Information Systems (ISE)

Major and Minor in Information Systems

Department of Computer Science, College of Engineering and Applied Sciences

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Information Systems (ISE)
The Information Systems major, which is housed in the Department of Computer Science, prepares its graduates to design and build computerized data processing and decision support systems. The program is technically oriented, emphasizing the design and implementation aspects of large-scale information systems as well as the more traditional managerial and organizational issues, and it balances development of system engineering skills with learning to deliver reliable systems on time and within budget. Throughout the program, students are exposed to diverse application areas ranging from traditional business, finance, and accounting through telecommunications, networks, multimedia, and database management, to computer-aided design and industrial production management systems.

Requirements for the Major and Minor in Information Systems (ISE)

Acceptance into the Information Systems Major

Qualified freshman and transfer students who have indicated their interest in the major on their applications may be admitted directly as a degree major or as a pre-major. Pre-majors are placed into the Area of Interest (AOI) program and to be eligible for the degree, they must be admitted to and declare the major. The requirements and application process for matriculation are detailed below. Students admitted to other programs within the College of Engineering and Applied Science (CEAS) follow the same admissions process as students in the AOI program. Students in programs outside of CEAS (non-CEAS students) and double major applicants may apply for admission to the degree program following a separate process, outlined below.

Area of Interest and Other CEAS Students (excluding double major applicants)

Applications for major admission from AOI and other CEAS students are reviewed twice per year and must be received by January 5 for Spring admission and June 5 for Fall admission. Students who submit their application on time will be admitted if they meet the following requirements:

- Completed at least three required courses (CSE 114, Calculus I - AMS 151, MAT 125, MAT 131 or MAT 141, and WRT 102) with an average of 3.00 or higher and no grade below C. Students who transfer credit for any of these courses must speak to the Undergraduate Program Director to determine courses needed for major entry;
- No grade lower than C in any course required for the ISE major. If a student has taken a course multiple times, the highest grade is considered. In addition, this criterion does not apply for any course the student has not yet taken or has taken once with a grade of W or I;
- Earned a cumulative grade point average of 2.80 or higher;
- Completed course evaluations for all transferred courses that are to be used to meet requirements of the major;
- Computer Science majors may switch to the Information Systems major provided they have maintained a cumulative grade point average of 2.80 or higher.

Students must complete these requirements no later than one year after they enroll in the first course that applies towards major entry. Students who submit their application on time will be admitted if they meet the following requirements:

Non-CEAS Students and Double Major Applicants

Applications for major admission from non-CEAS students and double major applicants are reviewed twice per year and must be received by January 5 for Spring admission and June 5 for Fall admission. Students who do not meet the requirements for AOI admission above will not be considered. Fulfilling the requirements does not guarantee acceptance. Admission is competitive and contingent upon program capacity.

Enrolling in ISE Courses

To enroll in ISE courses, students must have completed all prerequisites with a grade of C or higher (Pass/No Credit grades are not acceptable to meet prerequisites). For transfer students, official transfer credit evaluations must have been completed and approved.

Failure to satisfy the prerequisites or to attend the first class may result in deregistration. The Pass/No Credit option is not available to ISE majors for ISE courses.

Requirements for the Major
The major in Information Systems leads to the Bachelor of Science degree. At least two of the courses under requirement A.2. below must be completed at Stony Brook.

Completion of the major requires approximately 64 credits.

A. Information Systems Courses:

1. Lower Division Courses
   - CSE 114 Computer Science I
   - CSE 214 Computer Science II
   - ISE 218 Fundamentals of Information Technology

2. Upper Division Courses:
   - ISE 312 Legal, Social, and Ethical Issues in Information Systems
   - ISE 305 Database Design and Practice
   - ISE 316 Introduction to Networking or CSE 310 Computer Networks
   - ISE 320 Information Management or BUS 340 Information Systems Management

3. Electives:
   Four additional upper-division ISE courses. Note: ISE 475 may be considered among the ISE upper-division electives, but may only be counted once towards the ISE upper-division elective requirement.

B. Mathematics Courses

1. AMS 151 Applied Calculus I (or MAT 131 or MAT 141 or MAT 125, MAT 126)
2. AMS 161 Applied Calculus II or MAT 132 Calculus II or MAT 127 Calculus C or MAT 142 Honors Calculus II or CSE 215 Foundations of Computer Science
3. AMS 210 Applied Linear Algebra or MAT 211 Introduction to Linear Algebra
4. AMS 310 Survey of Probability and Statistics or ECO 320 Mathematical Statistics or AMS 110 Probability and Statistics in the Life Sciences

C. Specializations

Students must complete a specialization in one of the application areas listed below, or else design a specialization of six to eight courses in another application area in consultation with the ISE undergraduate director before the courses for the specialization are completed.

D. Upper-Division Writing Requirement: ISE 300 Technical Communications

All degree candidates must demonstrate technical writing skills at a level that would be acceptable in an industrial setting. To satisfy this requirement, students must pass ISE 300 Technical Communications, a course that requires various writing assignments, including at least one significant technical paper.

EST 304 Communication for Engineers and Scientists may be taken in lieu of ISE 300 to fulfill the ISE upper-division writing requirement.

Grading

All courses taken to satisfy Requirements A through D must be taken for a letter grade and completed with a grade of C or higher. A grade of C or higher is required in prerequisite courses listed for all CSE and ISE courses.

Specialization in Business and Economics

Students may take a specialization in Business and Economics consisting of the following courses:

Core Courses

a. BUS 115 Introduction to Business
b. ECO 108 Introduction to Economics
c. ACC 210 Financial Accounting

1. One of the following:
   - ACC 214 Managerial Accounting
   - ESE 201 Engineering and Technology Entrepreneurship
   - BUS 220 Introduction to Decision Sciences
   - BUS 294 Principles of Management

2. Two of the following:
   - BUS 346 Management and Operations
   - BUS 348 Principles of Marketing
   - BUS 355 Investment Analysis
   - BUS 356 Financial Engineering
Specialization in Digital Media

Students may take a specialization in Digital Media consisting of the following courses. Courses applied to the specialization may not be used toward requirements to satisfy the ISE major or minor.

1. Core Courses
   a. CDT 208 Introduction to Media Technology
   b. CSE 323/ISE 323 Human-Computer Interaction (see Note)

2. Two of the following:
   • ARS205 Foundations: Idea and Form
   • ARS210 Modern Art and the Moving Image
   • ARS225 Introduction to Digital Art
   • ARS281 Introductory Photography
   • CCS101 Introduction to Cinema & Cultural Studies
   • DIA207 Technologies of Representation
   • ISE102 Introduction to Web Design and Programming
   • ISE108 Introduction to Programming
   • THR103 Theatre and Technology

3. Two of the following:
   • ARS324 Intermediate Digital Art: Design
   • ARS325 Intermediate Digital Arts: Print
   • ARS326 Video Art: Narrative Forms
   • ARS327 Digital Arts: Web Design and Culture
   • ARS328 Digital Arts: Animation
   • ARS329: Video Art: Experimental Forms
   • CDT317 Interactive Media, Performance, and Installation
   • CDT318 Movie Making: Shoot, Edit, Score
   • CDT341 Sound Design
   • CDT450 Topics in Computational Arts
   • CSE333 User Interface Development
   • ISE325/CSE325 Computer Science and Sculpture
   • ISE334/CSE334 Introduction to Multimedia Systems
   • ISE340/EST310 Design of Computer Games
   • ISE364/CSE364 Advanced Multimedia Techniques
   • ISE488 Internship
   • DIA396 Video and Computer Game History
   • DIA397 Video and Computer Game Culture

Note: If CSE 323/ISE 323 is being used to satisfy an ISE upper division requirement, any one course listed in the above upper-division category can be substituted for CSE 323/ISE 323.

Specialization in Financial Information Systems

Students may take a specialization in Financial Information Systems consisting of the following courses.

1. Two of the following:
   • CSE 215 Foundations of Computer Science
   • AMS 315 Data Analysis
   • AMS 318 Financial Mathematics
2. Four of the following:
   - ACC 210 Financial Accounting
   - AMS 311 Probability Theory
   - AMS 316 Introduction to Time Series Analysis
   - AMS 320 Introduction to Quantitative Finance
   - AMS 341 Operations Research I: Deterministic Models
   - AMS 394 Statistical Laboratory
   - AMS 441 Business Enterprise
   - BUS 330 Principles of Finance
   - BUS 331 International Finance
   - BUS 355 Investment Analysis
   - BUS 356 Financial Engineering
   - ISE 323 Human-Computer Interaction
   - ISE 331 Fundamentals of Computer Security

**Specialization in Health Informatics**

Students may take a specialization in Health Informatics consisting of the six courses.

1. Core Courses:
   - HAN 200 Anatomy and Physiology I
   - BIO 202 or BIO 203 Fundamentals of Biology

2. Four of the following:
   - BCP 405 Pharmacology to Pharmacy: Practical Clinical Aspects for Non-Clinicians (Didactic)
   - BIO 202 or BIO 203 Fundamentals of Biology
   - BME 205 Clinical Challenges of the 21st Century
   - CSE 337 Introduction to Medical Imaging
   - ECO 327 Health Economics
   - HAN 202 Anatomy and Physiology II
   - ISE 305 Database Design and Practice
   - PSY 103 Introduction to Psychology

**Specialization in System & Network Administration**

Students may take a specialization in System & Network Administration consisting of the following courses. Courses applied to the specialization may not be used toward requirements to satisfy the ISE major or minor.

1. ISE 311 System Administration
2. ISE 321 Network Administration
3. ISE 331 Computer Security or CSE 331 Computer Security Fundamentals
4. ISE 337 Scripting Languages or CSE 337 Scripting Languages
5. ISE 488 Internship or ISE 487 Research in Information Systems
6. CSE 370 Wireless and Mobile Networking or EST 393 Project Management or BUS 393 Principles of Project Management or BUS 346 Management and Operations or AMS 341 Operations Research I: Deterministic Models

**Specialization in Technological Systems Management**

Students may take a specialization in Technological Systems Management consisting of the following courses.

1. Four required courses:
   a. EST 201 Technological Trends in Society or EST 202 Introduction to Science, Technology and Society Studies
   b. EST 391 Technology Assessment
   c. EST 392 Engineering and Managerial Economics
   d. EST 393 Project Management

2. Two elective courses from the following:
   - EST 310/ISE 340 Design of Computer Games
   - EST 320 Communication Technology Systems
   - EST 323/ISE 323 Human-Computer Interaction
   - EST 326 Management for Engineers
   - EST 327 Marketing for Engineers
   - EST 364 How to Build a Startup
   - EST 421 Starting the High-Technology Venture

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Note: Courses cross-listed between ISE and EST may be taken either as ISE electives (Item A.3) or as TSM specialization electives (Item C).

Specialization in Other Application Areas
A student may design a specialization in another application area of information systems in consultation with the ISE undergraduate director before the courses for the specialization are completed.

Requirements for the Minor

The minor in Information Systems is open to all students not majoring in either Computer Science or Information Systems or minoring in Computer Science. To declare the minor in Information Systems, students must complete ISE 108 or CSE 101 with a grade of C or higher and possess a cumulative grade point average of 2.80 or higher. The minor requires seven courses totaling 21 credits as outlined below:

1. ISE 108 Introduction to Programming or CSE 101 Introduction to Computers
2. CSE 114 Computer Science I
3. ISE 218 Fundamentals of Information Technology
4. Four electives totaling at least twelve credits. Electives must include nine credits of upper-division courses and at least nine credits of CSE or ISE courses. Approved courses include most ISE/CSE courses and other courses relevant to Information Systems. Consult with the ISE Undergraduate Program Director on the suitability of an elective course prior to registration.

Note: All courses above must be passed with a grade of C or higher

Sample Course Sequence for the Major in Information Systems
A course planning guide for this major may be found here.

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ISE

Information Systems

ISE 218: Fundamentals of Information Technology

This course introduces the fundamentals of Information Technology (IT) to students interested in the relationship between computer hardware, software, networks, and information systems. The course examines components found in high use computing devices such as desktop computers, smart phones, and navigation systems. The focus of the examination is understanding the underlying technology of each component, along with price/performance curves and competing technologies. Upon completion of the course, students should be proficient in reading device specifications, particularly functional and performance implications. Students should also be able to use that knowledge to compare competing devices.

Prerequisite: ISE 108 or CSE 114 or CSE 230
SBC: EXP+, TECH
3 credits

ISE 208: Intermediate Programming

Teaches programming and system design techniques with an emphasis on applications to business. Topics include object-oriented design techniques, testing and debugging, data structures, recursion, and exception-handling. Uses the Java programming language.

Prerequisite: ISE 108
3 credits

ISE 305: Database Design and Practice

The design of database applications including Entity-Relationship data modeling, the relational data model, the SQL database query language, application development, and database administration. Students will complete a project that includes designing a database application and implementing it using database development tools.

Prerequisite: ISE 208 or CSE 114 or CSE 230
SBC: EXP+, TECH
3 credits

ISE 311: Systems Administration

This course covers practical techniques to manage information systems, also known as IT Systems Administration. Students will learn how to install computers for assorted hardware and software platforms (Windows, Unix/Linux, OS-X). Install networking equipment and configure it. Install server software on several systems (e.g. web, database, mail) and configure it. Secure the network, hosts, and services, and apply system patches. Set up redundant computing services, virtual machines/services, and hardware so that services can survive some hardware/software failures. Evaluate the performance, reliability, and security of the overall system.

Prerequisites: CSE 214 or CSE 230 or CSE 260 or ISE 208; ISE or CSE major
3 credits
ISE 316: Introduction to Networking
This course introduces the principles of computer networks, including network architectures, algorithms, and performance, with the TCP/IP based Internet as an example. It examines various networking protocols at different layers of the Internet protocol stack, including those at the application, transport, network, and data link layers, respectively. May not be taken for credit in addition to CSE 310 or CSE 346/ESE 346.
Prerequisites: CSE 114 or ISE 208; Level 4 or higher on the mathematics placement exam or MAT 123
3 credits

ISE 317: Computer Networking II
Today's computer networks have become an infrastructure as essential as utility networks such as the transportation network and the national grid of electricity. A wide variety of networking technologies are deployed to support nearly every sector of the society. Among these technologies, those that are related to wireless and mobile networking, multimedia networking, as well as network security are among the most popular and important. After learning fundamental concepts and protocols in computer networks from the first networks course, this second computer networks course examines more practical and advanced topics in computer networking. In addition to those mentioned above, we will also study advanced routing algorithms in computer networks and network management. Both are critical tasks for corporations such as network service providers and for individual professionals such as network administrators.
Prerequisites: ISE 316 or CSE 310; ISE or CSE major
3 credits

ISE 320: Information Management
The course presents the relationship between information technology and the systems that use the technology. The emphasis is on business systems with a high information technology component (e.g., software developments, communications, financial management, etc.). Topics include infrastructure management, information management, security, and communications. Emphasis is given to case studies relating to information management.
Prerequisite: U2 Standing
3 credits

ISE 321: Introduction to Network Administration
The course introduces students to the fundamentals of network management, primarily for TCP/IP networks. Students are introduced to networking protocols, hardware, architecture, media, and software and experience hands-on management of typical network components. Various network protocols are examined, including Internet routing protocols. Network security is introduced in the overall context of network management.
Prerequisite: ISE 316 or CSE 310; ISE or CSE major
3 credits

ISE 323: Human-Computer Interaction
A survey course designed to introduce students to Human-Computer Interaction and prepare them for further study in the specialized topics of their choice. Students will have the opportunity to delve deeper in the course through a course project, and through a two-three week special topic selected at the instructor's discretion. Course is cross-listed as CSE 323, EST 323 and ISE 323.
Prerequisites: CSE 214 or CSE 230 or CSE 260 or ISE 208
3 credits

ISE 325: Computers and Sculpture
This multidisciplinary class surveys how computer science and computer technology are used in sculpture. Case studies with slides, videos, and software demonstrations illustrate a range of approaches of sculptors incorporating computers in their creative process. Various state-of-the art fabrication technologies are studied (with site visits if available on campus). Mathematical foundations are emphasized so students can recognize them when analyzing sculpture and choose the right tool when designing. In the weekly laboratory, these ideas are reinforced with projects using a range of available software and inexpensive construction materials, e.g., paper, cardboard, and foamcore.
Prerequisite: CSE 110 or CSE 101 or CSE 114 or permission of instructor
3 credits

ISE 331: Fundamentals of Computer Security
The course will introduce the concepts and terminology of computer security in addition to describing attacks against computer infrastructure and typical defenses against such attacks. The course will outline security policies and procedures used by enterprises and will introduce tools and techniques used by both attackers and defenders.
Prerequisite: ISE 218 or CSE 220
Corequisite: ISE 316 or CSE 310 or CSE/ESE 346
3 credits

ISE 332: Introduction to Visualization
This course is an introduction to both the foundations and applications of visualization and visual analytics, for the purpose of understanding complex data in science, medicine, business, finance, and many others. It will begin with the basics - visual perception, cognition, human-computer interaction, the sense-making process, data mining, computer graphics, and information visualization. It will then move to discuss how these elementary techniques are coupled into an effective visual analytics pipeline that allows humans to interactively think with data and gain insight. Students will get hands-on experience via several programming projects, using popular public-domain statistics and visualization libraries and APIs. This course is offered as both CSE 332 and ISE 332.
Prerequisites: CSE 214 or CSE 260; MAT 211 or AMS 210; AMS 310; CSE or ISE major
3 credits

ISE 333: User Interface Development
Survey of user interface systems, with emphasis on responsive and adaptive strategies to accommodate cross-platform deployment across multiple devices such as desktops and mobile devices. Demonstration of the use of tool kits for designing user interfaces. Additional topics include human factors, design standards, and visual languages. Students participate in a project involving the design and implementation of user interface systems. This course is offered as both CSE 333 and ISE 333.
Prerequisite: CSE 214 or CSE 260; CSE or ISE major
3 credits

ISE 334: Introduction to Multimedia Systems
Survey of technologies available for user interfaces. Discussion of hypertext: voice, music, and video together with tools and models for capturing, editing, presenting, and combining them. Capabilities and characteristics of a range of peripheral devices including devices based on posture, gesture, head movement, and touch. Case studies of academic and commercial multimedia systems including virtual reality systems. Students participate in laboratory exercises and build a multimedia project. This course is offered as both CSE 334 and ISE 334.
ISE 337: Scripting Languages

Scripting languages are widely used in the IT industry. Programming with scripting languages, also known as scripting, has several advantages compared to programming with other types of languages in that scripts facilitate rapid program development; can automate high-level jobs or tasks very effectively; and can be used to compose various software components, even binaries, into more complex and powerful applications. This course introduces the principles of scripting, covers one or two selected scripting languages in depth, and illustrates the advanced use of scripting by extensive case studies in application areas such as system administration, web application development, graphical user interface development, and text processing.

Prerequisites: CSE 114 or CSE 160 or ISE 208; CSE or ISE major; U3 or U4 standing

3 credits

ISE 340: Design of Computer Games

Fundamental ideas underlying the design of games, which occurs before the programming stage. How games function to create experiences, including rule design, play mechanics, game balancing, social game interaction and the integration of visual, audio, tactile and textual elements into the total game experience. Game design documentation and play testing. Students will design their own game during the semester. This course is offered as both EST 310 and ISE 340.

Advisory Prerequisite: Basic Computer Skills

SBC: TECH

3 credits

ISE 364: Advanced Multimedia Techniques

Digital media production techniques for high-bandwidth applications such as electronic magazine illustration, broadcast television, and motion picture special effects. Students explore techniques such as 3D modeling and character animation, video compositing, and high-resolution image processing in a state-of-the-art multimedia computing laboratory. High-capacity multimedia storage, high-speed networks, and new technologies such as DVD, HDTV, and broadband will be reviewed. This course is offered as both CSE 364 and ISE 364.

Prerequisites: CSE/ISE 334 and permission of the instructor

3 credits

ISE 377: Introduction to Medical Imaging

An introduction to the mathematical, physical, and computational principles underlying modern medical imaging systems. Covers fundamentals of X-ray computer tomography, ultrasonic imaging, nuclear imaging, and magnetic resonance imaging (MRI), as well as more general concepts required for these, such as linear systems theory and the Fourier transform. Popular techniques for the visualization, segmentation, and analysis of medical image data are discussed, as well as applications of medical imaging, such as image-guided intervention. The course is appropriate for computer science, biomedical engineering, and electrical engineering majors.

Prerequisites: AMS 161 or MAT 127 or 132 or 142; AMS 210 or MAT 211

3 credits

ISE 378: Introduction to Robotics

Introduces basic concepts in robotics including coordinate transformation, kinematics, dynamics, Laplace transforms, equations of motion, feedback and feedforward control, and trajectory planning. Covers simple and complex sensors (such as cameras), hybrid and behavior based control and path planning. Concepts are illustrated through laboratories using the LEGO Robot Kit.

Prerequisites: AMS 161 or MAT 127 or 132 or 142; AMS 210 or MAT 211 or MEC 262

3 credits

ISE 390: Special Topics in Information Systems

Lecture or seminar course on a current topic in information systems. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated as the topic changes, but cannot be used more than twice to satisfy ISE major requirements.

Prerequisite: ISE major or ISE minor

3 credits

ISE 475: Undergraduate Teaching Practicum

Students assist faculty by conducting a recitation or laboratory section that supplements a lecture course. The student receives regularly scheduled supervision from the faculty advisor. May be repeated once, but only one completion of the course will count towards the ISE upper division elective requirement.

Prerequisites: U3 or U4 standing as an undergraduate CEAS major; a minimum g.p.a. of 3.00 in all Stony Brook courses; grade of B or better in the course in which the student is to assist and permission of department.

SBC: EXP+

3 credits

ISE 487: Research in Information Systems

An independent research project with faculty supervision. Only three credits of research electives (AMS 487, BME 499, CSE 487, ESE 499, ESM 499, EST 499, ISE 487, MEC 499) may be counted toward technical elective requirements. May not be taken for more than six credits.

Prerequisites: Permission of instructor and department

0-6 credits

ISE 488: Information Systems Internship

Participation in local, state, national, or international private enterprise, public agencies, or nonprofit institutions. To obtain permission to register for the course, students are required to submit proof that the work is related to their studies and the work will include at a minimum of 180 hours during the semester. During the semester, the student will submit progress reports and a final report on their experience to the client and to the department. May be repeated up to a limit of 12 credits but can only be used once as a technical elective to satisfy ISE major requirements.

Prerequisites: ISE major; U3 or U4 standing; permission of faculty sponsor and department

SBC: EXP+

3 credits, S/U grading