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# Computer Science

The field of computing enables much of the on-going revolution in information technology and communications. Its techniques, tools and problem-solving approaches have proven most powerful and effective. Computing professionals define and provide the new information infrastructure thereby changing society and culture by extending and enhancing everyone's abilities. SUNYIT recognizes the need for trained professionals in the computer field. Two undergraduate programs provide the flexibility that allows students to position themselves in the field according to their own strengths and interests.

## The B.S. Degree in Computer and Information Science

The Bachelor of Science program in computer and information science provides a broad education in major areas of the field. The program, which closely follows the Association of Computing Machinery (ACM) recommendations, gives students the flexibility to concentrate studies according to their interests.

The general educative goal of the undergraduate program is to ensure that each graduate has a solid background in all the fundamental areas of computer science and to provide a sufficiently wide spectrum of advanced electives to allow each student to fashion a specialization (or concentration) suited to their strengths and interests.

Some concentrations that could be constructed from current and recent offerings are:

- Information Assurance/Data Security
- Entertainment Computing (including game design and game programming)
- System Administration
- Scientific and Engineering Computing
- Network and Grid Programming
- System Modelling and Simulation
- Information Technology

## The B.S. Degree in Computer Information Systems

The Bachelor of Science program in computer information systems places an emphasis on business applications of computing. Students acquire basic skills in computer systems areas, including programming, database management, and other business-oriented areas. The program is designed to follow the curricular guidelines of the ACM, which are endorsed by the Association for Information Technology Professionals (AITP). Many graduates who pursue advanced study enter graduate programs in management or business administration. Also, with appropriate course selection, a student in computer/information systems may be prepared to continue on into the M.S. program in computer and information science.

## The B.S. Degree in Applied Computing

The Bachelor of Science program in applied computing prepares the graduate to apply the analytic and programming skills of the science of computing to a cognate intellectual domain. The degree combines the core of the baccalaureate program in computer information systems or computer and information science with strong academic preparation in another area of study. The capstone project requires the student to apply the tools and techniques of science of computing to the cognate area through the design and implementation of a project. The cognate area requirement may be fulfilled by an associate degree in the cognate area, completion of an approved SUNYIT minor, or courses in another area approved by an advisor. With appropriate course selection, the applied computing graduate may continue into the M.S. program in computer and information science.

## Joint BS/MS Program in Computer and Information Science

The joint BS/MS program is a well-integrated program that permits students to complete both a bachelor's degree and a master's degree in computer and information science in a reduced time frame with a reduced total number of credits.

### Requirements

Completion of the joint BS/MS program requires a minimum of 145 semester hours, including a minimum of 33 semester hours of graduate study. All specific requirements for both the BS and the MS degrees must be met. Students in the joint program may apply up to twelve credits of graduate coursework to both the undergraduate and graduate degrees simultaneously. Students in the joint program may register for CSC 500 - Discrete Structures - which will satisfy the undergraduate Finite or Discrete Math requirement and will simultaneously be applied as a general graduate elective. Two graduate courses may be applied as undergraduate "Advanced" computer science electives. One or two other graduate courses (depending on whether students earned credit for CSC 500) may be applied as undergraduate unrestricted electives. Graduate bridge courses, other than CSC 500, may not be applied simultaneously to both degrees.

### Status

A student enrolled in the joint program will be considered to remain in undergraduate status until the completion of 124 semester hours, and thereafter tuition and fees will be charged at the graduate level. The BS degree will be awarded at such time as all the requirements for that degree are satisfactorily met. Students are expected to complete their BS program requirements prior to pursuit of the MS degree except where those two programs overlap.

## Academic Standing

Continued matriculation in the joint program requires maintenance of a GPA of 3.0 for courses taken at SUNYIT in each of the following categories: (a) all courses applicable to the undergraduate degree; (b) computer science courses applicable to the undergraduate degree; (c) all graduate courses. Students with a GPA of less than 3.0 in any of these categories will be placed on academic probation in the program. Students who are on academic probation for any two semesters or who have a GPA of less than 2.50 in any of these categories will be academically dismissed from the joint program. Students who are academically dismissed but have not yet completed the baccalaureate program but whose performance constitutes satisfactory performance in the undergraduate program will automatically be placed in that program.

## Admission to the BS/MS Program

Admission to the BS/MS program may be achieved, and enrollment maintained, in one of the following ways:

- A) As an entering freshman; continued enrollment in the joint program requires achievement of grades of B or better in CS 108, CS 240, CS 249, MAT 115 (or Mat 413), and a mathematics elective (calculus, linear algebra, or statistics). In addition, students must have an overall GPA of at least 3.0 at the end of the semester in which the first 60 credits have been completed.
- B) Upon initial transfer to SUNYIT; students must have earned grades of B or better in CS 108, CS 240, CS 249, MAT 115 (or MAT 413), and in a mathematics elective (or in their transfer equivalents), and must have a transfer GPA of at least 3.0.
- C) Subsequent to initial enrollment at SUNYIT; students must receive grades of B or better in those courses (or their transfer equivalents) listed in A) and B) above, have an overall GPA of at least 3.0 for all courses taken at SUNYIT, and have a GPA of at least 3.2 for courses in their major.

Students entering the joint BS/MS program must not have completed more than 94 credit hours toward their Bachelor's degree, and must be able to complete all requirements for the Bachelor's degree within the first 124 credit hours earned.

## B.S. Degree Requirements

To earn a B.S. degree in either computer and information science or computer information systems a student must successfully complete 124 credits. Requirements specific to each degree and general education requirements count toward the 124 credit requirement. Electives make up the remainder. In addition, all students are expected to be familiar with the UNIX operating system. This may be achieved through prior coursework, self-study, or enrollment in CS 307: The UNIX Programming Environment.

## Specific Requirements for B.S. in Computer and Information Science

*Computer Science Courses (40-42 credits)*

*Introductory Courses (12 credits)*

CS 108 - Computing Fundamentals

CS 220 - Computer Organization

CS 240 - Data Structures and Algorithms

**Students must achieve a grade of C or better in both CS 108 and CS 240 to be allowed to register for any intermediate courses or advanced electives.**

*Intermediate Courses (16 credits)*

CS 249 - Object-Oriented Programming

CS 330 - Operating Systems and Networking

CS 350 - Information and Knowledge Management

CS 370 - Software Engineering

*Advanced Electives (10-12 credits must be taken at SUNYIT; can not be transferred in)*

Three courses to be selected from electives listed below or from graduate courses.

CS 345 - Logic Design

CS 381 - Principles of Computer Security and Cryptography

CS 407 - UNIX System Administration

CS 420 - Numerical Computing

CS 421 - Computational Linear Algebra

CS 431 - Principles of Programming Languages

CS 441 - Computer Architecture

CS 445 - UNIX Network Programming

CS 446 - Local Area Network Architecture

CS 450 - Computer Graphics

CS 451 - Distributed Systems

CS 454 - System Simulation

CS 477 - Algorithms

CS 480 - Compiler Design

CS 490 - Special Topics in Computer Science

CS 491 - Independent Study

CS 495 - Artificial Intelligence

CS 5xx - Graduate Computer Science Courses \*

*\* Up to two graduate CS courses, other than bridge courses, may be chosen to fulfill this requirement. (See graduate catalog for a description of course offerings.)*

The department offers a wide variety of courses under the course number CS490, Special Topics. Some of these topics have been : ASP.NET/PHP.NET, Functional Programming, C#/Visual Basic.NET, Fuzzy Sets and Systems, Game Programming, Digital Image Processing, Wireless Computer Applications, Embedded Systems.

In addition, there are a number of courses whose course description are available but which do not appear in this year's catalog. Some of these are: Structure and Interpretation of Programs, a second course in Operating Systems, Logic Programming, Object-Oriented Systems, Ada Software Development, Lisp Programming, Software Engineering Projects, Introduction to the Theory of Computing.

*CS Major Capstone Project (2 Credits)*

CS 498 Project in Computer Science (2 Credits)

### Open Upper-division Computing Electives

The following courses are available to CS majors for open elective credit:

- CS 307 - The UNIX Programming Environment
- CS 311 - Data Analysis
- CS 324 - Internet Tools in Windows
- CS 351 - Web Development and Internet Programming
- CS 409 - Software Project Management
- CS 489 - Cooperative Work Study in Computer Science
- CS 491 - Independent Study
- IS 305 - Applications Programming with COBOL
- IS 310 - Hardware and Network Infrastructure
- IS 315 - Networking of Information Systems
- IS 320 - Systems Analysis and Design
- IS 325 - Database Management Systems
- IS 330 - Decision Support and Intelligent Systems
- IS 340 - E-Commerce
- IS 470 - Database Programming
- IS 490 - Special Topics in Information Systems

*General Education Requirements (applicable to students entering the State University of New York system Fall 2000 or later; students who entered the SUNY system prior to Fall 2000 should determine General Education Requirements in consultation with an Academic Advisor):*

A minimum of thirty credits to be selected from approved general education courses, including (unless otherwise specified) a minimum of one course in each of the following areas:

1. Composition/Communication (For Freshmen, English 101)
2. Humanities
3. Arts
4. Social/Behavioral Sciences
5. Laboratory Science
6. Science Elective
7. Foreign Language  
Requirement waived if the student attained a score of 85 or higher on a third year Regents examination in a foreign language. Consult with an advisor for other means of satisfying this requirement.
8. American History  
An approved course covering a period of at least one century; students attaining a score of 85 or higher on an American History Regents examination may substitute any approved course in American History.
9. Western Civilization
10. Other Civilizations
11. Mathematics  
Two courses; must include one course in Finite or Discrete Mathematics (MAT 115 or MAT 413), and at least one other course taken from Calculus/Linear Algebra/Statistics)

#### Upper-Division Writing Course:

In addition to the general education requirements, students must select either COM 350 - Designing Online Information or COM 400 - Computer Software Documentation to fulfill the Upper Division Writing Requirement.

### Open Electives (30 or more credits)

Computer science majors are encouraged to broaden their education by taking any of the excellent course offerings from the various disciplines at SUNYIT. Open elective credit may be used to meet the requirements of a minor. Some suggested areas are - Applied Mathematics, Physics, Bio-informatics, Engineering, Engineering Technology, Management and Telecommunications. Please see catalog for available areas for the minor and specific requirements. Note that completing a minor may require completion of coursework beyond 124 hours.

### Specific Requirements for B.S. in Computer Information Systems

#### Introductory Courses (8 credits)

- CS 108 - Computing Fundamentals
  - CS 240 - Data Structures and Algorithms
- Students must achieve a grade of C or better in each of these courses to be allowed to register for any intermediate courses or upper-division electives.*

#### Intermediate Computer Information Systems Courses (16 credits)

- IS 310 - Hardware and Network Infrastructure
- IS 320 - Systems Analysis and Design
- IS 325 - Database Management Systems
- IS 330 - Decision Support and Intelligent Systems

#### Business and Management Courses (8 credits)

Any two courses, one of which must be 300 level or higher, chosen from courses with the following prefixes: ACC, BUS, ECO, FIN, MGT, MKT.

#### Upper Division Electives (12 credits must be taken at SUNYIT; can not be transferred in)

In addition to the required courses listed above, students must complete 12 credits in electives at the 300, 400, or 500 level. Students who declare a minor may count 300 and 400 level courses required by a minor program of study toward this requirement. Students who do not declare a minor must select courses with IS or CS prefixes. The following list is not all-inclusive (the courses listed will be taught on a recurrent basis); students should check the current catalog and course schedule for the most recent list of 300, 400 and 500 level courses. (Note: Some CS courses may require a level of computer science knowledge that is not provided by the Introductory Computing Courses and Intermediate Computer Information Systems Courses. Additionally, each student's career goals should influence her/his course selections. For example, students who desire a career in the banking or insurance industry should consider taking IS305 Application Programming with COBOL. To facilitate effective course selection and to ensure that prerequisites are met, all students should consult with their advisors for guidance prior to course selection and registration.)

- IS 305 - Application Programming with COBOL
- IS 315 - Networking of Information Systems
- IS 340 - E-Commerce
- IS 470 - Database Programming
- IS 490 - Special Topics in Information Systems

IS 491 - Independent Study  
 CS 307 - The Unix Programming Environment  
 CS 350 - Information and Knowledge Management  
 CS 351 - Web Development and Internet Programming  
 CS 370 - Software Engineering  
 CS 407 - Unix System Administration  
 CS 409 - Software Project Management  
 CS 489 - Cooperative Work Study in Computer Science  
 CS 5xx - Graduate Computer Science Courses \*

\* Up to two graduate CS courses may be chosen to fulfill this requirement.  
 (See graduate catalog for a description of course offerings.)

*CIS Major Capstone Course (2 Credits)*  
 IS 495: Computer Information Systems Practicum

*General Education Requirements (applicable to students entering the State University of New York system Fall 2000 or later):*

A minimum of thirty credits to be selected from approved general education courses, including (unless otherwise specified) a minimum of one course in each of the following areas:

1. Composition/Communication (For Freshmen, English 101)
2. Humanities
3. Arts
4. Social/Behavioral Sciences
5. Laboratory Science
6. Science Elective
7. Foreign Language  
 Requirement waived if the student attained a score of 85 or higher on a third year Regents examination in a foreign language. Consult with an advisor for other means of satisfying this requirement.
8. American History  
 An approved course covering a period of at least one century; students attaining a score of 85 or higher on an American History Regents examination may substitute any approved course in American History.
9. Western Civilization
10. Other Civilizations
11. Mathematics  
 Two courses; must include one course in Finite or Discrete Mathematics (MAT 115 or MAT 413), and at least one other course taken from Calculus/Linear Algebra/Statistics)

*Upper-Division Writing Course:*

In addition to the general education requirements, students must select either COM 350 - Designing Online Information or COM 400 - Computer Software Documentation to fulfill the Upper Division Writing Requirement.

*Open Electives*

Students may choose courses from any discipline. However, students are strongly advised to seek guidance from their advisors before selecting any open electives courses because open electives may be used to satisfy prerequisites for upper-division electives. Additionally, for those students who declare a minor, courses taken to satisfy a minor's course of study may be applied as open electives.

## **Applied Computing – Select either Computer and Information Science or Computer Information Systems Track**

### **Computer and Information Science Track**

#### **Core Requirements:**

1. Computing Fundamentals (CS 108)
2. Data Structures (CS 240)

#### **Intermediate Requirements:**

1. Computer Organization (CS 220)
2. Object Oriented Programming (CS 249)

#### **Advanced Requirements – two of the following:**

1. Operating Systems & Networking (CS 330)
2. Information Knowledge & Management (CS 350)
3. Software Engineering (CS 370)

#### **Advanced Electives – two of the following courses (must be taken at SUNYIT; can not be transferred in):**

CS 345 Logic Design  
 CS 381 Principles of Computer Security and Cryptography  
 CS 420 Numerical Computing  
 CS 421 Computational Linear Algebra  
 CS 431 Principles of Programming Languages  
 CS 441 Computer Architecture  
 CS 445 UNIX Programming Environment  
 CS 446 Local Area Network Architecture  
 CS 450 Computer Graphics  
 CS 451 Distributed Systems  
 CS 454 System Simulation  
 CS 477 Algorithms  
 CS 480 Compiler Design  
 CS 490 Special Topics in Computer Science  
 CS 495 Artificial Intelligence

#### **Capstone:**

CS 498 Project in Computer Science

### **Computer Information Systems Track:**

#### **Core Requirements:**

1. Computing Fundamentals (CS 108)
2. Data Structures (CS 240)

#### **Intermediate Requirements :**

1. Hardware and Network Infrastructure (IS 310)
2. System Analysis & Design (IS 320)
3. Data Base Management (IS 325)
4. Decision Support & Intelligent Systems (IS 330)

#### **Advanced Electives (2 courses taken in residence (no less than 8 credits) chosen from the following:**

IS 305 Application Programming With COBOL  
 IS 315 Networking of Information System  
 IS 340 E-Commerce  
 IS 470 Database Programming  
 IS 490 Special Topics in Information Systems  
 CS 307 The UNIX Programming Environment  
 CS 311 Data Analysis  
 CS 324 Internet Tools in Windows

CS 350 Information and Knowledge Management  
 CS 351 Web Development and Internet Programming  
 CS 370 Software Engineering  
 CS 407 UNIX System administration  
 CS 409 Software Project Management  
 CS 410 Data Security

**Capstone:**

IS 495 Computer Information Systems Practicum

**Remaining Requirements are applicable to both tracks:****Cognate Area (no less than 20 credit hours) satisfied via one of the following:**

1. any approved SUNYIT minor except Computer Science or Computer Information Systems
2. an associate's degree in an area other than computer science, data processing, information technology, information systems, or similar titles or in individual studies, general studies, or similar titles lacking a substantial focus
3. a minimum of twenty credits in a single discipline or interrelated disciplines subject to the approval of the department chair who shall consult with a faculty member in the pertinent discipline

**General Education (applicable to students entering the State University of New York system Fall 2000 or later-students entering prior to Fall 2000 should determine the general education requirements in consultation with an advisor):**

A minimum of thirty credits to be selected from approved general education courses, including (unless otherwise specified) a minimum of one course in each of the following areas:

1. Composition/Communication (for Freshmen, ENG 101)
2. Humanities
3. Arts
4. Social/Behavioral Sciences
5. Laboratory Science
6. Science Elective
7. Foreign Language - requirement waived if the student attained a score of 85 or higher on a third year Regents examination in a foreign language. Consult with an advisor for other means of satisfying this requirement.
8. American History - an approved course covering a period of at least one century; students attaining a score of 85 or higher on an American History Regents examination may substitute any approved course in American History.
9. Western Civilization
10. Other Civilizations
11. Mathematics - two courses; must include one course in Finite or Discrete Mathematics (MAT 115 or MAT 413), and at least one other course chosen from Calculus, Linear Algebra, or Statistics.
12. Upper Division Writing Course - either COM 350 Designing Online Information or COM 400 Computer Software Documentation

**Unrestricted Electives:**

Balance of 124 credits

**Academic Minors**

CS and CIS students are encouraged to select an academic minor and to use the minor's course of study as a means of satisfying open electives requirements and upper-division electives requirements. Academic minors enable students to pursue in-depth education in a second discipline that supports or enhances the use and application of their computing and information systems education. Attaining an academic minor in addition to a B.S. may require a student to take more than 124 total credits to graduate. Students who declare a minor are strongly encouraged to consult with their advisors for guidance prior to course selection and registration. CS and CIS majors may choose to minor in Accounting; Anthropology; Finance; Health Services Management; Marketing; Mathematics; Physics; Professional and Technical Communication; Psychology; Quality Engineering and Systems Technology; Science, Technology, and Society; and Sociology. The detailed requirements for each minor are contained in this catalog.

**Computer Science Laboratories**

The Department of Computer and Information Sciences maintains six labs containing a mix of operating systems and software in support of the Computer and Information Science and the Computer Information Systems programs. These labs are interconnected on a modern high speed network and supported by multiple file servers for central data storage and is accessible both on and off campus. Students are strongly encouraged to view the CS website ([www.cs.sunyit.edu](http://www.cs.sunyit.edu)) and access the large quantity of software and services available. This includes remote access, databases (MySQL, PostgreSQL, and Oracle), software repositories, streaming video, and many other services. The Computer Science network is maintained by full time staff with the assistance of student administrators.

DogNET UNIX Lab (Kunsela C-012) provides access to UNIX workstations (named after dogs). Twenty-five workstations (currently Pentium IV/3.4GHz with 17" flat panel monitors). These machines run the Gentoo Linux operating system and provide access to many programs for internet access, multimedia applications, publishing, language compilers, etc. Used for computer science courses in programming languages, operating systems, networking, web development, and system administration, the lab has open access during building hours when not occupied by a class.

Microsoft Windows Labs (Kunsela C-014 and Kunsela C-109) provide access to the MS Windows operating system and software. The C-014 lab contains twenty-five workstations (currently Core 2 Duo/3.0 GHz, 2 GB RAM with 17" flat panel monitors and DVD/RW) and has open access during building hours when not occupied by a class. The C-109 special purpose lab contains six workstations and is ideal for small groups working collaboratively on projects. These labs support instruction and experimentation in object-oriented programming, client-server and distributed computing (networking, systems administration and interoperability with other platforms), collaborative computing (web development, videoconferencing, multimedia). Programming environments supported include SUNJava, Visual Studio (C#, J#, C++), Visual Basic), FORTRAN 90, Prolog, LISP, ML-Object-Caml, APL. Application software includes Microsoft Office, Sharepoint, Publisher, Visio, Matlab, Maple, and several Adobe titles.

Kunsela 24 Hour Open Lab (Kunsela B-118) provides access to resources found in other computer science labs on a 24/7 basis while classes are in session. Current hardware includes ten MS Windows workstations, two Gentoo Linux workstations, and a multimedia station with flatbed scanner and blu-ray writer.

Parallel Processing Lab – provides access to an assortment of hardware to facilitate experimentation in parallel programming and distributed computing. Current equipment includes a cluster of Sun Fire 4100 quad core Linux servers, Sony Playstation 3 consoles, and workstations with high end graphics processors to support GPU programming projects.

### **Computer and Information Science Minor**

See academic minor section.

### **Computer Information Systems Minor**

See academic minor section.

