Software Engineering Systems, MS (Toronto)

Admissions to this program will open for the 2026-2027 academic year.

Website (https://coe.northeastern.edu/academics-experiential-learning/academic-departments/mgen/ms-swes/)

The software engineering systems program takes a sociotechnical, engineering approach to software. This engineering foundation is designed to enable students to embrace real-world complexity as a golden opportunity, especially for the more technically advanced student. We are committed to shaping our students to be intuitive problem solvers, experienced engineering architects, and result leaders who will have a great impact at the exciting three-way intersection of computer science, engineering, and ethics.

Our program offers a multitude of courses in Big Data engineering and analytics in addition to supplementary courses that are required to deliver the data analytics results in a meaningful way to management. We cover data management, advanced data management, business intelligence, column databases, data science, and Big Data engineering. We offer advanced functional programming using the powerful Scala language and a course on advanced data science as well as cloud computing. Multithread concurrent computing is also offered as it is important for synchronizing a huge set of servers working in parallel to do large-scale analytics to make things run faster by a hundredfold increase in speed. Due to the high-level mathematical operations required to run these programs, only software engineers have the capacity to work in such complicated areas. Only they can make the necessary mathematical algorithms execute quickly enough to get the finest results.

Our engineers become fluent in data science for the sake of building the actual system. They study how to write machine-learning algorithms on top of statistical packages.

- Students study the fundamentals of logical computing formulation and program construction as well as the mathematical modeling and analysis of algorithms—an essential aspect of data science analytics.
- Students study clustering techniques, along with topic modeling and classification and logical regression techniques, as well as Bayesian statistics.
- Students study how to configure and operate a Hadoop environment (large clusters of commodity hardware) and in the process how to integrate data from diverse sources to move and manage data through Big Data platforms (in-house or in the cloud). Data ingestion, the filtering and firing of millions of operations to run over large clusters of commodity hardware, is a software engineering technique that we teach our students how to perform through Scala, multithreading, Spark programming, and "map-reduce" techniques.
- We show students how to make the business case for analytics projects and how to follow an execution road map that involves understanding the architectures underpinning such gigantic platforms as well as the resourcing and cost issues.

Degree Requirements

Students in the program must complete 32 semester hours of approved coursework with a minimum grade-point average of 3.000. Students must complete the master's degree by pursuing a thesis.

The thesis must be carried out under the supervision of a professor and must have prior approval of the program director. Proposals for a thesis need to be submitted at least one month before the start of the semester.

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Core Requirements

Code	Title	Hours
CSYE 6200	Concepts of Object-Oriented Design	4
CSYE 7230	Software Engineering	4
INFO 6205	Program Structure and Algorithms	4

Thesis

Code	Title	Hours
CSYE 7945	Master's Project	4
CSYE 7990	Thesis	4

In addition to completing the thesis course, students must successfully complete the thesis submission process, including securing committee and Graduate School of Engineering signatures and submission of an electronic copy of their MS thesis to ProQuest.

Electives

Code	Title	Hours
Complete 8 semester hours from the course code CYSE toward the elective requirement.		8
CSYE 6205	Concepts of Object-Oriented Design with C++	
CSYE 6220	Enterprise Software Design	
CSYE 6225	Network Structures and Cloud Computing	
CSYE 6230	Operating Systems	
CSYE 6305	Introduction to Quantum Computing with Applications	
CSYE 7105	High-Performance Parallel Machine Learning and AI	
CSYE 7125	Advanced Cloud Computing	
CSYE 7200	Big-Data System Engineering Using Scala	
CSYE 7215	Foundations of Parallel, Concurrent, and Multithreaded Programming	
CSYE 7220	Deployment and Operation of Software Applications	
CSYE 7270	Building Virtual Environments	
CSYE 7280	User Experience Design and Testing	
CSYE 7370	Deep Learning and Reinforcement Learning in Game Engineering	
CSYE 7374	Special Topics in Computer Systems Engineering	
CSYE 7470	Advanced Game Analytics	
CSYE 7550	Distributed Intelligent Agents in the Metaverse	
CSYE 7976	Directed Study	
A maximum of 4 semester hours may be taken from the following list toward the elective requirement		4
DAMG 6105	Data Science Engineering with Python	
DAMG 6210	Data Management and Database Design	
DAMG 7245	Big-Data Systems and Intelligence Analytics	
DAMG 7250	Big Data Architecture and Governance	
DAMG 7275	Advanced Database Management Systems	
DAMG 7350	Systems and Cybersecurity Fundamentals	
DAMG 7370	Designing Advanced Data Architectures for Business Intelligence	
DAMG 7374	Special Topics in Data Architecture and Management	
DAMG 7976	Directed Study	
INFO 5100 and INFO 5101	Application Engineering and Development and Lab for INFO 5100	
INFO 6105	Data Science Engineering Methods and Tools	
INFO 6150	Web Design and User Experience Engineering	
INFO 7225	Accounting and Budgetary Systems for Engineers	
INFO 7245	Agile Software Development	
INFO 7255	Advanced Big-Data Applications and Indexing Techniques	
INFO 7260	Business Process Engineering	
INFO 7385	Managerial Communications for Engineers	
INFO 7390	Advances in Data Sciences and Architecture	
INFO 7500	Cryptocurrency and Smart Contract Engineering	

OPTIONAL CO-OP EXPERIENCE

Code	Title	Hours
Complete the following (students must complete ENCP 6000 to qualify for co-op experience):		
ENCP 6000	Career Management for Engineers	1
ENCP 6964	Co-op Work Experience	0
or ENCP 6954	Co-op Work Experience - Half-Time	
or ENCP 6955	Co-op Work Experience Abroad - Half-Time	
or ENCP 6965	Co-op Work Experience Abroad	

PROGRAM CREDIT/GPA REQUIREMENTS

32 total semester hours required (33 with optional co-op)

Minimum 3.000 GPA required