

Mathematical and Computational Sciences, PhD, Computer Science Emphasis Area

Admission Requirements

~~Applicants must have at least a bachelor's degree in mathematics or in a field with significant mathematical content. Examples of such fields include computer science, data science, economics, engineering and physics. An applicant's record should demonstrate superior achievement in undergraduate mathematics.~~

~~Individuals may apply for direct admission to either the M.A. or Ph.D. program. Candidates for the M.A. degree may choose an emphasis in mathematics or data science. Students in the M.A. program who want to transfer to the Ph.D. program upon successful completion of 15 credit hours must fill out a new application through Graduate Admissions.~~

~~Students intending to enter the Ph.D. program must have a working ability in modern programming technologies. A student with a deficiency in this area may be required to take courses at the undergraduate level in computer science.~~

~~Applicants for the Ph.D. program must, in addition, submit three letters of recommendation and scores from the Graduate Record Examination (GRE) general aptitude test.~~

Applicants must meet the general graduate admission requirements of the Graduate School, described in the UMSL Bulletin. Students are considered for admission to the graduate program in Computer Science only after they have formally applied for admission through Graduate School. Applications are completed on-line. Additional requirements are listed below.

An applicant for admission to the Ph.D. in Mathematical and Computational Science - Computer Science option should have completed a Master's in Computer Science or a related area, with a GPA of at least 3.0/4.0. An applicant without a related master's but with an exceptional record will also be considered for admission into the Ph.D. program. Such a case will require justification in the form of strong academic standing, experience, participation in research/publications, and/or strong GRE. It should be presented through the statement of purpose and recommendation letters. Other applicants without a master's degree are advised to apply to the

master's program in Computer Science or Cybersecurity and then reapply to the Ph.D. before or after completing the Master's.

The statement of purpose should show evidence of the ability to convey ideas in a succinct and focused manner. The applicant should describe their reasons for applying to the UMSL Ph.D. program in Computer Science, their objectives, including research and career, and should outline a path to successful completion.

The application also requires at least two recommendation letters from academic or professional sources who can comment on academic competence, research potential, or professional experience. At least one of the letters must be from an academic source.

Applicants are advised to submit scores from the GRE general test, which are not more than 5 years old.

A student admitted to the Ph.D. can transfer prior related graduate coursework, subject to Graduate School regulations. Credits from an awarded master's degree can be credited towards the doctoral degree requirements. A student admitted without a master's degree can transfer up to 20 graduate credit hours of related courses, with the approval of the advisor and the Graduate Director. However, at least 31 credits used to satisfy requirements for the doctoral degree must be completed in residence at UMSL.

An applicant will be evaluated based on competency (related academic or professional experience) in core areas of computer science, specifically including

1. Programming skills and languages
2. Operating systems
3. Data structures and analysis of algorithms
4. Computer organization and architecture

Applicants missing some of the listed competency areas may be admitted and will be required to take related courses as a part of their studies. Applicants with too many core deficiencies may be advised to apply to the M.S. in Computer Science or M.S. in Cybersecurity - Computer Science Emphasis, and reapply to the doctoral program after completing necessary

courses, which can be transferred into the Ph.D. program subject to the stated limitations.

International applicants are required to show proficiency in English as directed by the UMSL Global office. The requirement is waived for students whose native language is English, or who have completed a previous degree from a US university. It may also be waived for students who are permanent residents of the US and who have lived in the US for a substantial period of time.

Visit this page for information on our research areas, this page for information about the current sponsored projects, and this page for information on financial support.

Application Process

The department admits students for the Fall and Spring semesters on a rolling basis. For international students, the deadlines are determined by the visa processing times and usually are May 31 for the Fall semester and October 31 for the Spring semester.

Follow the directions on the Graduate School web site.

Degree Requirements

The requirements for the Ph.D. degree include the following:

1. Course work
2. Comprehensive examination leading to Ph.D. Candidacy
3. Ph.D. Candidacy and Doctoral Dissertation

A student must advance to Ph.D. candidacy before working on a dissertation, then defend the dissertation to be awarded the doctoral degree.

~~1. Course Work~~

~~A minimum of 60 hours of courses numbered 4000 or above.~~

~~In the Computer Science Option, at least 45 hours must be in courses numbered 5000 or above.~~

~~At most 9 hours of a student's enrollment in Dissertation Research may be counted. Students are expected to maintain a 3.0 average on a 4.0 scale. All courses numbered below 5000 must be completed with a grade of at least B. Courses outside the Department of Mathematics and Computer Science will require approval of the graduate director.~~

~~When students who have earned a Master's degree are admitted to the doctoral program, appropriate credits of course work may be applied toward meeting the requirements for the doctoral degree, subject to Graduate School regulations and the approval of the graduate director. The same applied to those with some appropriate graduate credits but without a completed Master's degree.~~

A minimum of 60 credit hours of courses numbered 4000 or above are required, of which at least 45 credit hours must be from courses numbered 5000 or above. The 60 credit hours must include a minimum of 9 and a maximum of 15 Dissertation Research credit hours. All courses numbered below 5000 must be completed with a grade of at least B. Courses outside the Department of Computer Science will require the approval of the Graduate Director. The same applies to courses taken at other institutions, and these credits would be subject to residency requirements. All courses to be counted as part of the degree requirement, including transfers but excluding a prior M.S. degree, are subject to an eight-year limitation.

Students are expected to maintain a GPA of 3.0 on a 4-point scale. At least half of the counted courses must be UMSL courses according to the residency requirements.

2. Comprehensive Examination leading to Ph.D. Candidacy

~~Advancement to Ph.D. candidacy is a three-step process consisting of:~~

- ~~a. Completing 18 hours of 5000 level courses other than Ph.D. Dissertation Research as appropriate for the selected option.~~
- ~~b. Passing the comprehensive examination.~~
- ~~c. Selecting a Ph.D. committee and preparing a dissertation proposal and defense of the proposal.~~

Qualifying Examination

~~A student must fulfill the following requirements.~~

Basic Requirement

Pass one written examination covering fundamental topics. This examination would normally take place within the first 12 credit hours of study after admission to the Ph.D. program.

Computer Science Option

Topics from the theory of programming languages, operating systems, analysis of algorithms, and computer systems:

<u>CMP SCI 4250</u>	Programming Languages	3
<u>CMP SCI 4760</u>	Operating Systems	3
<u>CMP SCI 5130</u>	Advanced Data Structures and Algorithms	3
<u>CMP SCI 5700</u>	Computer Systems	3
Total Hours		12

Additional Requirement

After fulfilling the basic requirement above, the student must meet one of the following:

1. Pass a written examination in an area of the student's interests. This area will be approved by the graduate committee and will be based on a set of two or more graduate courses taken by the student. This examination would normally take place within the first 24 credit hours of study after admission to the Ph.D. program.
2. Write a survey paper in a specialized area under the direction of a member of the graduate faculty. The student should propose to take this option when he/she has already finished at least 2 graduate level courses and has the approval of the graduate committee. The paper should be submitted within four semesters, at which time an oral examination given by a committee of at least three members of the graduate faculty must be passed.

In both parts 1) and 2), the graduate committee will determine if the topics are consistent with the option that the student is pursuing.

A student advances to Ph.D. candidacy after satisfying the following requirements:

I. Passing comprehensive examinations in two steps:

1. Passing a qualifier examination covering fundamental topics in Computer Science. This examination should take place no later than in the semester immediately after completing 12 credit hours in the program at UMSL. If necessary, this examination can be repeated once in the first semester, but no later than the second semester following the first attempt. This examination covers the following two courses/topics

CMP SCI 4760	Operating Systems	3
CMP SCI 5130	Advanced Data Structures and Algorithms	3
Total Hours		6

and two additional courses, selected by the Graduate Director taking each student's interests into account.

2. After passing the qualifier examination, the student finds a research advisor, constitutes a research committee, and then must do one of the following:

- Pass a written examination in the area of the student's interests written under the direction of the research advisor covering some specialized advanced coursework or area.
- Write a survey paper in the area of the student's interests under the direction of the research advisor and successfully present it orally.

II. Completing the required credit hours other than Dissertation Research (minimum 45 credits, including transfers and prior M.S. credited toward the Ph.D.)

~~Dissertation Committee and Dissertation Proposal~~

~~After completing the comprehensive examinations, each student chooses a dissertation advisor and prepares a Dissertation Proposal. Usually students choose an advisor from contacts made through their course work. The dissertation committee will be formed, and the student will meet with this committee for an oral defense of his/her dissertation proposal. The dissertation proposal is a~~

~~substantial document describing the problem to be worked on and the methods to be used, as well as demonstrating the student's proficiency in written communication.~~

Doctoral Dissertation

~~Each Ph.D. candidate must write a dissertation that is an original contribution to the field on a topic approved by the candidate's Ph.D. Committee and the department, and which meets the standards and requirements set by the Graduate School including the public defense of the dissertation. Students working on a dissertation may enroll in Ph.D. Dissertation Research, as appropriate for the selected option. A maximum of 9 hours Dissertation Research can be used toward the required hours of work in courses numbered 5000 or above.~~

A Ph.D. candidate obtains the Ph.D. in these steps:

1. The Ph.D. candidate must propose a dissertation committee.
2. The Ph.D. candidate must prepare a written dissertation proposal and defend it in front of the dissertation committee. The dissertation proposal is a substantial document describing the problem area, the specific problem to be worked on, and the methods to be used, as well as demonstrating the student's proficiency in written communication. A candidate making substantial changes in the research direction may have to repeat this step.
3. The Ph.D. candidate must then write a dissertation as outlined in the dissertation proposal while enrolling for Dissertation Research credits. This work must be an original contribution to the field, and it must meet the standards and requirements set by the Graduate School including a public defense of the dissertation.
4. The Ph.D. candidate must successfully present and defend the dissertation in front of the dissertation committee.

Rationale

Changing the qualifier exam to make it more flexible for different fields of study. Also making other minor changes on admissions, and changing some language in degree requirements.