

Computer Science

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Chair of the Department

Computer Science at Manhattan

Computer Science prepares students for work in a number of computer-related fields as software engineers, designers of algorithms and designers of applications in various areas.

The Computer Science Department offers B.S. and B.A. degrees in Computer Science and provides the opportunity to pursue an interdisciplinary minor.

The B.S. Computer Science undergraduate program is accredited by the Computing Accreditation Commission of ABET.

The Computer Science degree combines depth in all aspects of modern Computer Science theory with the development of high level skills in computer programming and design of algorithms.

The program includes introduction to computer programming, object-oriented programming beginning with C++ and then Java, data structures and algorithms, discrete structures and fundamentals of discrete mathematics, systems programming with Linux, operating systems, databases, computer organization, computer security, numerical computation, computer networks, software engineering and capstone project design, plus electives in programming languages (Python, R, Matlab, other languages), cloud computing, artificial intelligence, artificial neural networks and machine learning, data mining, cryptography and cybersecurity, web security, blockchain technology, parallel computing, image processing and analysis, Linux kernel programming and other.

There is a **concentration area** in **Artificial Intelligence and Machine Learning** within a B.S. and B.A. degrees, which includes three courses: *Neural Networks and Learning Systems*, *Artificial Intelligence*, and *Data Mining*.

Students are encouraged to participate in programming contests such as the international ACM Collegiate programming contest and summer programs such as Google Summer of Code or research programs held at off-campus locations. With a faculty sponsor, a student may apply for support for an on-campus research project during the summer. Every year students present at the Manhattan College annual student research conference and publish in *The Manhattan Scientist* journal.

The Department started a **graduate program (M.S.)** in Computer Science in 2018. This program includes a special one year 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 24 more credits (8 courses or 6 courses and Master Thesis/Project) students may get their M.S. degree in Computer Science.

Mission Statement

The Computer Science Department strives for excellence in giving our students knowledge through comprehensive educational programs, research, dissemination through scholarly publications, and service to the profession, the community, the state, and the nation.

Program Educational Objectives

Within a few years after their graduation, graduates of the Manhattan College Computer Science Program will:

1. Have professional careers in industry, government, academia or entrepreneurship or will be engaged in advanced studies.
2. Demonstrate effective teamwork or leadership, with integrity and ethical considerations in their work.
3. Continue to enhance their knowledge and adapt to changes in technology as well as a varied and globalized society.

Program Learning Outcomes

Graduates of the program will have an ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

The Computer Science programs employ the standard set of ABET student learning outcomes for computing programs.

Degree Plans

General Requirements: Major courses should be taken in accordance with the PLAN OF STUDY listed below. The order in which School of Science core courses are taken is flexible. A minimum grade of C in each of the major courses is required. Before taking any major course, the student must obtain a grade of C or better in the prerequisite courses.

Major Computer Science

A major program in computer science is available in the School of Science within either a curriculum leading to a Bachelor of Science degree or a curriculum leading to a Bachelor of Arts degree.

B.S. in Computer Science

The Department has been working continuously on keeping its B.S. program in such a rapidly developing area as Computer Science up to date. Thus some changes, which are also important for ABET accreditation, were made recently.

Students entered starting from 2020 should follow the curriculum below:

MATH 185	Calculus I	4
MATH 186	Calculus II	4
MATH 351	Computational Linear Algebra & Statistics for Computer Science	3
CMPT 101	Computer Science I	3
CMPT 102	Computer Science II	3
CMPT 238	Data Structures and Algorithms - I	3
CMPT 240	Data Structures and Algorithms - II	3
CMPT 258	Database Systems I	3
EECE 229	Introduction to Digital Systems	3
CMPT 312	Operating Systems	3
CMPT 334	Computer Organization	3
CMPT 335	Discrete Structures	3
CMPT 353	Systems Programming	3
CMPT 360	Object Oriented Design with Java	3
CMPT 367	Computer Security	3
CMPT 439	Numerical Computation	3
CMPT 456	Software Engineering	3
CMPT 466	Computer Networks	3
CMPT 490	Capstone	4
PHYS 101 & PHYS 191	Physics I and Physics I Lab	4
PHYS 102 & PHYS 192	Physics II and Physics II Lab	4
PHYS 221	Physics of Digital Systems	4
Approved departmental electives		15
SCI 100	Science Orientation Seminar I	1
SCI 101	Science Orientation Seminar II	1
Total Credits		89

B.A. in Computer Science

Students entered starting from 2020 should follow the curriculum below:

MATH 185	Calculus I	4
MATH 186	Calculus II	4
MATH 351	Computational Linear Algebra & Statistics for Computer Science	3
CMPT 101	Computer Science I	3
CMPT 102	Computer Science II	3
CMPT 238	Data Structures and Algorithms - I	3
CMPT 258	Database Systems I	3
EECE 229	Introduction to Digital Systems	3
CMPT 312	Operating Systems	3
CMPT 334	Computer Organization	3
CMPT 335	Discrete Structures	3
CMPT 353	Systems Programming	3
CMPT 360	Object Oriented Design with Java	3
CMPT 439	Numerical Computation	3
CMPT 456	Software Engineering	3
CMPT 466	Computer Networks	3
CMPT 490	Capstone	4
Approved departmental electives		12
Three SCI 2xx courses *		9
SCI 100	Science Orientation Seminar I	1
SCI 101	Science Orientation Seminar II	1
Total Credits		77

* Students may opt instead to take one (1) full year of a science with lab (8 credits, that is two science courses with labs). In this case total credits required in this core for graduation is 76 instead of 77

Minor in Computer Science

The minor in Computer Science consists of a minimum of 15 credits. Specific requirements are listed below. A grade of at least C is required for all courses meeting the requirements for a minor in Computer Science. **Note:** CMPT 155 nor CMPT 214 will not be credited toward the minor in Computer Science.

Transfer Credit: At most one course transferred from another institution may be credited toward the fifteen credits required for a minor. A minimum of four courses, 12 credits, must be taken within the Department of Computer Science at Manhattan College.

Application: When the required courses are completed, a student must get a Minor Form from the department secretary, fill it out and have it signed by the Chair of the Department.

Minor Requirement for Students in the School of Engineering

The following two courses are required:

CMPT 102	Computer Science II	3
CMPT 238	Data Structures and Algorithms - I	3

One of the following courses is required:

CMPT 240	Data Structures and Algorithms - II	3
CMPT 258	Database Systems I	3
CMPT 312	Operating Systems	3
CMPT 353	Systems Programming	3
CMPT 360	Object Oriented Design with Java	3
CMPT 367	Computer Security	3
CMPT 439	Numerical Computation	3
CMPT 456	Software Engineering	3
CMPT 466	Computer Networks	3

Electives: 6

Any two CMPT courses at the 200-400 level (including any course from the list above), not including CMPT 214

Minor Requirements for Students in the Kakos Schools of Arts and Sciences and O'Malley School of Business

The following three courses are required:

CMPT 101	Computer Science I	3
CMPT 102	Computer Science II	3
CMPT 238	Data Structures and Algorithms - I	3

One of the following courses is required:

CMPT 240	Data Structures and Algorithms - II	3
CMPT 258	Database Systems I	3
CMPT 312	Operating Systems	3
CMPT 335	Discrete Structures	3
CMPT 353	Systems Programming	3
CMPT 360	Object Oriented Design with Java	3
CMPT 439	Numerical Computation	3
CMPT 456	Software Engineering	3

Elective: 3

One CMPT course at the 200-400 level (including any course from the list above), not including CMPT 214

PLAN OF STUDY

Bachelor of Science in Computer Science

Students entered starting from 2020 shall follow the following plan of study:

First Year

Fall	Credits	Spring	Credits
CMPT 101		3 CMPT 102	3
MATH 185		4 CMPT 335	3
SCI 100		1 MATH 186	4
Modern Language*		3 Modern Language*	3
RELS 110		3 ENGL 110	3
LLRN 102		3 SCI 101	1
	17		17

Second Year

Fall	Credits	Spring	Credits
CMPT 238		3 CMPT 240	3
CMPT 360		3 CMPT 258	3
MATH 351		3 PHYS 102 & PHYS 192	4
PHYS 101 & PHYS 191		4 Social Science	3
PHIL 150		3 ENGL 150	3
	16		16

Third Year

Fall	Credits	Spring	Credits
CMPT 353		3 CMPT 312	3
CMPT 439		3 CMPT 334	3
CMPT 466		3 PHYS 221	4
EECE 229		3 CMPT Elective	3
RELS Catholic Studies		3 MUSC 150 or ART 150	3
	15		16

Fourth Year

Fall	Credits	Spring	Credits
CMPT 456		3 CMPT 367	3
CMPT Electives		6 CMPT 490	4
RELS Global/Contemporary		3 CMPT Electives	6
HIST 150		3 Social Science	3
	15		16

Total Credits: 128

* *One year sequence of a modern foreign language.*

Bachelor of Arts in Computer Science

Students entered starting from 2020 and taking 9 credits of SCI 2xx shall follow the following 125-credit plan of study:

First Year

Fall	Credits	Spring	Credits
CMPT 101		3 CMPT 102	3
MATH 185		4 CMPT 335	3
SCI 100		1 MATH 186	4
Modern Language*		3 Modern Language*	3
RELS 110		3 ENGL 110	3
LLRN 102		3 SCI 101	1
	17		17

Second Year

Fall	Credits	Spring	Credits
CMPT 238		3 CMPT 258	3
CMPT 360		3 SCI 2xx**	3
SCI 2xx**		3 ENGL 150	3
MATH 351		3 Social Science	3
PHIL 150		3 Free Elective	3
	15		15

Third Year

Fall	Credits	Spring	Credits
CMPT 353		3 CMPT 312	3
CMPT 439		3 CMPT 334	3
CMPT 466		3 RELS Catholic Studies	3
EECE 229		3 MUSC 150 or ART 150	3
SCI 2xx**		3 CMPT Elective	3
	15		15

Fourth Year

Fall	Credits	Spring	Credits
CMPT 456		3 CMPT 490	4
CMPT Elective		3 RELS Global/Contemporary	3
Free Electives		3 CMPT Elective	6
Social Science		3 Free Electives	3
HIST 150		3	
	15		16

Total Credits: 125

* One year sequence of a modern foreign language.

** Students may opt instead to take one (1) full year of a lab science (8 credits) in this case total credits for graduation is 124.

Students entered starting from 2020 and taking 8 credits of two Science courses with labs shall follow the following 124-credit plan of study:

First Year

Fall	Credits	Spring	Credits
CMPT 101		3 CMPT 102	3
MATH 185		4 CMPT 335	3
SCI 100		1 MATH 186	4
Modern Language*		3 Modern Language*	3
RELS 110		3 ENGL 110	3
LLRN 102		3 SCI 101	1
	17		17

Second Year

Fall	Credits	Spring	Credits
CMPT 238		3 CMPT 258	3
CMPT 360		3 SCI with Lab II	4
SCI with Lab I		4 ENGL 150	3
MATH 351		3 Social Science	3
PHIL 150		3 Free Elective	3
	16		16

Third Year

Fall	Credits	Spring	Credits
CMPT 353		3 CMPT 312	3
CMPT 439		3 CMPT 334	3
CMPT 466		3 RELS Catholic Studies	3
EECE 229		3 MUSC 150 or ART 150	3
undefined		CMPT Elective	3
	12		15

Fourth Year

Fall	Credits	Spring	Credits
CMPT 456		3 CMPT 490	4
CMPT Elective		3 RELS Global/Contemporary	3
Free Electives		3 CMPT Elective	6
Social Science		3 Free Electives	3
HIST 150		3	
	15		16

Total Credits: 124

* *One year sequence of a modern foreign language.*