Computer Science and Engineering

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Graduate study is offered in the Department of Computer Science and Engineering leading to the degrees of Master of Science in Computer Science, Master of Science in Cyber Security and Operations, and Doctor of Philosophy in Computer Science.

The program of study of a Master of Science in Computer Science degree includes advanced courses in computer science that are selected according to the goals of the student. The program of study includes a thesis option, a professional project option, or courses-only option. The Master of Science in Cyber Security and Operations includes two concentrations: (1) Cyber Defense and (2) Cyber Operations with thesis- and non-thesis options available in each concentration. The program of study of a Doctor of Philosophy (Ph.D.) in Computer Science degree includes advanced courses in computer science and significant scholarly research in computer science, presented in a dissertation. Applicants with bachelor degrees can apply for direct admission to the Ph.D. program. Applicants with master's degrees are also welcome.

The department's core research areas include the following.

- Artificial intelligence
- Computational science
- Graphics
- Human centered computing
- Software engineering and systems

These core competencies support research applications in areas such as bioinformatics, visualization, computer security and forensics, human-computer interactions and high performance computing. Faculty, research assistants, thesis students, and dissertation students participate in a wide variety of research projects. Many research projects are multi-disciplinary or multi-specialty in nature.

The Master of Science in Cyber Security and Operations is designed for students who wish to help meet the challenges posed by increasing cyber-threats. Using a multidisciplinary approach, the program is designed to provide students with a focused education within a broad analytical framework for evaluating, understand, and solving cyber security problems. Either concentration will allow a thesis or non-thesis option.

The Cyber Defense concentration will focus on those aspects of cyber security needed to prepare an enterprise level system to protect itself. Material will prepare the students for developing cyber security policies to comply with existing and future laws, conducting risk assessment in enterprise to determine compliance with requirements and implementing security solutions for the enterprise.

The Cyber Operations concentration will focus on those aspects of cyber security that are needed to operate in the cyber domain. Material will prepare the student for advanced operations in the cyber domain such as penetration testing, after action analysis, and malware analysis. This concentration is designed to satisfy the requirements for the Center of Academic Excellence in Cyber Operations program of the Department of Defense.

Several teaching and research assistantships are available. Application forms for admission to graduate studies, departmental assistantships, information regarding the graduate programs, faculty and their research interests, and courses are available from the department's page on the World Wide Web.

Application Procedure

An applicant is required to submit the following application requirements to the Office of the Graduate School.

- Application for admission to graduate study
- Transcripts from all former institutions attended
- TOEFL or IELTS score (for applicable international students)
- Scores on the general test of the Graduate Record Examination (GRE)
- Three letters of recommendation
- Statement of the applicant's career goals and objectives
- Application fee

International students will also need a Document of Support Form and associated documentation, which are typically submitted after approval for admission.

In addition, the applicant is encouraged to submit directly to the Department of Computer Science and Engineering any additional information (such as GRE subject test scores, résumé, etc.) that supports his/her application.

The department's application form for assistantships is separate from the application for graduate admission. The application and more information are available at http://web.cse.msstate.edu/prospective/grad/assistantships.php.

Application Dates

Applications may be submitted at any time. Completed applications should be received by the dates specified by the Office of the Graduate School. Preference for awarding assistantships will be given to applications received by

Summer	February 1
Fall	February 1
Spring	October 1

M.S. Admission Requirements

Regular Admission to the M.S. Program

For regular admission to the Master of Science program, the applicant must

- satisfy the minimum requirements for admission to graduate study as specified in the Mississippi State University *Graduate School Catalog* and submit all documents as required in the application information (http://catalog.msstate.edu/archives/2017-18/graduate/admissions-information);
- possess those qualifications and interests that indicate to the Computer Science and Engineering Graduate Studies Committee that the applicant will be successful in the MSU computer science Master of Science program;
- have a minimum TOEFL (Test of English as a Foreign Language) score of 550 PBT (79 iBT) or IELTS (International English Language Testing System) score of 6.5. (This applies only to international students. The University may waive the TOEFL requirement for international students who hold a degree from a U.S. Institution).

Contingent Admission to the M.S. Program

An applicant who fails to meet the requirements for regular admission may be considered for contingent admission by the Graduate Studies Committee. Contingent admission may be granted under the following conditions:

- An international student with a TOEFL score of less than 550 (79 iBT) or IELTS of 6.5 but at least 500 PBT (61 iBT) or 5.5 on the IELTS may be admitted. To achieve regular admission status, the student will be required to complete satisfactorily the appropriate English as a Second Language sequence of courses; see the MSU Graduate School *Bulletin* (General Requirements for Admission, English Language Requirements for International Students) for specific requirements.
- An applicant who has not yet taken the GRE but who has a computer science baccalaureate degree from a U.S. institution may be admitted, but only on a contingency basis. To achieve regular admission status, the student will be required to take the GRE General Test in his or her first semester and obtain a satisfactory composite GRE score.
- A student who has not completed the undergraduate prerequisites may be given contingent admission. To achieve regular admission status, the student must complete all remaining prerequisites with a grade of B or better in each course.

Ph.D. Admission Requirements

Regular Admission to the Ph.D. Program

For regular admission to the doctoral program, the applicant must

1. satisfy the minimum requirements for admission to graduate study as specified in the Mississippi State University admissions information (http://catalog.msstate.edu/archives/2017-18/graduate/admissions-information) in the *Graduate School Catalog* and submit all documents as required in the application procedure below;

2. possess those qualifications and research interests that indicate to the Computer Science and Engineering Graduate Studies Committee that the applicant will be successful in the computer science doctoral program; and

3. have a minimum TOEFL (Test of English as a Foreign Language) score of 550 PBT (79 iBT) or IELTS (International English Language Testing System) score of 6.5. (This applies only to international students. The University may waive the TOEFL requirement for international students who hold a degree from a U.S. institution.)

Some students have master's degrees when they begin their Ph.D. studies, and some students pursue a Ph.D. degree directly after earning a bachelor's degree (a "Direct Ph.D.").

Contingent Admission to the Ph.D. Program

A student who fails to meet the requirements for regular admission may be considered for contingent admission by the Graduate Studies Committee. Contingent admission may be granted under the following conditions:

1. An international student with a TOEFL score of less than 550 PBT (or equivalent) but at least 500 PBT (61 iBT) or 5.5 on the IELTS may be admitted. To achieve regular admission status, the student will be required to complete satisfactorily the appropriate English as a Second Language sequence of courses; see the MSU Graduate School *Bulletin* (General Requirements for Admission, English Language Requirements for International Students) for specific requirements.

2. An applicant who has not yet taken the GRE but who has a computer science baccalaureate degree from a U.S. institution may be admitted, but only on a contingency basis. To achieve regular admission status, the student will be required to take the GRE General Test in his or her first semester and obtain a satisfactory composite GRE score.

3. A student who has not completed the undergraduate prerequisites may be given contingent admission. To achieve regular admission status, the student must complete all remaining prerequisites with a grade of B or better in each course.

Admission to Candidacy

A doctoral student becomes a candidate upon completion of all prerequisite and Fundamental Areas courses, completion of all courses on the program of study, acceptance of a research topic by his/her Graduate Committee, and passing the preliminary examination.

Academic Performance

Academic Probation

Requirements of the Graduate School apply as explained in the Bulletin of the Graduate School section "General Degree Completion Requirements."

Once admitted to the graduate program in Computer Science, a student who fails to maintain a satisfactory academic record will be considered to be on academic probation. A graduate GPA will be computed for each student at the end of each semester. The student's graduate GPA is the average of all graduate courses attempted while in the CS graduate program.

- A student whose graduate GPA drops below 3.00 is automatically on academic probation.
- A student who obtains a grade below a B on a prerequisite course is automatically on academic probation.
- To be removed from probation, the student, by the completion of the next nine credit hours of progress toward the degree, must:
  - achieve a graduate GPA of 3.00 or above and
  - earn a grade of B or above on any prerequisite course for which a grade lower than B was previously obtained.

With the approval of the Graduate Coordinator and the Dean of the College of Engineering, a student may retake one course per degree. This policy applies to all courses (even those not on the program of study) taken as a graduate student related to a specific program, and only to those courses taken at MSU. With the exception of those courses approved for repeated credit (e.g., internships, special topics, individual studies, thesis, dissertation, etc.), a specific course may be repeated only once. Both courses will remain on the permanent transcript, and both grades will be computed in final averages. No additional program credit hours will be generated from a repeated course.

At the beginning of each semester the Department of Computer Science and Engineering Graduate Studies Committee evaluates the records of all Computer Science graduate students currently on probation, as well as students with multiple grades of C and those making a grade of D, F, or U during the previous semester. The committee will consider recommending that the Dean of the College of Engineering dismiss a student enrolled in a graduate program in Computer Science if:

- The student was admitted on TOEFL contingency and fails to make satisfactory progress towards completion of the appropriate English as a Second Language sequence of courses.
- The student was admitted without GRE scores and fails to take the GRE General Test during the next semester or fails to obtain a satisfactory composite score on the GRE.
- The student was admitted with contingencies due to deficiencies in prerequisite coursework and fails to make satisfactory progress toward completion of the prerequisites.
- The student is on academic probation and is unable to meet all requirements for removal from probation by the completion of the next 9 credit hours of progress toward the degree.
- The student makes a grade of D or F in a graduate or undergraduate course attempted while in the graduate program in Computer Science or 6 or more credit hours of C grades.
- The student receives a grade of U in an S/U graded course.

Appeals Process

A student who has been dismissed from the Computer Science graduate program has the right to appeal the dismissal.

- Within four weeks of being notified of the dismissal, a student who wishes to appeal must write a letter requesting a reconsideration of the dismissal, giving all pertinent facts and explaining any extenuating circumstances. The letter should be addressed to the Head of the Department of Computer Science and Engineering. The Head of the Department of Computer Science and Engineering will review this appeal and will render a decision within five working days. If the decision is in favor of the student, the Head of the Department of Computer Science and Engineering will recommend to the Dean of the College of Engineering that the student's dismissal from the Computer Science graduate program be rescinded.
- If the student is dissatisfied with the decision of the Department Head, the student may appeal in writing to the Dean of the College of Engineering. See Appeal of Academic Dismissal in this publication.
- If this appeal is unsuccessful, the student may then appeal to the Provost and Vice President for Academic Affairs.

Undergraduate Prerequisite Courses for the Master's Degree

The prerequisite courses required of all Master's students are the following and their prerequisites:

CSE 2383	Data Structures and Analysis of Algorithms	3
MA 2733	Calculus III	3
ECE 3724	Microprocessors	4
CSE 3813	Introduction to Formal Languages and Automata	3
CSE 4713/6713	Programming Languages	3
CSE 4733/6733	Operating Systems I	3
CSE 4833/6833	Introduction to Analysis of Algorithms	3

Candidates for the master's degree must have completed all prerequisite courses or their equivalent. These courses may be completed after enrolling in the graduate program. A program of study for the master's degree may include 6000-level prerequisite courses.

Accelerated Program

The Accelerated Program enables a student to complete both a bachelor's degree in Computer Science or Software Engineering and a master's degree in Computer Science in approximately five years. The program has the following features.

- A student must apply for admission to the program no sooner than the end of the sophomore year (60 hours or more of graded courses). The criteria for admission assesses whether the applicant possesses those qualifications and interests that indicate to the department's Graduate Studies Committee that the applicant will be successful in the MSU M.S. in Computer Science program. The applicant must have an overall GPA of 3.5.
- A student must have senior standing to enter the program. A student is classified as an undergraduate until all the requirements for the undergraduate degree are fulfilled, at which point the student is then classified as a graduate student.
- A maximum of 9 hours of graduate courses taken after entering the program and prior to completing the bachelor's degree can count toward both the bachelor's degree and the program of study for the Master of Science in Computer Science degree. In order to count toward the master's degree, such courses must conform to other requirements for the M.S. degree. The program will follow procedures established by the Registrar for dual counting.
- During the senior year, if a student in the program enrolls in any graduate courses during a given term, then the maximum load of combined graduate and undergraduate courses is 16 credits during that fall or spring semester, or 6 credits during that summer (all summer terms combined).
- During the senior year, approval to enroll in graduate courses will be granted by the department's graduate coordinator using the form found at http://www.grad.msstate.edu/forms/pdf/accel.pdf.
- During the senior year, graduate courses at the 6000-level will count toward the Bachelor of Science degree similarly to the corresponding 4000-level courses.
- During the senior year, graduate courses at the 7000-level or above will count toward the Bachelor of Science degree as technical electives.
- During the senior year, the student will submit a normal admission application package for the M.S. degree, including GRE scores and application fee.
- Upon earning the bachelor's degree and making satisfactory progress, the student will be admitted to the Master of Science in Computer Science program. The department's graduate coordinator will initiate the graduate admission process by the end of the first semester of the senior year.
- After earning the bachelor's degree, the student will complete the M.S. degree requirements in the normal manner.
- An undergraduate student may opt out of the program at any time and complete only the undergraduate portion of the program. No additional dual counting will occur after opting out.

Master of Science in Computer Science - Thesis

Fundamental Areas Courses

Select at least three of the following: [1]		9-10
CSE 6153	Data Communications and Computer Networks	
CSE 6163	Designing Parallel Algorithms	
CSE 6214	Introduction to Software Engineering	
CSE 6413	Principles of Computer Graphics	
CSE 6503	Database Management Systems	
CSE 6633	Artificial Intelligence	
Theory Courses		
Select one of the following:		3
CSE 8813	Theory of Computation	
CSE 8833	Algorithms	
CSE 8843	Complexity of Sequential and Parallel Algorithms	
CSE 8990	Special Topics in Computer Science and Engineering [2]	
Seminar		
CSE 8011	Graduate Seminar	1
Additional Coursework		
8000 or 9000-level graduate-level coursework [3]		12
Research/Thesis		
CSE 8000	Thesis Research/ Thesis in Computer Science and Engineering	6
Total Hours		31-32

[1]   A student who has taken any of these six courses for undergraduate credit may use the undergraduate course to meet the graduate Fundamental Areas requirement and substitute another graduate-level course approved by the student's graduate committee.

[2]   On a topic which has been designated in advance by the department as a theory course fulfilling this requirement.

[3]   A minimum of 12 credit hours of full graduate (8000- or 9000-level) computer science courses must be included in the program of study.

The student must:

- propose research within his/her area of interest. Normally the major professor will direct the thesis research. The research must be accepted by his/her Graduate Committee and reported in a defensible thesis paper
- defend the thesis research to his/her Graduate Committee at a formal presentation at the time of the comprehensive examination.

A student may only select the thesis option if a member of the graduate faculty has agreed to serve as the thesis director.

Master of Science in Computer Science - Non-Thesis

Fundamental Areas Courses		
Select at least three of the following: [1]		9
CSE 6153	Data Communications and Computer Networks	
CSE 6163	Designing Parallel Algorithms	
CSE 6214	Introduction to Software Engineering	
CSE 6413	Principles of Computer Graphics	
CSE 6503	Database Management Systems	
CSE 6633	Artificial Intelligence	
Theory Courses		
Select one of the following:		3
CSE 8813	Theory of Computation	
CSE 8833	Algorithms	
CSE 8843	Complexity of Sequential and Parallel Algorithms	
CSE 8990	Special Topics in Computer Science and Engineering [2]	
Seminar		
CSE 8011	Graduate Seminar	1
8000 or 9000-level graduate-level coursework [3, 4]		18
Total Hours		31

1   A student who has taken any of these six courses for undergraduate credit may use the undergraduate course to meet the graduate Fundamental Areas requirement and substitute another graduate-level course approved by the student's graduate committee.

2   On a topic which has been designated in advance by the department as a theory course fulfilling this requirement.

3   A minimum of 15 credit hours of the courses in the program of study must be at the full graduate level (numbered 8000 or 9000).

4   One of the three additional courses may be CSE 8080 if the student's major professor (or another member of the student's graduate committee) agrees to direct the project;

Students who complete a directed project present the results of the directed project to his/her Graduate Committee at the time of the comprehensive examination. All M.S. students must perform satisfactorily on an oral comprehensive examination. The master's comprehensive examination is held in conjunction with the student's project presentation.

Master of Science in Cyber Security and Operations with concentrations in Cyber Defense and Cyber Operations

Major Required Courses		16
CSE 6243	Information and Computer Security	
CSE 6273	Introduction to Computer Forensics	
CSE 6383	Cryptography and Network Security	
CSE 8273	Software Requirements Engineering	
CSE 8743	Advanced Network Security	
CSE 8011	Graduate Seminar	
Choose One Concentration		9
Concentration in Cyber Defense		
BIS 6113	Business Information Systems Security Management	
Two advanced Cyber Security electives		
Concentration in Cyber Operations		
CSE 6363	Software Reverse Engineering	
CSE 8713	Advanced Cyber Operations	
ECE 8823	Wireless Networks	
Choose Thesis or Non-Thesis Option		6
Thesis Option:		
ECE 8000	Thesis Research/ Thesis in Electrical and Computer Engineering	
Non-Thesis Option:		
Six hours of electives in CSE or ECE		
Total Hours		31

Doctor of Philosophy in Computer Science

Major Coursework		
Select two of the following Theory of Computation courses:		6-12
CSE 8813	Theory of Computation	
CSE 8833	Algorithms	
CSE 8843	Complexity of Sequential and Parallel Algorithms	
CSE 8990	Special Topics in Computer Science and Engineering [1]	
Select at least four full graduate courses from one area (the area of concentration) below and at least two full graduate courses from one other area below (the supporting area): [2]		18
Artificial Intelligence		
Software Engineering		
High Performance Computing		
Graphics and Visualization		
Computer Security		
Select at least three of the following Fundamental Areas courses: [3]		9-10
CSE 6153	Data Communications and Computer Networks	
CSE 6163	Designing Parallel Algorithms	
CSE 6214	Introduction to Software Engineering	

CSE 6413	Principles of Computer Graphics	
CSE 6503	Database Management Systems	
CSE 6633	Artificial Intelligence	
CSE 8011	Graduate Seminar	1
Additional 8000- to 9000-level coursework		9
Dissertation		
CSE 9000	Dissertation Research/ Dissertation in Computer Science and Engineering [4]	20
Total Hours		63

[1]   On a topic designated in advance by the department as a theory course fulfilling this requirement.

[2]   Courses applying directly to the student's research and approved by the student's Graduate Committee may be included in the research area coursework, even if they are offered from another area or by another department.

[3]   A student who has taken any of these six courses for undergraduate credit may use the undergraduate course to meet the graduate fundamental areas requirement and substitute another graduate-level course approved by the student's Graduate Committee.

[4]   A student may enroll in dissertation hours only with the approval of his/her major professor, who is the instructor of record and will assign a grade (S or U).

Graduate courses completed as part of a master's degree or graduate courses completed prior to entry into the Ph.D. program may, when approved by the student's Graduate Committee, be applied to the Ph.D. degree requirements. The Committee's decision will be documented by an "Attachment Sheet for Program of Study" form. The program of study will cover remaining coursework requirements.

All undergraduate prerequisite courses listed for the master's degree must be satisfied. A Ph.D. student's program of study may include 6000-level prerequisite courses.

Minor

A minor is defined by the Graduate School as a current block of coursework completed in any program other than the major program and approved for master's or doctoral programs. A minor for Ph.D. students in computer science is optional. The minor requirements (12 hours) are in addition to those required in the major area and must be approved by the minor professor. The minor professor serves as a member of the student's Graduate Committee.

Examination Procedure

During preparation for the doctoral degree, the student will be required to complete three examinations and present an oral dissertation proposal. The examinations are the qualifying examination, typically taken during the student's first year of study; a preliminary examination, taken after the student has completed (or is within 6 hours of having completed) all coursework and has had a dissertation topic approved; and the final examination, taken when all other examinations and the dissertation have been completed.

At the time that the student takes the qualifying examination, the graduate faculty will conduct a review of the student's status in the program. This review will include, as a minimum, the following:

- performance on the qualifying examination
- progress and performance in courses
- possible serious impediments to further progress toward the doctorate

Such a review could result in binding recommendations from the graduate faculty or strong recommendations that the student address a problem within a certain time frame or could even result in dismissal from the program.

Minor in Computer Science, Master's Degree Program

The Graduate Council requires that a student who wishes to earn a minor in computer science in a master's degree program complete at least 9 semester hours of computer science graduate credit, not to include CSE 6613. In addition, the Department of Computer Science and Engineering requires that the following requirements be satisfied:

- At least 3 semester hours must be at the full graduate (8000) level.
- At least 6 semester hours must be in one of the research focus areas, or theory.
- CSE 2383 or CSE 6753 or equivalent must have been completed by the student. This required background may have been completed during undergraduate study. CSE 6753 may count toward the minor.
- The student must pass a comprehensive examination over minor coursework, as determined by the minor professor. This may be in conjunction with an examination for the primary degree program.

The student must be accepted by a minor professor in the Department of Computer Science and Engineering and have the approval of both the minor professor and the Graduate Coordinator in Computer Science and Engineering of the minor program of study. The minor professor will be included in the student's supervisory committee.

Minor in Computer Science, Doctoral Degree Program

The Graduate Council requires that a student who wishes to earn a minor in computer science in a Ph.D. degree program complete at least 12 semester hours of computer science graduate credit, not to include CSE 6613. In addition, the Department of Computer Science and Engineering requires that the following requirements be satisfied:

- At least 3 semester hours must be at the full graduate (8000) level.
- At least 6 semester hours must be in one of the research focus areas, or theory.
- CSE 2383 or CSE 6753 or equivalent must have been completed by the student. This required background may have been completed during undergraduate study. CSE 6753 may count toward the minor.
- The student must pass a comprehensive examination over minor coursework, as determined by the minor professor. This may be in conjunction with an examination for the primary degree program.

The student must be accepted by a minor professor in the Department of Computer Science and Engineering and have the approval of both the minor professor and the Graduate Coordinator in Computer Science and Engineering of the minor program of study. The minor professor will be included in the student's supervisory committee.

University policy on graduate minors is located in the Master of Science and Doctor of Philosophy sections in this publication.