

MS in Computer Engineering

The Computer Engineering program prepares students to work in the dynamic and rapidly expanding field of digital technology. Computer engineers design computers and computer systems, apply computers as components of larger systems, and apply digital techniques to solve a broad range of engineering problems.

NTU's Master of Science degree program in Computer Engineering requires a minimum of 30 credits, consisting of four core courses, four specialization courses, and two elective courses. The curriculum features substantial choice of specialization and elective courses, thereby enabling students to tailor the program of study to meet their specific needs and fulfill their particular aspirations. The advanced portion of the curriculum remains open-ended, to encourage students to take advantage of new courses that concentrate on the latest developments in the field.

Completion of the curriculum requires approximately one-and-a-half years of full-time graduate study. Part-time students enrolled through NTU, whose work schedules preclude full-time study, should expect to fulfill the requirements within five years by registering for at least two three-credit courses each academic year.

Admissions Requirements

Students must meet the following eligibility requirements for regular admission into the Computer Engineering program:

- BS degree in computer engineering from an ABET-accredited engineering program in the United States or a CEAB-accredited program in Canada; or the equivalent from a foreign institution.
- Cumulative undergraduate G.P.A. of at least 2.9 on a 4.0 scale.

Students who do not meet these requirements may be granted provisional admission into the program, depending on academic background and experience. For additional information about provisional admission status, see the Admission section of this bulletin.

Curriculum Overview

Students must complete a minimum of 30 credits for graduation. These credits must satisfy the following distribution requirement: four core courses, four specialization courses, and two elective courses.

Core Curriculum (12 credits)

The core curriculum consists of four courses and allows students to develop knowledge across a broad spectrum of topics related to computer engineering. Students select courses from a specified set of courses covering computer architecture, digital systems, integrated circuits, software engineering, computer networks, and operating systems. Students should complete the core courses prior to pursuing specialization and elective courses.

Specializations (12 credits)

Students select at least four courses from a specialization that represents the technical emphasis most compatible with their educational and career goals. Areas of specialization for Computer Engineering include computer architecture, digital systems, signal processing, real-time and embedded systems, and software systems. Students should consult an advisor or visit the NTU Web site for information about currently offered specialization areas and courses available in those areas.

Electives (6 credits)

Students may select their two elective courses from any of NTU's graduate-level courses to meet the elective requirement and to bring their total credits to a minimum of 30. Elective courses are designed to give students the opportunity to tailor the program to their individual and organizational goals and needs. Students are encouraged to consult with an NTU advisor to select appropriate elective courses.

Thesis Option

Most students are expected to pursue a non-thesis Master of Science degree program. However, when desirable and appropriate, as determined by the student in consultation with his or her academic NTU advisor, a thesis option, constituting a maximum of six credits, is available and may be substituted for the elective courses. For additional information about the thesis option and guidelines, see the Academic Information section of this bulletin.

Program of Study Plan

Admitted students should submit a Program of Study Plan (PSP) to NTU prior to completion of six semester credit hours. Failure to submit a PSP

increases the possibility of students completing duplicate courses or courses that are not applicable to their degree programs. Although NTU cannot guarantee preferred course availability in any given term, the PSP documents do guide course selection from partner universities. It may be necessary for a student to revise an approved PSP when course availability does not comply with the student's needs. The PSP form should be submitted through the NTU Web site.

The following list of courses illustrates the choice of academic material available to students wishing to obtain an MS in Computer Engineering. Individual course descriptions may be found on the NTU Web site at www.ntu.edu. *Specific courses and course requirements may change. Updates will be posted on the NTU Web site.*

Core Courses (12 credits)

Students must take the following courses to satisfy the core requirement:

Both of the following courses:

CA 714	Graduate Computer Architecture
SE 710	Software Engineering

One of the following courses:

ST 759	Data Communication Networks
CS 740	Operating Systems Principles

One of the following courses:

DS 510	Digital ASIC Design
IC 541	Introduction to Digital Integrated Circuits

Specialization Courses (12 credits)

Students select four courses from one specialization area to satisfy this requirement. Courses for three specialization areas are listed below. Please consult an advisor or visit the NTU Web site for information about other specialization areas and courses available in those areas.

Computer Architecture

CA 712	Digital Systems Design
CA 720	Parallel Computer Architecture
CA 722	Computer Networks—Architecture, Protocols, and Standards
CA 765	Realtime Systems
DS 765	Digital System Design with Hardware Description Language
DS 766	Digital System Design and Interfacing with Verilog
DS 770	Testing and Diagnosis of VLSI Systems
DS 780	Fault Tolerant Systems
IC 752	Computer-Aided Engineering for Integrated Circuits
CS 765	Distributed Computing Systems

Digital Systems

CC 560	Digital Signal Processing
CC 715	Digital Communications
CC 760	Analog and Digital Filter Design
CC 764	VLSI Signal Processing
DS 765	Digital System Design with Hardware Description Language
DS 766	Digital System Design and Interfacing with Verilog
DS 770	Testing and Diagnosis of VLSI Systems
IC 742	Advanced Digital Integrated Circuits
IC 752	Computer-Aided Engineering for Integrated Circuits

Software Systems

SE 531	Advanced Java Programming
SE 538	XML, Java, and the Enterprise
SE 730	Object-Oriented Analysis and Design
ST 765	Cryptography
ST 550	Computer Networking
ST 750	Data Communications
CS 720	Programming Language Principles
CS 730	Compilers
CS 741	Advanced Operating Systems
CS 750	Information Systems
ST 731	Simulation
ST 740	Computer Graphics

Elective Courses (6 credits)

Students may select their two elective courses from any of NTU's graduate-level courses, provided they have the appropriate prerequisite knowledge.

Foundation Courses

Foundation courses are available for those students who do not have an adequate preparation to begin a master's program in Computer Engineering. Undergraduate Foundation courses for students entering graduate study in Computer Engineering are available in the topical areas given below. Foundation courses cannot be taken for graduate credit. Please see the NTU Web site for a current set of Foundation courses.

AD 310-319	Data Structures (formerly BC 30-39 Data Structures)
CA 310-319	Computer Architecture (formerly BC 60-69 Digital System Design—Computer Architecture)
CA 360-369	Microcomputers and Embedded Computer Systems (formerly BC 40-49 Microprocessors and Assembly Level Programming)
CM 310-319	Mathematical Logic and Automata Theory (formerly BC 80-89 Discrete Structures)
CS 340-349	Operating Systems (formerly BC 50-59 Operating System Principles)

- DS 360-369 Digital Hardware Design (formerly BC 20-29 Digital Logic Design)
- SE 330-339 Analysis and Design Techniques (formerly BC 10-19 Fundamentals of Computer Engineering)