

1988

# Master of Science in Computer Science Catalog

Nova Southeastern University

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Nova Southeastern University, "Master of Science in Computer Science Catalog" (1988). *College of Engineering and Computing Course Catalogs*. Paper 143.

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CENTER FOR COMPUTER SCIENCE

MASTER OF SCIENCE

COMPUTER SCIENCE

NOVA UNIVERSITY  
3301 College Avenue  
Fort Lauderdale, Florida 33314



# Nova University

CENTER FOR COMPUTER SCIENCE

3301 College Avenue, Fort Lauderdale, Florida 33314 • (305) 475-7563

EDWARD R. SIMCO, Ph.D.

*Dean*

MASTER OF SCIENCE, MAJOR IN  
COMPUTER SCIENCE

1988-1989

October 3, 1988 - December 23, 1988  
January 2, 1989 - March 24, 1989  
April 3, 1989 - June 23, 1989  
July 3, 1989 - September 22, 1989

Holidays

November 24,25, 1988 - Thanksgiving Day  
March 24, 1989 - Good Friday  
May 29, 1989 - Memorial Day  
July 4, 1989 - Independence Day  
September 4, 1989 - Labor Day

WHY THE M.S. IN COMPUTER SCIENCE  
PROGRAM IS RIGHT FOR YOU

- \* Fully accredited programs
- \* Part-time and full-time degree programs
- \* Designed to meet the needs of South Florida industry
- \* Evening classes
- \* A graduate degree program for those who need a technical degree
- \* Solid academic foundation with a practitioner's approach to technology
- \* Faculty: practicing Computer Scientists and Engineers.

Nova University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award bachelor's, master's, educational specialist, and doctoral degrees.

MASTER OF SCIENCE, MAJOR IN  
COMPUTER SCIENCE

The Department of Computer Science offers a graduate program leading to the degree of Master of Science with a major in Computer Science. This program is designed to give the student a thorough knowledge of computer systems through course work, basic and applied research activities, and specialized projects.

Current areas of specialization include:

- . Artificial Intelligence
- . Compiler Construction
- . Computer Systems Performance
- . Database Design
- . Data Communications
- . Modeling and Simulation
- . Network Design
- . Numerical Analysis
- . Operating Systems Design
- . Software Engineering
- . Structured Programming

**FORMAT:** The Master of Science in Computer Science Program operates on a 12 week term. Each three (3) semester credit course meets for four (4) hours per week for 12 weeks. All courses in the program are scheduled in the evenings or on Saturday.

## ADMISSION REQUIREMENTS

The Computer Science Graduate Program has been designed for students with undergraduate training in computer science, engineering, mathematics or physics. Applicants for the Master of Science degree in Computer Science should have an undergraduate major in one of the above areas or a related area and must meet the following requirements:

- (1) A baccalaureate degree, granted by an accredited institution representing completion of a course of study which fulfills prerequisites for graduate work in the area of Computer Science.
- (2) A 2.5 undergraduate grade point average on a grading scale of 4.0 (A).
- (3) The intellectual capacity and motivation to pursue graduate work as determined by credentials and an interview. The interview can be waived if the applicant does not reside in the state of Florida. The applicant's official transcript must be submitted directly from the degree-granting institution.
- (4) Satisfaction of undergraduate prerequisites in:
  - (a) Data Structures
  - (b) Experience with higher level programming languages such as FORTRAN, PASCAL, C or PL/I and with assembly language programming.
  - (c) Computer architecture
  - (d) Mathematics-including calculus, linear algebra and some discrete mathematics.

Students not satisfying these prerequisites will be required to make up the appropriate deficiencies in the undergraduate program before being admitted with full graduate status.

**TRANSFER CREDIT.** Up to 6 graduate credits may be transferred from a regionally accredited institution. The courses selected for transfer must have received a "B" or better grade and must match a course in the required program. The transfer will be evaluated upon the receipt of an official transcript from the institution originally giving the credit.

TUITION AND FEES

Tuition (per credit)	\$160
Application fee, nonrefundable	\$ 30
Registration fee, nonrefundable	\$ 25
Late Registration fee	\$ 30

REGISTRATION CLOSES ONE WEEK BEFORE THE BEGINNING OF THE TERM.

Refund Policy

First 2 weeks of class	- 80% refund
Third week of class	- 60% refund
Fourth week of class	- 40% refund
Fifth week of class	- 20% refund

TERMS BEGIN:

January  
April  
July  
September

FOR INFORMATION CALL:

(305) 475-7563

OR WRITE:

Nova University  
Department of Computer Science, Master's Program  
3301 College Avenue  
Fort Lauderdale, Florida 33314

## GRADING POLICY

The instructors in the Master's Program assign grades to course work according to the following system:

<u>Grade</u>	<u>Quality Points</u>
A	4.0
A-	3.7
B+	3.2
B	3.0
B-	2.7
C+	2.3
C	2.0
C-	1.7
D+	1.3
D	1.0
F	0
I	Incomplete
PR	In Progress (used for dissertations only)
W	Withdrew

A "W" grade is assigned when a student withdraws from a course after the fifth scheduled class and prior to the eleventh scheduled class. Prior to and including the last day to drop courses, dropped courses will be deleted from the student's record. After that date, a grade will be assigned.

An "I" (incomplete) indicates that the student has not completed the course requirements and that the instructor has given additional time to do so. An "I" grade is not routinely assigned in courses, only when serious exigencies prevent completion of the course requirements. It is a prerogative of the instructor of a course to authorize an incomplete for a student. A student may not, by choice, take an incomplete in a course merely by failing to complete the course requirements. Grades normally are based on what has been achieved in the regular time period of a course.

Incompletes may be assigned at the discretion of the instructor at the request of the student. Should the instructor choose to assign an incomplete, a contract form is to be completed and signed by both the instructor and the student and the original kept on record in the Office of the Director of the Master's Program. The contract must specify the following:



1. The requirements to be completed by the student to remove the incomplete.
2. The time period within which the student must satisfy the incomplete. The time limit is to be specified by the instructor, but must not exceed 53 weeks.
3. A grade which the student will receive if the incomplete is not satisfied by the conclusion of the specified time period.

A student will not be permitted to register for a sequential course when a grade of "I" (incomplete) or "F" (failure) has been received in a prerequisite course.

#### ACADEMIC STANDING

The grading policy for the Master's Program in Computer Science requires the student to maintain a minimum cumulative grade point average of 3.0. In addition, other minimum requirements are in existence. Failure to meet them will result either in academic probation or dismissal as detailed below.

#### PROBATION POLICY

Students failing to achieve a minimum of a 3.0 (B) grade point average upon completion of the first four courses are not eligible for admission as candidates for the master's degree.

Those students who achieve a grade point average of 2.5 or lower for the first four courses are dismissed from the program.

Students with a grade point average greater than 2.5 but less than 3.0 for the first four courses are placed on academic probation. Such students are counseled as to the number of courses they may take in order to facilitate the raising of their averages. No more than four additional courses may be taken without achieving an overall grade point average of 3.0.

Should a student's grade point average fall below 3.0 after the initial four courses, he or she is placed on probation. The student is allowed one academic year to bring the grade point average up to the 3.0 minimum. Failure to achieve the minimum at that time results in dismissal from the program.

Students dismissed from the program may petition for re-admission after one academic year. Such students will have their records examined by the Dean of the Center for Computer Science and the Admissions Committee. Upon approval of the committee, the student will be readmitted to the program. Only those courses with grades of B or better will be applicable to the M.S. program.

#### TIME LIMITATION

A candidate for a master's degree is expected to complete the program within four years from the first registration.

The Center for Computer Science, Master of Science in Computer Science degree program maintains up to date progress records on each student. After each evaluation period, the University furnishes students with working transcripts showing current status and all courses completed and/or attempted. When these transcripts are sent to the student they serve as grade reports.

## STUDENT CONDUCT

Students are expected to comply with the legal and ethical standards of the institution. Academic dishonesty and/or non-academic misconduct will result in disciplinary action. Specific instances of misconduct include, but are not limited to, cheating, plagiarism, knowingly furnishing false information to the institution, and forging or altering institution documents and/or academic credentials.

The institution reserves the right to require a student to withdraw at any time for misconduct as described above. It also reserves the right to impose probation or suspension on a student whose conduct is determined to be unsatisfactory.

Students who feel their rights have been denied are entitled to due process.

## VA STUDENTS

Nova University's academic programs are approved by the Coordinator for Veterans Approval, State of Florida, Department of Education, for veterans educational benefits. The VA Representative will assist veterans in applying for benefits.

A VA student must attain and maintain a minimum grade point average (GPA) of not less than a 3.0 ("B" 80 - 89%) each evaluation period (e.g. term, semester, quarter). He/she also must meet any skill or technical requirements of his/her particular program.

Each VA student is expected to complete the program within the number of training hours approved by the State Approving Agency for Veterans Training. If at any point in time it is determined that a VA student cannot successfully complete the program within the approved number of hours, the student's VA educational benefits will be terminated for unsatisfactory progress.

A VA student who, at the end of any evaluation period, has not attained and maintained satisfactory progress (3.0 GPA or better) will be placed on academic probation for the next evaluation period. Should the student not attain and maintain satisfactory progress (3.0 GPA or better) by the end of the probationary period (one evaluation period), the student's VA educational benefits will be terminated for unsatisfactory progress.

A student whose VA educational benefits have been terminated for unsatisfactory progress may petition the school to be re-certified after one evaluation period has elapsed. The school may re-certify the student for VA educational benefits only if there is a reasonable likelihood that the student will be able to attain and maintain satisfactory progress for the remainder of the program.

## MASTER OF SCIENCE DEGREE REQUIREMENTS

Two options leading to the Master of Science degree with a major in Computer Science are offered. The requirements for both the thesis and the non-thesis option are:

(1) The completion of 36 semester hours of graduate credit of which 24 semester hours are required courses and must include the following courses:

CIS 610	Theory and Principles of Programming	3 cr.
CIS 620	Modeling and Simulation	3 cr.
CIS 630	Compiler Design Theory	3 cr.
CIS 640	Operating Systems Theory and Design	3 cr.
CIS 650	Network Design and Analysis	3 cr.
CIS 660	Data Base Management	3 cr.
CIS 670	Artificial Intelligence/Expert Systems	3 cr.
CIS 680	Software Engineering	3 cr.

(2) The student must maintain a grade average of 3.0 (B) or better in all graduate level courses. The additional requirements for the thesis option are the completion of six semester hours of approved elective courses in Computer Science, and six semester hours for a written thesis. The non-thesis option has the additional requirement of the completion of 12 semester hours of approved elective courses in Computer Science.

### ELECTIVES

CIS 600	Computer Systems	3 cr.
CIS 601	Programming Languages	3 cr.
CIS 611	Systems Programming and Project Implementation	3 cr.
CIS 612	Concurrent Programming Languages	3 cr.
CIS 621	Mathematical Programming	3 cr.
CIS 622	Numerical Analysis	3 cr.
CIS 631	Language Theory and Automata	3 cr.
CIS 632	Compiler Implementation	3 cr.
CIS 633	Graph Theory	3 cr.
CIS 634	Complexity Theory	3 cr.
CIS 641	Digital Computer Design	3 cr.
CIS 642	Integrated Computer Systems	3 cr.
CIS 643	Array Processors and Supercomputers	3 cr.
CIS 644	Operating Systems Implementation	3 cr.
CIS 645	Microprogramming and Microprocessors	3 cr.
CIS 651	Data Communications	3 cr.
CIS 652	Systems Performance Evaluation	3 cr.
CIS 661	Data Base Practicum	3 cr.
CIS 662	Distributed Data Base	3 cr.
CIS 671	Robotics and Automated Processing	3 cr.
CIS 681	Interactive Computer Graphics	3 cr.
CIS 682	Software Engineering Implementation	3 cr.
CIS 690	Special Topics	3 cr.

## COURSE DESCRIPTIONS

### CIS 600 COMPUTER SYSTEMS

Introduction to digital computer design, peripheral devices, storage allocation, operating systems, compilers and assemblers. An understanding of the total operating environment will be developed. Investigation of the common programming techniques and their theory. Segmentation and overlays, recursion, dynamic storage processing, (stacks, queues, trees), macros.

PREREQUISITE: CONSENT OF INSTRUCTOR. May be required of students whose undergraduate major was not computer science.

### CIS 601 PROGRAMMING LANGUAGES

Introduction to data structures and data types, and understanding of the modern approach to structured programming will be developed. A comparative study of several high-level programming languages. Emphasis will be placed on how concepts are expressed in each of the major languages, such as FORTRAN, COBOL, PL/1, PASCAL, and ALGOL.

PREREQUISITE: CONSENT OF INSTRUCTOR. May be required of students whose undergraduate major was not computer science.

### CIS 610 THEORY AND PRINCIPLES OF PROGRAMMING

The mathematics of algorithm and programming construction. The art of structured programming. The dynamic environment of a program and its record of execution. The theory of concurrent programming.

PREREQUISITES: CIS 600, CIS 601.

### CIS 611 SYSTEMS PROGRAMMING AND PROJECT IMPLEMENTATION

Participation in the implementation of an industrial, business or University project requiring the knowledge of systems programming

PREREQUISITES: CIS 600, CIS 601.

### CIS 612 CONCURRENT PROGRAMMING LANGUAGES (ADA, MODULA AND SIMULA-67)

An introduction to concurrent programming languages. Modules and class structures, packages and concurrent tasks in ADA. Generic procedures. Concurrent programming, mailbox tasks, signals and semaphores. Abstract data types, operations on abstract objects, hiding of the representation of objects of a given type, private data types.

PREREQUISITES: CIS 600, CIS 601.

CIS 620 MODELING AND SIMULATION

Introduction to modeling techniques. Discrete events systems. Development programs such as SIMULA, GPSS, and SIMSCRIPT.  
PREREQUISITE: CONSENT OF INSTRUCTOR.

CIS 621 MATHEMATICAL PROGRAMMING

Introduction to linear programming. Non-linear models. Integer programming. The transportation problem. Mathematical programming models. Model languages.  
PREREQUISITE: CONSENT OF INSTRUCTOR.

CIS 622 NUMERICAL ANALYSIS

Introduction to error analysis, iterative methods, eigenvalue problems, integration and differentiation by computer, interpolation, ill-conditioned problems.  
PREREQUISITES: CIS 600, CIS 601.

CIS 630 COMPILER DESIGN THEORY

Language theory will be applied to the design of a compiler for a high-level language. Parsing, syntax analysis, interpretation phase and code generation. Other areas of the compilation process will be covered, such as storage allocation, symbol table management, searching and sorting, and recursion.  
PREREQUISITES: CIS 600, CIS 601.

CIS 631 LANGUAGE THEORY AND AUTOMATA

Introduction to formal grammars, Backus-Naur notation. The formal theory behind the design of a computer language is studied. The corresponding types of automata which may serve as recognizers and generators for a language will be described.  
PREREQUISITES: CIS 600, CIS 601.

CIS 632 COMPILER IMPLEMENTATION

Design, implementation, and testing of a compiler for a high-level language.  
PREREQUISITE: CIS 630.

CIS 633 GRAPH THEORY

Finite linear graphs. Applications to modeling optimization, networks, operating systems design, digital design.  
PREREQUISITES: CIS 600, CIS 601.

CIS 634 COMPLEXITY THEORY

A general theory of computational complexity. Theory of algorithms. Turing machines, unsolvable problems. Exponential difficulty, NP-Completeness.  
PREREQUISITE: CIS 633.

CIS 640 OPERATING SYSTEMS THEORY AND DESIGN

Analysis of computer operating systems with emphasis on structured design. Multi-programming and multiprocessing, real-time, time-sharing, networks, job control. Scheduling, synchronization and other forms of resource management: I/O programming memory and file system management.

PREREQUISITES: CIS 600, CIS 601.

CIS 641 DIGITAL COMPUTER DESIGN

Principles and techniques of digital computer design. Integrated circuits, logic design, LSI and MSI design, sequential circuit analysis. Processor logic design, arithmetic unit, memory systems, input-output structures, microprogramming.

PREREQUISITES: CIS 600, CIS 601

CIS 642 INTEGRATED COMPUTER SYSTEMS (VLSI)

Introduction to MOS circuits. The technology of integrated systems. Design of elementary components and subsystems (shift registers, dynamic registers, stacks). Fabrication process and implementation procedures. The design of an Integrated Computer System (data path, controller, microprogrammed control). System timing. Processor arrays. The physics of integrated systems.

PREREQUISITE: CONSENT OF INSTRUCTOR.

CIS 643 ARRAY PROCESSORS AND SUPERCOMPUTERS

An introduction to supercomputers. Parallel computer organization. Pipeline, associative and array computer architectures. Examples: Texas Instrument ASC, Control Data STARAN, CRAY-I, Burroughs BSP. Control and parallel processors. Stream of micro-instructions. Conflict free memory. Algorithmic detection of recurrent relations. Control flow graphs.

PREREQUISITES: CIS 600, CIS 601.

CIS 644 OPERATING SYSTEMS IMPLEMENTATION

Implementation and testing of operating system design on actual hardware.

PREREQUISITE: CIS 640.

CIS 645 MICROPROGRAMMING AND MICROPROCESSORS

The past, present and future of microprogramming will be discussed in detail with particular attention given to processor technology. An in-depth survey of commercially available microprogrammable microprocessors will be presented as well as monolithic microprogrammed devices. The students will implement a processor instruction set in both vertical and horizontal microcode utilizing a Simulator, Micro-assembler, and Register Transfer language. Advanced topics in special-purpose processor design and architecture definition (dynamic) will be presented.

PREREQUISITE: CONSENT OF INSTRUCTOR.

CIS 650 NETWORK DESIGN AND ANALYSIS

Distributed processing and other forms of network systems.

PREREQUISITES: CIS 600, CIS 601.

CIS 651 DATA COMMUNICATIONS

An introduction to basic data communication concepts, coding modes and types of transmissions, multiplexing, line protocols, switching techniques and communication satellite technology.

PREREQUISITE: CIS 650.

CIS 652 SYSTEMS PERFORMANCE EVALUATION

An analysis of the computer resources in a monitoring environment. CPU, channel, memory and mix utilization statistics. Hardware monitors and software monitors. Determining the overloaded computer system. Capacity analysis.

PREREQUISITES: CIS 600, CIS 601.

CIS 660 DATABASE MANAGEMENT

Computer-oriented techniques for information storage and retrieval with emphasis on on-line capability. File structures, including data definition and manipulation languages.

PREREQUISITES: CIS 600, CIS 601.

CIS 661 DATA BASE PRACTICUM

The techniques of Data Base Management will be applied to practical projects.

PREREQUISITE: CIS 660.

CIS 662 DISTRIBUTED DATA BASE

The study of information storage and retrieval in a distributed environment. Distributed processing networks.

PREREQUISITE: CONSENT OF INSTRUCTOR.

CIS 670 ARTIFICIAL INTELLIGENCE/EXPERT SYSTEMS

This course emphasizes the area of programming involved with non-deterministic solutions to problems. Concepts of LISP, PROLOG, OPS5 and other specialized programming languages will be presented. The notion of knowledge bases will be developed and all students will be expected to produce a working expert system which embodies these concepts.

PREREQUISITES: CIS 600, CIS 601.

CIS 671 ROBOTICS AND AUTOMATED PROCESSING

The principles and concepts of modern robots and automation are developed. The concepts of algorithmic and non-algorithmic control are presented along with the details of sensor and device I/O. Experiments with simulated and real robots will be performed to reinforce the basic concepts presented.

PREREQUISITE: CIS 670.



CIS 680 SOFTWARE ENGINEERING

This course offers a thorough analysis of the problems related to the design, development and implementation of software projects. First, the fundamentals of software project management are presented, followed by a discussion of the techniques of software development. A comprehensive, modern approach to structured programming, program modularization and program correctness is offered. Software verification and validation, software security and software protection will also be analyzed in detail.

PREREQUISITE: CONSENT OF INSTRUCTOR.

CIS 681 INTERACTIVE COMPUTER GRAPHICS

The principles of interactive computer graphics are presented. Emphasis will be placed on mastering the concepts of two-dimensional graphics including the basic transformations (scale, translate, rotate), perspective, hidden-line removal and hardware support devices. The two-dimensional concepts will be extended to include three-dimensional computer graphics including smoothing algorithms, animation and a variety of related topics.

PREREQUISITES: CIS 600, CIS 601.

CIS 682 SOFTWARE ENGINEERING IMPLEMENTATION

The techniques of software engineering will be applied to practical projects.

PREREQUISITE: CIS 680.

CIS 690 SPECIAL TOPICS

This seminar will focus on the professor's current research interests.

PREREQUISITE: CONSENT OF INSTRUCTOR.