M.S. in Computer Science

Degree Requirements

Students will meet with the graduate advisor to assist them in formulating a program of study and selecting a possible specialization. These degree requirements apply to all on-campus and online programs.

The 30 credit requirement may be satisfied in one of three ways:

- Courses (30 credits)
- Courses (27 credits) + MS Project (3 credits)
- Courses (24 credits) + MS Thesis (6 credits)

Students with non-computing STEM background may be accepted and required to take the following bridge courses (CS 506 may count toward the credits required for the MS degree):

M.S. in Computer Science (courses only)

Code	Title	Credits
Bridge Courses		
CS 280	Programming Language Concepts	3
CS 332	Principles of Operating Systems	3
CS 505	Programming, Data Structures, and Algorithms [1]	3
CS 506	Foundations of Computer Science [2]	3
Total Credits		**12**

1 CS 505 Programming, Data Structures, and Algorithms requires prior knowledge of higher level programming language. For students with no prior programming experiences, CS 113 Introduction to Computer Science and CS 114 Introduction to Computer Science II are recommended for replacement.

2 The credits earned for CS 506 Foundations of Computer Science count towards the 30 credits required for the degree.

Code	Title	Credits
Core Courses		
CS 610	Data Structures and Algorithms	3
or CS 667	Design Techniques for Algorithms	
Select three of the following:		9
CS 631	Data Management System Design	
CS 630	Operating System Design	
CS 650	Computer Architecture	
CS 656	Internet and Higher-Layer Protocols	
Elective Courses		
Two courses from an approved list of advanced courses		6
Course either from the Computer Science graduate catalog or from another department's graduate catalog [1]		3
Three courses from the Computer Science graduate catalog or IS 601, IS 650, IS 657, IS 665, MATH 661, YWCC 691 [2]		9
Total Credits		**30**

1 Courses from outside the Computer Science Department must be relevant to the Computer Science program and require prior approval.

2 YWCC 691 can be counted towards the 30 credits required for the degree only if no more than 6 out of the 30 credits are earned from non-lecture courses.

M.S. in Computer Science (Master's project)

Code	Title	Credits
Bridge Courses		
CS 350	Intro to Computer Systems	3
CS 332	Principles of Operating Systems	3

CS 505	Programming, Data Structures, and Algorithms [1]	3
CS 506	Foundations of Computer Science [2]	3
Total Credits		**12**

1 CS 505 Programming, Data Structures, and Algorithms requires prior knowledge of higher level programming language. For students with no prior programming experiences, CS 113 Introduction to Computer Science and CS 114 Introduction to Computer Science II are recommended for replacement.

2 The credits earned for CS 506 Foundations of Computer Science count towards the 30 credits required for the degree.

Code	Title	Credits
Core Courses		
CS 610	Data Structures and Algorithms	3
or CS 667	Design Techniques for Algorithms	
Select three of the following:		9
CS 631	Data Management System Design	
CS 630	Operating System Design	
CS 650	Computer Architecture	
CS 656	Internet and Higher-Layer Protocols	
Project		
CS 700B	Master's Project	3
Elective Courses		
One course from an approved list of advanced courses		3
Course either from the Computer Science graduate catalog or from another department's graduate catalog [1]		3
Three courses from the Computer Science graduate catalog or IS 601, IS 650, IS 657, IS 665, MATH 661, YWCC 691 [2]		9
Total Credits		**30**

1 Courses from outside the Computer Science Department must be relevant to the Computer Science program and require prior approval.

2 YWCC 691 can be counted towards the 30 credits required for the degree only if no more than 6 out of the 30 credits are earned from non-lecture courses.

M.S. in Computer Science (Master's thesis)

Code	Title	Credits
Bridge Courses		
CS 332	Principles of Operating Systems	3
CS 350	Intro to Computer Systems	3
CS 505	Programming, Data Structures, and Algorithms [1]	3
CS 506	Foundations of Computer Science [2]	3
Total Credits		**12**

1 CS 505 Programming, Data Structures, and Algorithms requires prior knowledge of higher level programming language. For students with no prior programming experiences, CS 113 Introduction to Computer Science and CS 114 Introduction to Computer Science II are recommended for replacement.

2 The credits earned for CS 506 Foundations of Computer Science count towards the 30 credits required for the degree.

Code	Title	Credits
Core Courses		
CS 610	Data Structures and Algorithms	3
or CS 667	Design Techniques for Algorithms	
Select three of the following:		9
CS 631	Data Management System Design	
CS 630	Operating System Design	
CS 650	Computer Architecture	
CS 656	Internet and Higher-Layer Protocols	

Thesis		
CS 701B	Master's Thesis	6
& 701B	and Master's Thesis	
or CS 701C	Master's Thesis	
Elective Courses		
Course either from the Computer Science graduate catalog or from another department's graduate catalog [1]		3
Three courses from the Computer Science graduate catalog or IS 601, IS 650, IS 657, IS 665, MATH 661		9
Total Credits		**30**

1 Courses from outside the Computer Science Department must be relevant to the Computer Science program and require prior approval.
2 A student must select a specialization, and the thesis must match the selected specialization.

Specializations

Students can optionally specialize in a specific area (see below) by taking a minimum of three (3) courses listed in the specialization in accordance with requirements (b) and (c). Note that some specialization courses have prerequisites that must be fulfilled before enrolling in these courses.

Computer Networking and Security

Code	Title	Credits
Select three of the following:		9
CS 608	Cryptography and Security	
CS 633	Distributed Systems	
CS 652	Cognitive Cloud Networking - Architectures and Applications	
CS 696	Network Management and Security	
IS 681	Computer Security Auditing	
Total Credits		**9**

Databases and Data Mining

Code	Title	Credits
Select three of the following:		9
CS 632	Advanced Database System Design	
CS 731	Applications of Database Systems	
CS 634	Data Mining	
BNFO 644	Data Mining and Management in Bioinformatics	
CS 744	Data Mining and Management in Bioinformatics [1]	
CS 700B	Master's Project [1]	
Total Credits		**9**

1 Taking CS 700 level courses require permission of the graduate advisor.

Image Processing and Pattern Recognition

Code	Title	Credits
Select three of the following:		9
CS 659	Image Processing and Analysis	
CS 681	Computer Vision	
CS 759	Advanced Image Processing and Analysis [1]	
CS 700B	Master's Project [1]	
Total Credits		**9**

1 Taking CS 700 level courses require permission of the graduate advisor.

Computer Algorithms

Code	Title	Credits
CS 611	Introduction to Computability and Complexity	3
CS 667	Design Techniques for Algorithms	3
CS 700B	Master's Project	3
Total Credits		**9**

Bioinformatics

Code	Title	Credits
Select three of the following:		9
BNFO 601	Foundations of Bioinformatics I	
BNFO 602	Foundations of Bioinformatics II	
CS 744	Data Mining and Management in Bioinformatics [1]	
MATH 663	Introduction to Biostatistics	
CS 700B	Master's Project [1]	
Total Credits		**9**

[1] Taking CS 700 level courses require permission of the graduate advisor.

Master's Project

Students must

- Enroll in CS 700B Master's Project.

In the semester prior to enrolling in CS 700B Master's Project, the student must prepare and submit a project proposal to the Department no later than the last weekday class day of the 8th week of the

- Fall semester for a spring project, or
- Spring semester for a summer or fall project.

The student must have an advisor in the Computer Science Department who is a tenure- track faculty member or who holds a joint appointment in the department.

Project Requirements

- Before a student pursues a Master's Project, the following requirements must be fully satisfied:
  - All bridge courses must be completed - In the semester prior to the project, a student prepares and submits a project proposal to the Department no later than the last weekday class day of the 8th week of the Fall semester for a spring project and no later than the last weekday class day of the 8th week of the Spring semester for a summer or fall project. The preparatory work for the proposal may be accomplished within the framework of a required course or an independent study course offered by the prospective advisor. Therefore, such a course must be taken in the semester prior to the project.
- A CS Department tenure-track faculty member or a faculty member who holds a joint appointment in the computer science department can advise an MS project.
- Proposal preparation must adhere to the existing departmental guidelines; the information and templates are available online.

Thesis Option

(30 credits)

Students must

- select a specialization, and
- enroll in the Thesis CS 701 course for two (2) semesters (Thesis must match specialization).

A student can enroll in CS 701 during the second semester of full time study. Normally the student enrolls for two semesters of CS 701 to prepare the thesis proposal, perform the research, and prepare the thesis. The thesis must be orally defended and follow the style set forth by the Graduate School at NJIT. The thesis committee is composed of a Computer Science tenure-track committee chair and two other tenure-track members of the Computer Science Department or Faculty holding a joint appointment to the department.

Thesis Requirements

- Before a student pursues a Master's Thesis, the following requirements must be fully satisfied:
  - All bridge courses must be completed.
  - In the semester prior to the thesis, a student prepares and submits a thesis proposal to the department no later than week 8 of the Fall semester for a spring thesis and week 8 of the Spring semester for a summer of fall thesis. The preparatory work for the proposal may be accomplished within the framework of a required course or an independent study course offered by the prospective advisor. Therefore, such a course must be taken in the semester prior to the thesis.
- A CS department tenure-track faculty member or a faculty member who holds a joint appointment in the Computer Science Department can advise an MS thesis.
- A thesis must adhere to the style requirements set forth by the Graduate School: https://www.njit.edu/graduatestudies/thesis.php.
- An oral defense is required. The defense must take place between one week prior to the Reading Day of the semester and the last day of the Examination period. A committee of at least three tenure-track faculty members from the CS Department, including the thesis advisor, collectively determines the grade for CS 701 at the conclusion of the oral defense.

Other Policies

- **Transfer:** Transfer of computer science courses from other US/Canada institutions is allowed as per university regulations provided that these courses are related to the program. Graduate Advisor and Graduate Studies Office approvals are required.
- **MS/MS Program:** Under the University MS/MS program, up to six credits of courses taken in other departments can be used for graduate credits toward the degree as long as these courses are related to computer science. Graduate advisor and Graduate Studies Office approvals are required.
- **Co-op Program:** Before a student applies for CS 590 /CS 591 /CS 592 registration, the successful completion of the bridge program, all ESL requirements, and at least four graduate courses is required.
- The same course cannot satisfy two or more requirements.

CS Advanced Courses

Code	Title	Credits
CS 632	Advanced Database System Design	3
CS 636	Data Analytics with R Program	3
CS 644	Introduction to Big Data	3
CS 647	Counter Hacking Techniques	3
CS 675	Machine Learning	3
CS 676	Cognitive Computing	3
CS 643	Cloud Computing	3
CS 659	Image Processing and Analysis	3
CS 661	Systems Simulation	3
CS 670	Artificial Intelligence	3
CS 673	Software Design and Production Methodology	3
CS 677	Deep Learning	3
CS 680	Linux Kernel Programming	3
CS 681	Computer Vision	3
CS 696	Network Management and Security	3
CS 782	Pattern Recognition and Applications	3