

# COMPUTER SCIENCE (M.S.)

The Department of Computer Science awards the degree of Master of Science with a major in computer science under two plans. The two plans are distinguished on the basis of the breadth and depth of the material covered. The Master of Science degree under the Plan A option is granted to students who pursue a more concentrated set of topics culminating in a master's thesis. The Master of Science degree under the Plan C option offers students experience in many areas of computer science.

The great variety of subjects that are part of computer science, together with the immense diversity of their applications, makes it imperative that students in the master's program maintain close contact with their advisors in order to achieve a coherent plan of study directed toward a specific goal. In particular, elections of courses should be made after consultation with and the approval of the student's advisor.

## Admission Requirements

Admission to these programs is contingent upon admission to the Graduate School (<http://bulletins.wayne.edu/graduate/general-information/admission/>). In addition, applicants are expected to have attained a level of scholarship in the baccalaureate program equal to a grade point average of 3.0 or better, including adequate preparation in computer science and supporting courses in mathematics. Normally, the entering student will be expected to have fulfilled the equivalent of the requirements for the Bachelor of Science degree at Wayne State University and to have satisfied any deficiencies by successfully completing necessary prerequisite course work, before becoming an applicant for an advanced degree. The Graduate Record Examination (GRE) is not required for admission to the Master of Science program.

Applicants must submit official transcripts from each college or university attended, three letters of recommendation, Graduate Record Examination scores, a statement of approximately 300 words describing the applicant's academic and professional goals, and the Computer Science Graduate Admission Evaluation Form.

Students planning to pursue some of the more theoretical courses may find it necessary to have additional preparation in mathematics and/or computer science. The student should make a careful examination of the prerequisites for advanced courses in his/her areas of special interest before seeking admission. Prerequisite course work which is required as a condition of admission must be completed prior to electing graduate courses.

Upon admission, each student is assigned an advisor for guidance and direction in meeting degree requirements and academic goals. As the student's interests in computer science become more focused, a change in advisor may be necessary; forms for this purpose are available from the Department office. Such a change must be done prior to submitting the Plan of Work.

## Areas of Research

**Computer and Network Systems:** Networking & Distributed Systems, Computer Security, Parallel & Cloud Computing, Real-Time Systems, Software Engineering.

**Information and Intelligent Systems:** Databases, Machine Learning, Artificial Intelligence, Pattern Recognition, Computer Graphics & Visualization, Bioinformatics and Health Informatics.

## Degree Requirements

The Master of Science degree is offered under either Plan A or Plan C. Plan A requires thirty credits and includes eight credits for the

completion of a thesis. A thesis is a technical paper describing the original creative work of the author. The master's thesis work is directed by the student's advisor together with a committee of at least two additional faculty members. All committee members must read and approve the thesis, after which time it must be presented at a public session prior to final acceptance. The thesis must conform to the Graduate School's specifications on format and presentation (<http://bulletins.wayne.edu/graduate/general-information/degree-certificate-requirements/#mastersdegreestext>). Plan C requires thirty credits in course work. There is no thesis required for the Plan C Master's degree.

## Course Requirements and Restrictions for Plan A

Code	Title	Credits
Select at least 1 course (minimum 3 credits) from each of the 3 groups <sup>1</sup>		
<b>Group 1</b>		
CSC 6500	Theory of Languages and Automata	
CSC 6580	Design and Analysis of Algorithms	
<b>Group 2</b>		
CSC 5272	Principles of Cyber Security	
CSC 5100	Introduction to Mobility	
CSC 5430	Game Programming and Design I	
CSC 5431	Game Programming and Design I: Lab	
CSC 6110	Software Engineering	
CSC 6220	Parallel Computing I: Programming	
CSC 6280	Real-Time and Embedded Operating Systems	
CSC 6290	Data Communication and Computer Networks	
CSC 7220	Parallel Computing II: Algorithms and Applications	
CSC 7260	Distributed Systems	
CSC 7270	Advanced Computer Security	
CSC 7290	Advanced Computer Networking	
<b>Group 3</b>		
CSC 6430	Game Programming and Design II	
CSC 6431	Game Programming and Design II: Lab	
CSC 6710	Database Management Systems I	
CSC 6720	Data Science Applications Development	
CSC 6800	Artificial Intelligence I	
CSC 6860	Digital Image Processing and Analysis	
CSC 6870	Computer Graphics II	
CSC 7300	Bioinformatics I: Biological Databases and Data Analysis	
CSC 7301	Bioinformatics I: Programming Lab	
CSC 7410	Bioinformatics II	
CSC 7710	Database Management Systems II	
CSC 7800	Artificial Intelligence II	
CSC 7810	Data Mining: Algorithms and Applications	
CSC 7825	Machine Learning	
<b>CSC 8999</b>	<b>Master's Thesis Research and Direction</b>	<b>8</b>

<sup>1</sup> At least one course that must be taken at or above the 7000 level.

No more than three credits of CSC 7990, Directed Study, can be used to satisfy the degree requirements.

A student must have prior written consent of their advisor and the Graduate Committee Chair before registering for any course outside of the department.

At least twenty-four credits must be taken in residence.

## Course Requirements and Restrictions for Plan C

**Code** **Title** **Credits**

Select at least 1 course (minimum 3 credits) from each of the 3 groups

### Group 1

CSC 6500	Theory of Languages and Automata	
CSC 6580	Design and Analysis of Algorithms	

### Group 2

CSC 5272	Principles of Cyber Security	
CSC 5100	Introduction to Mobility	
CSC 5430	Game Programming and Design I	
CSC 5431	Game Programming and Design I: Lab	
CSC 6110	Software Engineering	
CSC 6220	Parallel Computing I: Programming	
CSC 6280	Real-Time and Embedded Operating Systems	
CSC 6290	Data Communication and Computer Networks	
CSC 7220	Parallel Computing II: Algorithms and Applications	
CSC 7260	Distributed Systems	
CSC 7270	Advanced Computer Security	
CSC 7290	Advanced Computer Networking	

### Group 3

CSC 6430	Game Programming and Design II	
CSC 6431	Game Programming and Design II: Lab	
CSC 6710	Database Management Systems I	
CSC 6870	Computer Graphics II	
CSC 6720	Data Science Applications Development	
CSC 6800	Artificial Intelligence I	
CSC 6860	Digital Image Processing and Analysis	
CSC 7300	Bioinformatics I: Biological Databases and Data Analysis	
CSC 7301	Bioinformatics I: Programming Lab	
CSC 7410	Bioinformatics II	
CSC 7710	Database Management Systems II	
CSC 7800	Artificial Intelligence II	
CSC 7810	Data Mining: Algorithms and Applications	
CSC 7825	Machine Learning	

<sup>1</sup> Select at least one course must be taken at or above the 7000 level. CSC 7990 does not satisfy the 7000 level requirement.

All credits must be taken from CSC designated courses.

At least twenty-four credits must be taken in residence.

## AI Concentration Requirements

A master student (Plan A or C) must fulfill both breadth requirement (outlined above) and depth requirement described here, i.e., at least four lecture courses must be selected from the following list and a course can be used to fulfill both breadth and depth requirements.

Code	Title	Credits
CSC 5430	Game Programming and Design I	3
CSC 5800	Intelligent Systems: Algorithms and Tools	3
CSC 5825	Introduction to Machine Learning and Applications	3
CSC 5870	Computer Graphics I	3
CSC 6430	Game Programming and Design II	3

CSC 6800	Artificial Intelligence I	3
CSC 6860	Digital Image Processing and Analysis	3
CSC 6870	Computer Graphics II	3
CSC 7800	Artificial Intelligence II	3
CSC 7810	Data Mining: Algorithms and Applications	3
CSC 7825	Machine Learning	3

## AD Concentration Requirements

A master student (Plan A or C) must fulfill both breadth requirement (outlined above) and depth requirement described here, i.e., CSC 5100 - Introduction to Mobility and no less than three lecture courses must be selected from the following electives and a course can be used to fulfill both breadth and depth requirements.

## AD Elective Courses

The following two focuses (real-time and artificial intelligence) are used only as a guideline for the students; students are free to select courses across the two focuses.

Code	Title	Credits
<b>Focus on the real-time aspect of Autonomous Driving:</b>		
CSC 5280	Introduction to Cyber-Physical Systems	3
CSC 6280	Real-Time and Embedded Operating Systems	3
CSC 8260	Seminar in Networking, Distributed Systems and Parallel Systems	3
<b>Focus on artificial intelligence aspect of Autonomous Driving:</b>		
CSC 5825	Introduction to Machine Learning and Applications	3
CSC 6800	Artificial Intelligence I	3
CSC 6860	Digital Image Processing and Analysis	3
CSC 7800	Artificial Intelligence II	3

## Candidacy

By the time twelve credits have been earned, a Plan of Work must be developed with the student's advisor and submitted to the Chairperson of the Computer Science Graduate Committee. In the Plan of Work the student indicates his/her choice of master's program, either Plan A or C (see below). Upon approval of the Plan of Work by the Graduate Committee, the student is considered a degree candidate. The student is not permitted to take more than twelve credits in the master's program unless candidacy has been established. If the student has not graduated after two years as a candidate, the Plan of Work will be reviewed for possible adjustment.

## Scholarship/Academic Probation

Students must maintain a minimum overall 3.0 grade point average. Failure to do so for one semester places the student on academic probation. Failure to do so for two semesters will result in the student's dismissal from the graduate program. All course work must be completed in accordance with the regulations of the Graduate School (<http://bulletins.wayne.edu/graduate/general-information/academic-regulations/>) and the James and Patricia Anderson College of Engineering (<http://bulletins.wayne.edu/graduate/college-engineering/academic-regulations/>). The above requirements are those in force as of the publication date of this bulletin; however, students should keep in mind that the degree requirements for any particular student are those in force at the time of his/her admission.

## Online Program

The Department of Computer Science offers Online Master's of Science Program in Computer Science with concentration in Artificial Intelligence (MSCS-AI) under the plan C that offers students experience in core AI

algorithms and systems. The great variety of subjects that are part of AI and computer science, together with the immense diversity of their applications will prepare the students for an advanced career in AI research and development in both public and private sectors. The quality and requirement of the Online Master Program is expected to be equivalent to the traditional in-person Program in MSCS-AI.

The Master of Science online degree is offered under Plan C only. Plan C requires thirty credits in course work. There is no thesis required for the Plan C Master's degree.

## Course Requirements and Restrictions for Plan C

Code	Title	Credits
Select at least 1 course (minimum 3 credits) from each of the 3 groups		
<b>Group 1</b>		
CSC 6500	Theory of Languages and Automata	
CSC 6580	Design and Analysis of Algorithms	
<b>Group 2</b>		
CSC 5272	Principles of Cyber Security	
CSC 5100	Introduction to Mobility	
CSC 5290	Cyber Security Practice	
CSC 5430	Game Programming and Design I	
CSC 5431	Game Programming and Design I: Lab	
CSC 5991	Special Topics in Computer Science	
CSC 6110	Software Engineering	
CSC 6220	Parallel Computing I: Programming	
CSC 6280	Real-Time and Embedded Operating Systems	
CSC 6290	Data Communication and Computer Networks	
CSC 7220	Parallel Computing II: Algorithms and Applications	
CSC 7260	Distributed Systems	
CSC 7270	Advanced Computer Security	
CSC 7290	Advanced Computer Networking	
<b>Group 3</b>		
CSC 6430	Game Programming and Design II	
CSC 6431	Game Programming and Design II: Lab	
CSC 6710	Database Management Systems I	
CSC 6870	Computer Graphics II	
CSC 6720	Data Science Applications Development	
CSC 6800	Artificial Intelligence I	
CSC 6860	Digital Image Processing and Analysis	
CSC 7300	Bioinformatics I: Biological Databases and Data Analysis	
CSC 7301	Bioinformatics I: Programming Lab	
CSC 7410	Bioinformatics II	
CSC 7710	Database Management Systems II	
CSC 7800	Artificial Intelligence II	
CSC 7810	Data Mining: Algorithms and Applications	
CSC 7825	Machine Learning	

<sup>1</sup> Select at least one course must be taken at or above the 7000 level. CSC 7990 does not satisfy the 7000 level requirement.

All credits must be taken from CSC designated courses.

At most six credits can be transferred from a comparable C.S. graduate program.

## AI Concentration Requirements

A master student (Plan C) must fulfill both breadth requirement (outlined above) and depth requirement described here, i.e., at least four lecture courses must be selected from the following list and a course can used to fulfill both breadth and depth requirements.

Code	Title	Credits
CSC 5430	Game Programming and Design I	3
CSC 5800	Intelligent Systems: Algorithms and Tools	3
CSC 5825	Introduction to Machine Learning and Applications	3
CSC 5870	Computer Graphics I	3
CSC 6430	Game Programming and Design II	3
CSC 6800	Artificial Intelligence I	3
CSC 6860	Digital Image Processing and Analysis	3
CSC 6870	Computer Graphics II	3
CSC 7760	Deep Learning	3
CSC 7800	Artificial Intelligence II	3
CSC 7810	Data Mining: Algorithms and Applications	3
CSC 7825	Machine Learning	3

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## Scholarship/Academic Probation

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