysis. Life sciences focuses on understanding the tools for representing

the structure and operation of complex biological and ecological processes. Social sciences focuses on understanding the tools for representing the structure and operation of complex social systems and processes.

By offering courses that enhance transdisciplinary exchanges and collaboration among the faculty and students interested in addressing questions of social relevance, the program builds upon foundations already established.

The complex adaptive systems science concentration trains the next generation of scientists in advanced concepts and methods needed for approaching diverse phenomena in the social and life sciences. The program is tightly integrated with diverse, ongoing, university-wide research on complex adaptive system science at ASU and emphasizes the value of a complex adaptive perspective to give better insight and a more active role in seeking solutions to a broad array of critical issues facing society today. Students become fluent in the common language of complexity while also receiving a solid foundation in the domain knowledge of existing academic disciplines.

At a glance

- **College/School:** [College of Global Futures](#)
- **Location:** [Tempe](#)

Degree requirements

84 credit hours, a written comprehensive exam, a prospectus and a dissertation

Required Core (6 credit hours)

AML 610 Topics in Applied Mathematics for the Life and Social Sciences (3)

AML 612 Applied Mathematics for the Life and Social Sciences Modeling Seminar (3)

Concentration Courses (6 credit hours)

ASM 570 Fundamentals of CAS Science (3) or BIO 570 Fundamentals of CAS Science (3)

Complex adaptive systems science approaches course (3)

Restricted Electives (12 credit hours)

biostatistics course (3)

numerical analysis course (3)

life sciences and social sciences (6)

Electives (36 credit hours)

Research (12 credit hours)

AML 592/792 Research (12)

Culminating Experience (12 credit hours)

AML 799 Dissertation (12)

Additional Curriculum Information

Students should see the academic unit for a complete list of complex adaptive systems sciences approaches courses required for the concentration.

For required research, other 592/792 Research courses may be substituted with academic unit approval.

When approved by the student's supervisory committee and the Graduate College, this program allows 30 credit hours from a previously awarded master's degree to be used for this degree. If students do not have a previously awarded master's degree, the 30 hours of coursework is made up of electives to reach the required 84 credit hours.

Students entering the program without a master's degree must earn an additional 30 hours of graduate credit, produce a research portfolio which is formally evaluated by a faculty committee and present that research in a public forum before continuing on in the later stage of the doctoral program.

All students must maintain an average GPA of 3.20 (scale is 4.00 = "A") in their courses and complete degree requirements per the program's satisfactory progress policy.

Admission requirements

Applicants must fulfill the requirements of both the Graduate College and the College of Global Futures.

Applicants are eligible to apply to the program if they have earned a bachelor's or master's degree from a regionally accredited institution. A master's degree in the social sciences (e.g., anthropology, sociology, gender studies or geography), life sciences or related fields (e.g., biology, genomics or ecology), applied mathematics, mathematics or statistics is preferred.

Applicants must have a minimum cumulative GPA of 3.00 (scale is 4.00 = "A") in the last 60 hours of their first bachelor's degree program, or a minimum cumulative GPA of 3.00 (scale is 4.00 = "A") in an applicable master's degree program.

All applicants must submit:

1. graduate admission application and application fee
2. official transcripts
3. personal statement outlining educational and professional goals
4. current curriculum vitae or resume
5. three letters of recommendation
6. proof of English proficiency

Additional Application Information

An applicant whose native language is not English must provide proof of [English proficiency](#) regardless of their current residency.

Applicants may submit an optional scholarly writing sample, not to exceed 30 double-spaced pages, to be included in their application materials.

Prior to admission, students should have completed at the undergraduate junior or senior level a minimum of the following:

1. fifteen credit hours of mathematics or statistics
2. nine credit hours of life sciences and social sciences coursework at the senior or college graduate level
3. no fewer than three credit hours each of life sciences and social sciences coursework

Tuition information

When it comes to paying for higher education, everyone's situation is different. Students can learn about [ASU tuition and financial aid](#) options to find out which will work best for them.

Application deadlines

Fall

[expand](#)

Global opportunities

Global experience

Studying abroad is encouraged for graduate students. Nearly all of the College of Global Futures faculty-directed programs offer graduate credit. In addition, the Global Education Office offers more than 50 program opportunities, with programs on every continent.

Faculty-directed programs tend to be the best fit for graduate students; taking courses with ASU professors over the summer or during academic breaks offers students close mentorship and professional network growth in many fields of study while they earn ASU credit. Exchange program participation is also possible with careful planning.

Students can find programs specific to their interests on the [College of Global Futures Study Abroad](#) webpage, and additional opportunities and information on the [ASU Global Education Office](#) website. These sites also include additional information about applying for funding to support global travel.

Graduate students are also encouraged to apply for funding for international research, study and professional development through [ASU's Lorraine W. Frank Office of National Scholarships Advisement](#).

Career opportunities

The degree program in applied mathematics for the life and social sciences prepares students to enter the environmental, life, health, mathematical and social science fields. Graduates of the program possess the quantitative, scientific and analytical skills that are critical for professionals working in these areas.

The need for scientists and professionals quantitatively trained in the life and social sciences is strong in Arizona and the nation. This degree's applied use of mathematics, modeling, statistics and simulation methodologies are in high demand and provide excellent training for future academics and professionals in industries including:

- bioinformatics
- computational sciences
- ecology
- genomics
- mathematical analysis
- mathematical epidemiology
- nonlinear dynamics
- population dynamics
- social science fields

Contact information

[School of Complex Adaptive Systems](#) | ECA 100

CASSgrad@asu.edu | 480-727-0478