

A student who is dissatisfied with the instruction received or the interaction with the instructor of a course should first discuss the complaint with the site coordinator, proctor and the instructor. If the issue is not resolved at that level, the student may contact the NTU Office of Academic Programs to request action. The Office of Academic Programs will make the final decision after consulting with the site coordinator or proctor, the instructor or the appropriate person(s) at the originating university.

Courses of Instruction

National Technological University reserves the right to change the listing of courses without notice.

The courses listed on the NTU Web site under “All Academic Courses” are those submitted by the participating institutions and accepted by NTU for possible offering via CD-ROM, DVD, the Internet and/or videotape. New courses and programs are added periodically. The frequency of individual course offerings depends upon the programmatic priorities of the institution where the course is taught, student demand and program needs. However, because of its access to courses from its partners, NTU is likely to offer equivalent courses on a regular basis.

Note: The most up-to-date information about each course is available on the NTU Web site. The Class Schedule is also available on the NTU Web site.

Terms of Instruction

NTU offers courses in accordance with the calendars of participating universities. Most institutions use the semester calendar, and a few use the quarter calendar. Moreover, some courses may be offered on special schedules that will be announced well in advance. Students must consult the NTU Web site.

Prerequisites

Permission of the instructor to enroll in a course is implied when the student meets the specified prerequisites. Prerequisites are considered to be met if the student is convinced that he or she is properly prepared. If there is any concern, the student should discuss prerequisites with the instructor. Academic prerequisites notwithstanding, enrollments are sometimes limited to a specified number of students, students within a specified degree program or students at particular class levels (i.e., entry or advanced).

Course Fees

Tuition is posted on each individual course Web page. Additional fees may apply. Tuition and fees do not include the cost of textbooks and other required learning materials.

Special Topics Courses

NTU special topics courses are independent study courses that may include extra credit for regular credit courses, special laboratories and professional development program (PDP) courses. Special topics courses must be arranged with the agreement of the student's NTU academic advisor and faculty chair in advance of registration. Special topic course requirements will be determined by the student's NTU advisor in accordance with normal, acceptable university practices.

PDP courses may be taken for 0.1–0.5 semester credit hours (SCH); special labs, etc., may be taken for 1–3 SCH. Tuition for special topic registration is based on the percent of SCH of the current NTU rate, plus a \$100/SCH special fee (minimum 1 SCH).

When a student takes a PDP course for credit, he or she enrolls in the PDP course in the usual way and also enrolls for the desired number of credits (maximum .5 SCH) in the NTU credit program. The student needs to contact the NTU Office of the Registrar to obtain the appropriate course number for credit registration.

Special topics courses must be completed within one year. Students need to work with their advisors to complete a project to fulfill the special topics requirement.

Course Delivery

NTU offers courses via a variety of nontraditional delivery methods that are identified in each course description. When registering for courses, students need to choose a delivery method. Delivery methods fall into the following categories:

CD-ROM

Course material can be viewed on any Windows PC with a CD-ROM drive running Windows Media Player 7.2 or above.

DVD

Lectures can be viewed on a television screen with any DVD player with U.S. region coding (U.S. Standard) or on a Windows PC or Mac with a DVD drive and DVD playback software, including Windows Media Player 7.2 and above.

DVD-R

Lectures can be viewed on most Windows PCs and Macs with a DVD drive (indicating DVD-R compatibility) and Windows Media Player 7.2 or above. Lectures may also be viewed with a DVD player, depending on the model and date of manufacture.

Independent Study

This section typically includes courses that are managed by an advisor or instructor and includes projects, written/oral reports, NTU capstone courses and special topics courses.

Online

Lectures are delivered via streaming video, requiring a Windows PC running Windows Media Player 7.2 or above. Many online courses also include downloadable course materials. Video quality is based on the speed of the Internet connection. (Not recommended for speeds lower than 56Kb/s.)

Video CD (VCD)

Lectures can be viewed at full screen resolution on any PC or Mac with a CD-ROM or DVD drive and Windows Media Player 7.2 or above. Lectures may also be viewed with a DVD player, depending on the model and date of manufacture.

Videotape (VHS)

Lectures can be viewed on any standard VHS tape deck and television capable of playing NTSC (U.S. Standard) video. The lectures are recorded at SP speed. DVD delivery involves any class with course lectures, syllabus and other class materials delivered primarily via DVD. This could be an all-inclusive DVD course on one or more discs or could include some links to Web sites.

Course Numbering System

NTU course numbers are codes that indicate course-area designation, course level, sub-area and the offering institution. For example:

AD 711-R Algorithms and Data Structures

AD = Course Area (*Algorithms and Data Structures*)
7 = Course Level (*700 - Advanced Graduate Course*)
11 = Sub Area
R = Institution (*University of Florida*)

300 - Undergraduate Course
500 - Introductory Graduate Course
700 - Advanced Graduate Course

Information with brackets [] shown with course descriptions indicates the requirements that the course fills in each program's curriculum. For example:

AD 711-R Algorithms and Data Structures

CE [CD] CH [NA] CS [CD] EE [BE] EM [E] ESM [NA]
MAT [NA] MBA [NA] MES [E] ME [E] MSE [CDE] SE [B]
SY [AA]

CE	Computer Engineering
CH	Chemical Engineering
CS	Computer Science
EE	Electrical Engineering
EM	Engineering Management
ESM	Environmental Systems Management
MAT	Materials Science and Engineering
MBA	Master of Business Administration
MES	Microelectronics and Semiconductor Engineering
ME	Mechanical Engineering
MSE	Manufacturing Systems Engineering
SE	Software Engineering
SY	Systems Engineering

[C]	Core
[D]	Depth
[B]	Breadth
[E]	Elective
[NA]	Not Applicable
[AA]	Advisor Approval
[Br]	Foundation/Bridging
[Cap]	Required Capstone

Thus, AD 711-R is applicable to the Computer Engineering and Computer Science degree programs as a Core or Depth course; Electrical Engineering as a Breadth or Elective; Manufacturing Systems Engineering as a Core, Depth or Elective, etc.

Institution Identification

The suffixes following course numbers identify the institution offering the individual course:

A	University of Massachusetts Amherst
AH	University of Alabama in Huntsville,The
AT	University of Alabama,The
AR	University of Arkansas
CA	University of California, Berkeley
CL	Columbia University in the City of New York
CU	University of Colorado at Boulder
D	University of South Carolina
DE	University of Delaware
E	University of Arizona,The
F	Northeastern University
FG	Florida Gulf Coast University
I	Michigan Technological University
KS	Kansas State University
LE	Lehigh University
N	Southern Methodist University
NB	University of Nebraska—Lincoln
NJ	New Jersey Institute of Technology
NM	University of New Mexico,The
NT	National Technological University
OB	Oklahoma State University, College of Business Administration
OE	Oklahoma State University, College of Engineering
Q	University of Illinois at Urbana—Champaign

R	University of Florida
S	University of Idaho
TN	University of Tennessee,The
U	Iowa State University
W	Arizona State University
Y	University of Washington

Course Area and Sub-Area Designations

The following is a list of all course area and sub-area designations and numbers within the NTU course numbering system. All course numbers start with a two-letter course area designation followed by “3,” “5” or “7” indicating the level of the course and a two-digit number indicating the sub-area. Foundation courses, which do not have a two-letter course area designation, are listed at the end of this section.

AD—Algorithms and Data Structures

AD 10-19	Data Structures
AD 20-29	Design and Analysis of Algorithms
AD 30-39	Multiprocessor Algorithms (see also CA 50s, CM 50s and CS 60s)

AE—Aerospace Engineering

AE 10-19	Analysis (see also MP 20s, ME 20s and MS 60s)
AE 20-29	Mechanics of Compressible Fluids (see also ME 40s)
AE 30-39	Air Frame Design
AE 40-49	Structures
AE 90-99	Special Topics

CA—Computer Architecture

CA 10-19	Computer Architecture
CA 20-29	Parallel Systems and Interconnection Networks (see also CC 80s and ST 50s)
CA 30-39	Microprogramming
CA 40-49	Computer Descriptive Languages/High-Level Language Architecture
CA 50-59	Multiprocessor and Concurrent Computer Systems (see also CM 50s, CS 60s and AD 30s)
CA 60-69	Microcomputers and Embedded Computer Systems
CA 70-79	Interfacing and Memory Systems
CA 80-89	Interactive Computer Systems
CA 90-99	Advanced Topics

CC—Communications

CC 10-19	Communications/Statistical Communications and Signal Theory (see also TC 10-29,TC 50-59 and CT 10s)
CC 20-29	Pattern Recognition and Remote Sensing
CC 30-39	Estimation and Detection Theory
CC 40-49	Information Theory and Coding

CC 50-59	Speech Processing
CC 60-69	Analog, Optical and Digital Signal Processing (see also CR 50s)
CC 70-79	Image Processing and Radar Systems (see also IS 60s, EM 30s and EM 60s)
CC 80-89	Telecommunications, LANS and Communication Networks (see also TC 40-49, ST 50s and CA 20s)
CC 90-99	Advanced Topics

CH—Chemical Engineering

CH 10-19	Thermodynamics
CH 20-29	Transport Phenomena
CH 30-39	Chemical Kinetics, Catalysis and Reactor Design
CH 40-49	Systems Analysis and Design
CH 50-59	Chemical Engineering Mathematics
CH 60-79	Chemical Engineering Electives

CM—Computational Methods and Theory

CM 10-19	Mathematical Logic and Automata Theory
CM 20-29	Formal Languages
CM 30-39	Computability and Computational Complexity
CM 40-49	Numerical Techniques (see also CT 60s)
CM 50-59	Methods for Parallel Computation (see also CA 50s, CS 60s and AD 30s)
CM 60-69	Advanced Topics

CR—Circuit Theory

CR 10-19	General Circuit Theory
CR 20-29	Electronic Circuits (see also PS 40s)
CR 30-39	Non-Linear Circuits (see also CT 40s and PS 40s)
CR 40-49	Large Scale Systems—Analysis and Simulation (see also ST 30s, PS 50s and PS 30s)
CR 50-59	Analog/Digital/Adaptive Filter Design (see also CC 60s)
CR 60-69	Switched Capacitor Filter Design
CR 70-79	Computational Methods and Graph Theory
CR 80-89	Optimization Techniques for Large Scale Systems (see also PS 50s and PS 80s)
CR 90-99	Advanced Topics

CS—Computer Software

CS 10-19	Methodology
CS 20-29	Programming Languages
CS 30-39	Translator Design Techniques
CS 40-49	Operating Systems
CS 50-59	Database Systems
CS 60-69	Distributed Computer Systems (see also CA 50s, CM 50s and AD 30s)
CS 70-79	Multiprocessor Software Methods
CS 80-89	Modeling and Performance Evaluation
CS 90-99	Advanced Topics

CT—Control Theory

CT 10-19	Linear Systems (see also CC 10s)
CT 20-29	Feedback Control
CT 30-39	Stochastic Control
CT 40-49	Nonlinear Systems (see also PS 40s and PS 70s)
CT 60-69	Optimal Control (see also CM 40s)
CT 70-79	Digital Control (see also PS 40s and PS 70s)
CT 80-89	Robotic Systems (see also IS 50s and PD 60s)
CT 90-99	Applications of Control Theory

DS—Digital Systems

DS 10-19	VLSI Design Applications (see also IC 40s and 50s)
DS 20-29	Reliable Computation
DS 30-39	Computer Arithmetic
DS 40-49	High Speed Computation
DS 50-59	Parallel Processing Hardware Systems
DS 60-69	Digital Hardware Design (see also IC 80s)
DS 70-79	Testing of Digital Hardware Systems
DS 80-89	Fault Tolerant Systems
DS 90-99	Advanced Topics

EA—Emerging Areas

EA 20-29	Multimedia
EA 40-49	Bioinformatics

EF—Economics and Finance

EF 10-19	Managerial or Cost Accounting (see also MG 10s)
EF 20-29	Financial Management (see also SP 40s and MG 40s)
EF 30-39	Engineering Economics (see also MG 20s)
EF 40-49	Managerial Economics
EF 50-59	Special Topics

EM—Electromagnetics

EM 10-19	Lightwaves and Optics
EM 20-29	Lasers and Quantum Electronics
EM 30-39	Active and Passive Microwave Systems (see also CC 70s and IC 70s)
EM 40-49	Field Theory
EM 50-59	Antennas
EM 60-69	Applications (see also CC 70s)
EM 70-79	Scattering and Diffraction of Waves (see also MC 50s)
EM 80-89	Computational Methods
EM 90-99	Advanced Topics

EP—Electrical Properties

- EP 10-19 General
EP 20-29 Electronic Materials Processing (see also IC 30s and ES 10s)
EP 30-39 Device Fabrication and Packaging (see also IC 00s, IC 20s and IC 30s)
EP 40-49 Physical Properties

ES—Engineering Science

- ES 10-19 Physics (see also IC 60s)
ES 20-29 Chemistry (see also PM 10-49 and CH 10s)
ES 30-39 Biology
ES 40-49 Geology
ES 50-59 Health Sciences
ES 60-69 Nuclear Engineering/Science (see also EV 70s)
ES 70-79 Civil Engineering/Science
ES 80-89 Environmental Engineering (see also EV 40s and 80s)
ES 90-99 Advanced Topics

EV—Environmental Systems Management

- EV 05-09 Environmental Systems Management
EV 10-14 Laws and Regulations
EV 20-24 Risk Assessment
EV 25-29 Fate and Transport
EV 40-45 Technology: Treatment
EV 50-59 Water Applications
EV 60-64 Air Applications
EV 65-69 Land Applications
EV 75-79 Hazardous Waste
EV 80-89 Science/Engineering
EV 90-94 Special Topics

FT—Fast Track

- FT 00-09 Fast Track—Computer Science

IC—Integrated Circuits

- IC 00-09 Electronic Packaging (see also EP 20s)
IC 10-19 Electronic Materials (see also EP)
IC 20-29 Devices and Modeling (see also EP 30s)
IC 30-39 Fabrication and Process Modeling (see also EP 20s, EP 30s and MS 40s)
IC 40-49 Circuit and System Design (including General VLSI) (see also DS 10s)
IC 50-59 VLSI Design Automation (see also DS 10s)
IC 60-69 Physical Electronics (see also ES 10s)
IC 70-79 Analog Circuits (including Specialized VLSI) (see also EM 30s)
IC 80-89 Digital Circuits (including Specialized VLSI) (see also DS 60s)
IC 90-99 Advanced Topics

IS—Intelligent Systems

- IS 10-19 General Methods for AI
IS 20-29 Expert/Knowledge-Based Systems
IS 30-39 Programming Languages for AI
IS 40-49 Natural Language Processing
IS 50-59 Intelligent Robotic Systems (see also CT 80s and PD 60s)
IS 60-69 Computer Vision (see also CC 70s and PD 60s)
IS 70-79 Machine Learning
IS 80-89 Logic Programming and Deduction
IS 90-99 Neural Networks

MA—Mathematics

- MA 10-19 Discrete Mathematics and Combinatorics
MA 20-39 Probability and Statistics
MA 40-49 Calculus/Complex Variables/Vector and Matrix Analysis
MA 50-59 Queuing Theory and Statistical Analysis (see also TO 70s)
MA 60-69 Algebra
MA 70-79 Graph Theory and Topology
MA 80-89 Differential Equations
MA 90-99 Advanced Topics

MB—Management and Behavioral Science

- MB 10-19 Management for Engineers (see also TO 60s and MG 50s)
MB 20-29 Organizational Behavior/Personnel (see also MG 60s)
MB 30-39 Human Relations
MB 40-49 Industrial Psychology
MB 50-59 Law
MB 60-69 Emerging Issues in Technical Management
MB 80-89 Capstone Projects
MB 90-99 Special Topics

MC—Materials Characterization

- MC 10-19 General
MC 20-29 Surface and Interface Analysis
MC 30-39 Characterization of Bulk Materials
MC 40-49 Imaging and Image Processing (see also EM 10s and EM 70s)
MC 50-59 Diffraction Techniques (see also EM 70s)
MC 60-69 Non-Destructive Testing
MC 90-99 Special Topics

ME—Mechanical Engineering

- ME 10-19 Mechanics, Dynamics and Vibrations (see also MP 10s and MS 10s)
ME 20-29 Design
ME 30-39 Heat and Mass Transfer
ME 40-49 Fluid Mechanics (see also AE 20s)
ME 50-59 Combustion and Power-Producing Devices

ME 60-69	Thermal Environmental Engineering
ME 70-79	Thermodynamics (see also MS 20s)
ME 80-89	Advanced Mechanics
ME 90-99	Special Topics

MG—Business and Administration

MG 10-19	Managerial Accounting
MG 20-29	Global Marketing Management
MG 30-39	Managerial Economics
MG 40-49	Financial Management
MG 50-59	Management of Technology
MG 60-69	Organizational Behavior and Cultural Environments
MG 70-79	Legal Environment of Business
MG 80-89	Global Strategic Management

MP—Mechanical Properties

MP 10-19	General (see also ME 10s)
MP 20-29	Mechanics of Materials (see also ME 10s)
MP 30-39	Deformation and Fracture Mechanisms
MP 40-49	Multiphase Mechanics
MP 50-59	Deformation Processing
MP 60-69	Machining and Fabrication

MS—Materials Science

MS 10-19	General (see also ME 10s)
MS 20-29	Thermodynamics and Kinetics (see also ME 70s)
MS 30-39	Materials Degradation
MS 40-49	Solid State Chemistry (see also IC 30s)
MS 50-59	Electronic, Atomic and Molecular Arrangements
MS 90-99	Special Project

PD—Product and Process Design

PD 10-19	Design for Assembly
PD 20-29	Design for Manufacturability
PD 30-39	Facility Design and Material Handling
PD 40-49	Manufacturing Processes (see also IC, MP and SP)
PD 50-59	Materials Processing (see also EP 20s and IC 30s)
PD 60-69	Flexible Automation (see also IS 50s and CT 80s)
PD 70-79	Integration of CAD/CAM/CAE (see also ST 10s)
PD 80-89	Environmentally Conscious Manufacturing
PD 90-99	Advanced Topics

PM—Polymeric Materials

PM 10-19	General
PM 20-29	Rheology
PM 30-39	Processing of Polymers (see also MP 50s, MP 60s and PD 40s)
PM 40-49	Morphology and Molecular Structure

PS—Power Systems

PS 10-19	Power Systems Analysis
PS 20-29	High Voltage Engineering
PS 30-39	Energy Conversion
PS 40-49	Power Electronics (see also CR 20s, CR 30s, CT 40s and CT 70s)
PS 50-59	Operation of Power System/Stability & Control (see also CR 40s and CR 80s)
PS 60-69	Energy Management Systems/Planning, Design and Scheduling
PS 70-79	Electric Drives (see also CT 40s and CT 70s)
PS 80-89	Transmission Systems (see also CR 40s and CR 80s)
PS 90-99	Advanced Topics

QM—Quantitative Methods

QM 10-19	Operations Research (see also SP 20s)
QM 20-29	Linear Programming (see also SP 20s)
QM 30-39	Specialized Techniques
QM 40-49	Decision Analysis
QM 50-59	Systems Management or Engineering (see also MB 10s and TO 10s)

SE—Software Engineering

SE 10-19	Software Engineering Methodology
SE 20-29	Life Cycle Models and Software Metrics
SE 30-39	Analysis and Design Techniques
SE 40-49	Programming Environments and Implementation Issues
SE 50-59	Testing and Reliability
SE 60-69	Productivity Measures and Quality Assurance
SE 70-79	Software Requirements and Specifications
SE 80-89	Software Management, Psychology and Control Methods
SE 90-99	Advanced Topics

SP—Manufacturing Systems Planning and Control

SP 10-19	Modeling and Analysis
SP 20-29	Production Control and Scheduling (see also ST 30s, QM 10s and QM 20s)
SP 30-39	Materials Management and Logistics
SP 40-49	Strategic Planning (see also TO 20s and EF)
SP 50-59	Measurement and Sensing
SP 60-69	Manufacturing Management and Integration
SP 90-99	Advanced Topics

ST—Software Techniques

ST 10-19	CAE/CAD/CAM Tool Development (see also PD 70s)
ST 20-29	Real Time Software Systems
ST 30-39	Simulation (see also CR 40s, SP 10s and SP 20s)
ST 40-49	Computer Graphics

ST 50-59 Computer Networks (see also CC 80s and CA 20s)
 ST 60-69 Computer System Security
 ST 70-79 Internet Software Techniques
 ST 90-99 Special Topics

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)

SY—Systems Engineering

SY 10-19 Systems Engineering Principles and Processes
 SY 20-29 Systems Modeling and Analysis
 SY 30-39 Systems Concepts of Strategic Cost Analysis
 SY 40-49 Systems Optimization
 SY 50-59 Systems Reliability
 SY 60-69 Systems Management
 SY 70-79 Logistics from Acquisitions Systems Engineering
 SY 80-89 Systems Engineering Design

Foundation—Electrical Engineering

CC 310-319 Communications Systems (formerly BE 40-49 Systems)
 CR 310-319 General Circuit Theory (formerly BE 10-19 Circuits)
 DS 360-369 Digital Hardware Design (formerly BC 20-29 Digital Logic Design)
 EM 340-349 Electromagnetic Field Theory (formerly BE 30-39 Electromagnetics)
 IC 320-329 Electronic Devices and Modeling (formerly BE 20-29 Electronics)
 PS 330-339 Energy Conversion (formerly BE 50-59 Systems)

TC—Telecommunications

TC 00-09 Telecommunication Principles (see CC 10s)
 TC 10-19 Telecommunication Technologies (see CC 80s)
 TC 20-29 Data Communications (see ST 50s)
 TC 40-40 Telecommunication Networks and Systems (see ST 50s, CC 80s)
 TC 50-59 Personal and Wireless Telecommunications
 TC 70-79 Telecommunication Systems Administration
 TC 80-89 Telecommunication Standards, Policy and Regulations
 TC 90-99 Special Topics

Foundation

MA 320-339 Probability and Statistics (formerly BR 00-09 Mathematics)
 MA 340-349 Calculus/Complex Variables/Vector and Matrix Analysis (formerly BR 00-09 Mathematics)
 MA 360-369 Algebra (formerly BR 00-09 Mathematics)
 MA 380-389 Differential Equations (formerly BR 00-09 Mathematics)
 ME 310-319 Mechanics, Dynamics and Vibrations (BR 00-09 Mathematics)
 MC 310-319 General Materials (formerly BR 40-49 Materials Science and Engineering and BR 50-59 Mechanical Engineering with the exception of BR 347-Q)
 ME 325 Design (formerly BR 347-Q)

TO—Technical Operations

TO 10-19 Information Systems (see also QM 50s)
 TO 20-29 Forecasting (see also SP 20s and SP 40s)
 TO 30-39 Marketing Management/Industrial Marketing
 TO 40-49 Human Factors
 TO 50-59 Industrial Engineering
 TO 60-69 Project Management (see also MB 10s)
 TO 70-79 Quality Control and Reliability (see also MA 50s)
 TO 80-89 Production Management
 TO 90-99 Special Topics

Foundation—Computer Engineering, Computer Science and Software Engineering

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)