

COMPUTER & INFORMATION TECHNOLOGY, MCIT

The Master of Computer and Information Technology (MCIT) program is a rigorous graduate-level program that gives talented students who have no prior experience in Computer Science an opportunity to embark on a highly successful career in computing and technology, often in coveted interdisciplinary roles or even in purely technical software development positions. The MCIT program stems from a belief that advanced computer science coursework for people with undergraduate degrees in other diverse fields leads to highly successful career paths. Our graduates and their careers today stand as strong proof to this philosophy. Within the realm of academia, pursuing further advanced study in computer science is also an option open to MCIT graduates. Due to the goals and nature of the MCIT program, it is strictly for applicants with limited or no past experience in computer science. Candidates with an undergraduate major in Computer Science or closely related fields, should consider applying to the Master of Science in Engineering (MSE) program instead.

For more information: <http://www.cis.upenn.edu/prospective-students/graduate/mcit.php>

For students interested in learning more about MCIT Online, click here (<https://online.seas.upenn.edu/degrees/mcit-online/>).

A total of 10 course units are required for the MCIT degree.¹

Code	Title	Course Units
Required Courses ¹		
CIT 5910	Introduction to Software Development ²	1
CIT 5920	Mathematical Foundations of Computer Science ²	1
CIT 5930	Introduction to Computer Systems ²	1
CIT 5940	Data Structures and Software Design	1
CIT 5950	Computer Systems Programming	1
CIT 5960	Algorithms and Computation	1
Electives		
Select 4 electives ⁴		4
Total Course Units		10

¹ It is expected that full-time MCIT students will take the six required courses during the first two semesters of enrollment and four electives during their second year.

² Offered in the Fall semester only. They are the prerequisites for CIT 5940 Data Structures and Software Design, CIT 5960 Algorithms and Computation, and CIT 5950 Computer Systems Programming, respectively, which are offered in the Spring semester only.

³ Courses can be waived or replaced only with the permission of the instructor. As of Fall 2016, students must pass a proficiency exam in order to waive a course. All MCIT courses must be completed (or waivers obtained) during the first semester that the course is offered during the student's time in the program. Students may not waive or replace more than two required MCIT courses. Courses that are waived need to be replaced with a suitable alternative.

⁴ Electives

- MCIT students must also complete four graduate-level (5000 or higher) electives.

- At least three must be a CIS course; one may be an approved non-CIS course.
- The following courses are recommended for all MCIT students:
 - CIS 5500 Database and Information Systems
 - CIS 5550 Internet and Web Systems
 - CIS 5730 Software Engineering
 - CIS 5570 Programming for the Web
- Additional suitable electives include:
 - CIS 5020 Analysis of Algorithms
 - CIS 5050 Software Systems
 - CIS 5190 Applied Machine Learning
 - CIS 5510 Computer and Network Security
 - CIS 5520 Advanced Programming
 - CIS 5530 Networked Systems
 - CIS 5540 Programming Paradigms
 - CIS 5590 Programming and Problem Solving
- Click here (<http://www.cis.upenn.edu/about-academics/courses.php#500>) for all CIS graduate course options.
- One course from the list of pre-approved non CIS graduate courses, found here (<http://www.cis.upenn.edu/current-students/graduate/advising/electives-non-cis.php>), may be used as an elective. Graduate courses offered in other departments may count as an elective with the prior approval of the MCIT program director; in general, such courses must have a strong technical component in order to be approved.

Continuing in the Master of Science in Computer & Information Science (CIS/ MSE) Program

MCIT students may apply to continue in the Master of Science in Engineering in Computer & Information (CIS/MSE) program. Students pursuing this dual degree route need to satisfy a minimum GPA requirement, have earned a high grade in at least one CIS elective, and have completed the majority of the MCIT requirements at the time of applying. In addition to the ten courses required for the MCIT program, students continuing in the CIS/MSE program need to take six additional CIS graduate courses for a total of sixteen credits; satisfactory completion results in the awarding of the MCIT and CIS/ MSE degrees. Click here (<http://www.cis.upenn.edu/current-students/graduate/mse/>) to access the CIS/MSE degree requirements. Click here (<http://www.seas.upenn.edu/graduate/advising/documents/g-apply-for-dual-masters.pdf>) to access the MCIT-CIS/MSE dual degree application.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2025 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.

Computer & Information Technology, MCIT - Online

The online Master of Computer and Information Technology (MCIT Online) graduate-level program enables students from non-computer science backgrounds to participate in a rigorous program in which they gain a foundation in Computer Science and cultivate ways of thinking as an engineer. MCIT Online allows students from around the world to benefit from the research and teaching expertise of Penn's world-renowned experts. While studying from the comfort of home, students take part in assignments that engage real-world tools and environments. MCIT Online provides a pathway to embark on a highly successful career in computing and technology, often in coveted interdisciplinary roles or even in purely technical software development positions. The MCIT Online program stems from a belief that advanced computer science coursework for people with undergraduate degrees in other diverse fields leads to highly successful career paths and that the opportunity to pursue those paths should be affordable and accessible.

For more information: <https://online.seas.upenn.edu/degrees/mcit-online/>

For students interested in learning more about the MCIT on campus program, click here (<https://www.cis.upenn.edu/graduate/program-offerings/master-of-computer-and-information-technology/requirements/>).

Curriculum

Code	Title	Course Units
Required Courses ¹		
CIT 5910	Introduction to Software Development	1
CIT 5920	Mathematical Foundations of Computer Science	1
CIT 5930	Introduction to Computer Systems	1
CIT 5940	Data Structures and Software Design	1
CIT 5950	Computer Systems Programming	1
CIT 5960	Algorithms and Computation	1
Elective Courses ¹		
Students must complete 4 Elective CUs from the list below		
CIS 5150	Fundamentals of Linear Algebra and Optimization	
CIS 5210	Artificial Intelligence	
CIS 5300	Natural Language Processing	
CIS 5450	Big Data Analytics	
CIS 5470	Software Analysis	
CIS 5490	Wireless Communications for Mobile Networks and Internet of Things	
CIS 5500	Database and Information Systems	
CIS 5510	Computer and Network Security	
CIS 5530	Networked Systems	
CIS 5550	Internet and Web Systems	
CIS 5690	GPU Computing for Machine Learning Systems	
CIS 5810	Computer Vision & Computational Photography	
DATS 5750	Cloud Technologies Practicum	

ESE 5410	Machine Learning for Data Science	
ESE 5420	Statistics for Data Science	
ESE 5460	Principles of Deep Learning	
EAS 5160	Mathematical Foundations for Machine Learning I: Probability	
EAS 5240	Technology Ethics and the Legal Landscape	
EAS 5740	How to Use Data	
EAS 5850	Imaging Informatics	
EAS 5860	Medical Image Analysis	
EAS 5830	Blockchains	
or CIT 5820	Blockchains and Cryptography	
HCIN 6022	Digital Health ²	
Total Course Units		10

A total of 10 course units are required for the MCIT degree.

¹ Click here (<https://online.seas.upenn.edu/degrees/mcit-online/academics/>) for MCIT Online course descriptions.

² HCIN 6022 should only be taken as an elective if students plan to apply for the Graduate Certificate in Health Care and Technology from the Perelman School of Medicine. All SEAS students entering the Graduate Certificate in Health Care and Technology must take this course as part of their degree studies. SEAS students taking this course for credit in an engineering degree must complete a final project focused on an area of computer science.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2025 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.

Computer & Information Technology, MCIT (online) and Learning Analytics and Artificial Intelligence, MEd Dual Degree

Code	Title	Course Units
Dual Degree Requirements		
Computer and Information Technology Requirements		
CIT 5910	Introduction to Software Development	1
CIT 5920	Mathematical Foundations of Computer Science	1
CIT 5930	Introduction to Computer Systems	1
CIT 5940	Data Structures and Software Design	1
CIT 5950	Computer Systems Programming	1
CIT 5960	Algorithms and Computation	1
Two Electives ¹		2
Learning Analytics and Artificial Intelligence Requirements		
EDUC 6191	Core Methods in Educational Data Mining	1
EDUC 6116	Master's Foundations of Teaching and Learning	1

EDUC 6190	Feature Engineering	1
EDUC 6195	Capstone Seminar: Learning Analytics	1
EDUC 5918	Large Language Model Seminar	1
EDUC 6XXX - Deep Learning and Transformer Models		1
Two EDUC Electives ²		2
<i>Other Requirements</i>		
Masters Capstone Project, supported by EDUC 6195		
Total Course Units		16

¹ Electives cannot be taken from EDUC courses. Students may select other online courses within Engineering.
For MCIT Online students pursuing the dual degree, they may choose to substitute up to 2 of the following courses from the MCIT Online curriculum to satisfy up to 2 CUs toward the Learning Analytics and AI degree:

- CIS 5450: Big Data Analytics
- CIS 5210: Artificial Intelligence
- CIS 5300: Natural Language Processing

² Electives are taken from other online EDUC courses offered by the Learning Analytics and Artificial Intelligence program.
For Learning Analytics and AI students pursuing the dual degree, they may choose to substitute up to two of the following courses from the Learning Analytics and AI curriculum to satisfy up to 2 CUs toward the MCIT Online degree:

- EDUC 6123 Big Data, Education, and Society
- EDUC 6185: Databases and Data Management*
- EDUC 5183: Adaptive Learning Systems
- EDUC 5144: Dashboard for Discovery and Learning Applications

*Elective that cannot be taken by dual degree students without them having to take an additional required course.

Suggested Plan of Study - MSED Start

Course	Title	Course Units
First Year		
Fall		
EDUC 6191	Core Methods in Educational Data Mining	1
EDUC Elective 1		1
	Course Units	2.00
Spring		
EDUC 6190	Feature Engineering	1
EDUC Elective 2		1
	Course Units	2.00
Summer		
EDUC 6195	Capstone Seminar: Learning Analytics	1
	Course Units	1.00

Second Year		
Fall		
EDUC 5918	Large Language Model Seminar	1
	Course Units	1.00
Spring		
EDUC 6116	Master's Foundations of Teaching and Learning	1
EDUC 6XXX - Deep Learning and Transformer Models		1
	Course Units	2.00
Summer		
CIS Elective 1		1
CIS Elective 2		1
	Course Units	2.00
Third Year		
Fall		
CIT 5910	Introduction to Software Development	1
CIT 5920	Mathematical Foundations of Computer Science	1
	Course Units	2.00
Spring		
CIT 5930	Introduction to Computer Systems	1
CIT 5940	Data Structures and Software Design	1
	Course Units	2.00
Summer		
CIT 5950	Computer Systems Programming	1
CIT 5960	Algorithms and Computation	1
	Course Units	2.00
	Total Course Units	16.00

Suggested Plan of Study - MCIT Start

Course	Title	Course Units
First Year		
Fall		
CIT 5910	Introduction to Software Development	1

CIT 5920	Mathematic Foundations of Computer Science	1	Summer		
			EDUC 6195	Capstone Seminar: Learning Analytics	1
	Course Units	2.00		Course Units	1.00
Spring				Total Course Units	16.00
CIT 5930	Introduction to Computer Systems	1			
CIT 5940	Data Structures and Software Design	1			
	Course Units	2.00			
Summer					
CIT 5950	Computer Systems Programming	1			
CIT 5960	Algorithms and Computations	1			
	Course Units	2.00			
Second Year					
Fall					
CIT Elective 1		1			
CIT Elective 2		1			
	Course Units	2.00			
Spring					
EDUC Elective 1		1			
EDUC 6116	Master's Foundations of Teaching and Learning	1			
	Course Units	2.00			
Third Year					
Fall					
EDUC 5918	Large Language Model Seminar	1			
EDUC 6191	Core Methods in Educational Data Mining	1			
EDUC Elective 1		1			
	Course Units	3.00			
Spring					
EDUC 6190	Feature Engineering	1			
		1			
	Course Units	2.00			