

Department of Computer Science

Dr. Igor Aizenberg
Chair, Department of Computer Science
Director, Graduate Program

The graduate program in Computer Science is designed for students interested in pursuing Computer Science at an advanced level. This program is a great opportunity to get perfectly prepared for an advanced level position in industry or for pursuing a Ph.D. degree.

This **30-credit** program is open to all **external applicants** *meeting the admission criteria*.

At the same time we have a **special option** for those students who received their **undergraduate degree in Computer Science from Manhattan College**. Staying only for one more year in the College and taking only **24 credits** (8 courses *or* 6 courses and Master Thesis/Project) these students may get their **M.S.** degree in Computer Science.

Overall, there is a large and continuously growing demand for advanced level computer science professionals in the State of New York and across the country. The program will extend well beyond knowledge acquired at the undergraduate level. The program will prepare students to enter computer-related industry directly after graduation, or to continue their educational path to a Ph.D. The curriculum is designed to allow students to develop their skills needed to achieve leadership positions in industry, business, and government or related fields, where computer science has become an important tool.

The coursework in the program represents a realistic balance between fundamental computer science theory and cutting edge modern computing techniques and technologies. Students will master methods of algorithm design and their analysis, networking, databases, and operating systems.

Students will have also an excellent opportunity to explore cutting edge areas, which are currently in high demand, such as cryptography and security, cloud computing, neural networks and machine learning, artificial intelligence, embedded systems, Linux kernel programming, image analysis, and data mining. These areas will be covered by electives, which students will be able to choose in accordance with their personal interests.

A capstone experience involving either a research Master Thesis or a major software system design (Master Project) will help students to strengthen their knowledge and skills, put ideas and concepts to work in solving actual problems and finally become successful professionals able to gain employment in industry and/or to be accepted into a Computer Science Ph.D. program.

Admission Criteria and Application

Admission Criteria for students who are pursuing a degree in Computer Science at Manhattan College

Undergraduate students pursuing a degree in Computer Science at Manhattan College should notify the Computer Science Department that they are planning to apply and submit their application during their senior year.

Admission Requirements:

- A minimum GPA of 3.0 in the undergraduate CMPT courses taken to date is required.

Applicants have to submit:

- **Two letters of recommendation** from faculty who can comment on the applicant's ability to succeed in the M.S. coursework is required.
- **Written statement** of interest describing the applicant's objectives in undertaking graduate study.

Admission Criteria for students who received a B.S. or B.A. degree in Computer Science or related discipline outside of Manhattan College or received a bachelor degree from Manhattan College, but in any area different from Computer Science.

Admission Requirements:

- A minimum GPA of 3.0 and a strong record in the undergraduate computing courses is normally required, although other factors can be considered in the decision for admission.
- Applicants are not required to submit results of the Graduate Record Examination (GRE). However, GRE scores may enhance the application.
- A strong record in the undergraduate computing courses is normally required. Students entering the program should have at least 15 credits of undergraduate computing courses, including at least 6 credits of computer programming, data structures, operating systems, databases. They should also have at least 9 credits of mathematics, which may include calculus, discrete mathematics, probability/statistics, linear algebra, numerical methods, differential equations and other university level mathematics courses.
- Confirmed practical experience in computer programming is not required, but it should be a plus for students whose bachelor degree is not in Computer Science or a closely related discipline.

External applicants have to submit:

- **Written statement** of interest describing applicant's objectives in undertaking graduate study.
- **Academic transcript.**
- **Two letters of recommendation** from appropriate academic or professional references. At least one letter must be from an academic reference who can comment on the applicant's ability to succeed in the M.S. coursework.
- **All international applicants** who were educated outside of the United States for their undergraduate and/or graduate degree *must provide a course-by-course evaluation report* (which should be inclusive of your official transcripts) provided by one of the agencies listed on the NACES website (<https://www.naces.org/members/>).
- (Optional) GRE Test results (optional subject GRE for international students).
- (Optional) Curriculum Vitae (CV) - only for those who have professional working experience.

English language requirement for international applicants

International applicants whose native language is not English and who have taken all or part of their undergraduate education in a country where English is not the native language are required to prove their ability to study in English. This can be done in any of the following ways:

1. Submit scores on the Test of English as a Foreign Language (TOEFL). The following minimum scores must be obtained:
 - Paper Based Test: 550
 - Computer Administered Test: 213
 - Internet Based Test: minimum of 80 points.
2. Submit scores on the IELTS (International English Language Testing System) with a minimum of 6.5 points on the 9.0 scale.
3. Submit scores on the TOEIC (Test of English for International Communication) with a minimum score of 690.
4. Submit scores on the Duolingo English Test with a minimum score of 110 points.

International applicants can be exempt from the language proficiency requirement if they meet one of the following criteria:

- The applicant attended one academic year of study at a university or college in a country where English is the first official language (does not include IELP programs).
- The applicant is currently enrolled at a U.S. institution and has completed a 100-level (or equivalent) English Composition course and at least 12 credit hours of 100-level (or equivalent) courses
- The applicant was educated in one of these countries (<https://manhattan.edu/admissions/graduate/english-proficiency-countries.php>)

Financial requirement for international applicants

- ***In order to complete the application and have your file evaluated, as an international applicant, you will need to submit a copy of your passport, certificate of financial responsibility, and bank statement showing sufficient funds to cover the first year of study (around \$39,000).***

Degree Requirements

The M.S. program in Computer Science is a 30-credit program and is available in the School of Science. Students can pursue this program in one of two ways: a course based option or a thesis/project based option. All students take a common core of 12 credits. Students pursuing the course based option then take 18 elective credits. Students pursuing the thesis/project based option take 6 credits of thesis/project and then 12 elective credits.

General Requirements: The order in which courses are taken is flexible. The department offers two required core courses every fall and two required core courses every spring. The department also offers at least two elective courses every fall and every spring. A

minimum grade of B in all graduate courses is required. Before taking any course, the student must obtain a grade of B or better in the prerequisite course(s) (if any).

Degree requirements for students who graduated from Manhattan College with a B.S. or B.A. degree in Computer Science

Courses from Undergraduate Program¹: 6 credits

6 credits counted towards a M.S. degree from the undergraduate curriculum in Computer Science (a grade B or higher is required)

CMPT 456	Software Engineering	3
One of the following Electives (Only one of these courses can be counted even if more were taken)		3
CMPT 363	Data Mining	
CMPT 364	Cloud Computing and Virtualization	
CMPT 420	Artificial Intelligence	
CMPT 465	Neural Networks and Learning Systems	

¹ Students who minored in Computer Science and who have taken CMPT 456 and (or) one of CMPT 363, CMPT 364, CMPT 420, CMPT 465, as well as any other Manhattan College graduates who have taken these classes, may also claim 3 or 6 undergraduate credits counted towards their graduate degree, respectively. Otherwise these students shall follow degree requirements for students who graduated from other institutions.

Required Graduate Core: 12 credits

CMPG 612	Operating Systems	3
CMPG 638	Design&Analy of Algorithms	3
CMPG 658	Database Systems	3
CMPG 667	Computer Networking	3

Course-Based Option (without M.S. Thesis/Project): 12 credits

12 credits of graduate electives (any 4 courses from the following list)²

CMPG 720	Artificial Intelligence	3
CMPG 763	Data Mining	3
CMPG 764	Cloud Computing&Virtualization	3
CMPG 765	Neural Networks&Learn Sys	3
CMPG 767	Image Processing and Analysis	3
CMPG 768	Cryptography and Security	3
CMPG 769	Cyber Security Lab	3
CMPG 780	Linux Kernel Programming	3
CMPG 788	Topics in Advanced Computer Science	3
CMPG 797	Graduate Independent Research	3

MATG 557	Machine Learning	3
ECEG 721	Embedded Systems	3

² Only 1 course from CMPG 720/CMPT 420, CMPG 763/CMPT 363, CMPG 764/CMPT 364, CMPG 765/CMPT 465 taken during the undergraduate study can be counted towards a graduate degree. If a student did not get a grade B or higher in the undergraduate class (classes), which can be counted towards a graduate degree, he/she needs to take respectively 5 or 6 elective classes from this list.

M.S. Thesis/Project Option: 12 credits

6 credits of M.S. Thesis/Project (research or a major software project design under supervision of a faculty)

CMPG 798	Master Thesis/Project Seminar	3
CMPG 799	Master Thesis/Project	3

6 credits of graduate electives (any 2 courses from the following list)³

CMPG 720	Artificial Intelligence	3
CMPG 763	Data Mining	3
CMPG 764	Cloud Computing&Virtualization	3
CMPG 765	Neural Networks&Learn Sys	3
CMPG 767	Image Processing and Analysis	3
CMPG 768	Cryptography and Security	3
CMPG 769	Cyber Security Lab	3
CMPG 780	Linux Kernel Programming	3
CMPG 788	Topics in Advanced Computer Science	3
MATG 557	Machine Learning	3
ECEG 721	Embedded Systems	3

³ Only 1 course from CMPG 720 / CMPT 420, CMPG 763 / CMPT 363, CMPG 764 / CMPT 364, CMPG 765 / CMPT 465 taken during the undergraduate study can be counted towards a graduate degree. If a student did not get a grade B or higher in the undergraduate class (classes), which can be counted towards a graduate degree, he/she needs to take respectively 3 or 4 elective classes from this list.

Degree requirements for students who graduated from other institutions of higher education with a B.S. or B.A. degree (major or minor) in Computer Science or related disciplines and for students who graduated from Manhattan College with a B.S. or B.A. degree in any area different from Computer Science

Required Graduate Core: 12 credits

CMPG 612	Operating Systems	3
CMPG 638	Design&Analy of Algorithms	3
CMPG 658	Database Systems	3
CMPG 667	Computer Networking	3

Course-Based Option (without M.S. Thesis/Project): 18 credits

18 credits of graduate electives (any 6 courses from the following list):

CMPG 756	Software Engineering	3
CMPG 720	Artificial Intelligence	3
CMPG 763	Data Mining	3
CMPG 764	Cloud Computing&Virtualization	3
CMPG 765	Neural Networks&Learn Sys	3
CMPG 767	Image Processing and Analysis	3
CMPG 768	Cryptography and Security	3
CMPG 769	Cyber Security Lab	3
CMPG 780	Linux Kernel Programming	3
CMPG 788	Topics in Advanced Computer Science	3
CMPG 797	Graduate Independent Research	3
MATG 557	Machine Learning	3
ECEG 721	Embedded Systems	3

M.S. Thesis/Project Option: 18 credits

6 credits of M.S. Thesis/Project (research or a major software project design under supervision of a faculty)

CMPG 798	Master Thesis/Project Seminar	3
CMPG 799	Master Thesis/Project	3

12 credits of graduate electives (any 4 courses from the following list):

CMPG 756	Software Engineering	3
CMPG 720	Artificial Intelligence	3
CMPG 763	Data Mining	3
CMPG 764	Cloud Computing&Virtualization	3
CMPG 765	Neural Networks&Learn Sys	3

CMPG 767	Image Processing and Analysis	3
CMPG 768	Cryptography and Security	3
CMPG 769	Cyber Security Lab	3
CMPG 780	Linux Kernel Programming	3
CMPG 788	Topics in Advanced Computer Science	3
CMPG 797	Graduate Independent Research	3
MATG 557	Machine Learning	3
ECEG 721	Embedded Systems	3