

COMPLEX SYSTEMS AND DATA SCIENCE AMP

All students must meet the Requirements for the Accelerated Master’s Degree Pathway

OVERVIEW

The accelerated M.S. in Complex Systems and Data Science (CSDS) is a 5-year degree coupled with a relevant bachelor's degree with optional disciplinary tracks. Our central goal is to help students become protean data scientists with eminently transferable skills. We provide students with a broad training in computational and theoretical techniques for (1) describing and understanding complex natural and sociotechnical systems, enabling them to then, as possible, (2) predict, control, manage, and create such systems. Students will be trained in: Industry standard methods of data acquisition, storage, manipulation, and curation; Visualization techniques, with a focus on building high quality web-based applications; Finding complex patterns and correlations through, for example, machine learning and data mining; Powerful ways of hypothesizing, searching for, and extracting explanatory, mechanistic stories underlying complex systems—not just how to use black box techniques; Combining the formulation of mechanistic models (e.g., toy physics models) with genetic programming.

SPECIFIC REQUIREMENTS

Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

To be eligible for the Accelerated Master’s Entry Pathway, a student must be a declared computer science, mathematics, or statistics B.S. major, and have identified a Complex Systems faculty sponsor. Students need to apply early (before the second semester of their junior year) to have time to plan two graduate level courses that can be used toward both their bachelor's and graduate (M.S.) degree. These credits must be taken after formal admission to the graduate program. Other requirements include a GPA typically higher than 3.2 overall. All students must meet the Graduate college requirements for the Accelerated Master’s Degree Pathway. There is no GRE requirement.

Minimum Degree Requirements for the Degree of Master of Science

A total of 30 credits, distributed as shown below:

Requirement Description		Credits
Common Core (3 Credits Each)		12
CSYS 6701	Principles of Complex Systems 1 (Include individual and/or team projects)	3
or MATH 6701	Principles of Complex Systems 1	

CSYS 6020	Modeling Complex Systems I (Include individual and/or team projects)	3
or CS 6020	Modeling Complex Systems I	
CSYS 5870	Data Science I - Experience	3
or STAT 5870	Data Science I - Experience	
or CS 5870	Data Science I - Experience	
1 of the following 3 courses:		3
CSYS/MATH 6713	Principles of Complex Systems 2	
CSYS/CS 6990	Special Topics (Modeling Complex Systems II)	
STAT 6870	Data Science II	
Electives		9
6 credits of Complex Systems and/or Data Science Electives		6
3 credits of an advisor approved course		3
Path Specific		9
Coursework only: 9 credits of either additional Complex Systems and Data Science courses or an elective path (Biomedical Systems, Distributed Systems, Energy Systems, Environmental Systems, Evolutionary Robotics, Policy Systems, or Self-designed named disciplinary path (requires approval of the CSDS advisor))		
Coursework and project: 3 to 6 credits of project (CSYS 6392) plus additional 3 to 6 credits of course work		
Coursework and thesis: 6 to 9 credits of thesis research (CSYS 6391) plus additional 3 credits of course work if needed.		

Threaded throughout their courses, a desired central outcome of each Master’s student’s training will be their development of a data-intensive, high design portfolio of interactive online visualizations. Students will have many opportunities to work with faculty, researchers, institutions, and corporations, on meaningful, important real-world data sets, drawn from engineering systems, neuroscience, society through the lens of social media, and more. Beyond being a key training mechanism, we envisage these portfolios—in the manner of, for example, a traditional engineering design or artist’s set of works—will be instrumental in students achieving outstanding positions in their chosen fields.

Comprehensive Exam

Students must demonstrate mastery of the material by one of four possible routes: an oral exam, a written exam, a paper, or a portfolio. For the course-based Master's, receiving a grade of A- or better in all courses constitutes successfully completing the comprehensive examination in a student’s field of specialization. Students who receive a grade of B+ or lower in any of their courses must pass a written and/or oral comprehensive exam. The exact format will be decided upon by the Curriculum Committee in consultation with

the student. The Curriculum Committee will also designate three relevant faculty who will create the exam and or specify the format and content area of the paper and assess the student's performance.

Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of the comprehensive exam and all required coursework.