
Associate of Science in Computer Science

This program is designed to meet the needs of students who plan a career in computer science or whose career area requires extensive first-hand knowledge of computer science. Together, the basic curriculum and electives afford students considerable flexibility in planning a degree program to meet their career objectives.

CSCI C201 Computer Programming II is a required prerequisite to subsequent computer science courses and should be taken during the first semester of the first year. However, students who have not completed two years of high school algebra or who do not score high enough to enter MATH M122 College Algebra on the math placement test must take MATH M007 Elementary Algebra and/or MATH M117 Intermediate Algebra before taking CSCI C201. Because of prerequisite relationships, the computer science courses must be taken in sequence. The social sciences and arts and letters electives may be satisfied by taking any courses in those areas. In the final semester of the program, the student may, after

obtaining the approval of a sponsoring full-time faculty member, undertake a project in CSCI C390 Individual Programming Laboratory. Finally, the general requirements for all degrees at IUS include a research writing requirement to be completed during the first 60 credit hours at IUS.

The Associate of Science in Computer Science requires at least 64 credit hours:

- I. General Education Core:
 - a. Communication.....9
 - English W131
 - Speech S121
 - English W234
 - Research Writing R200
 - b. Mathematics6-9
 - Mathematics K300 or
 - Economics E280-E281
 - CSCI C251
 - c. Social sciences electives.....6
 - Any social sciences course satisfies this elective requirement, but the following are recommended:*
 - Psychology P101
 - Sociology S163
 - d. Arts and letters elective3
 - Any arts and letters course satisfies this elective requirement, but the following is recommended:*
 - Philosophy P250
 - e. General electives12
 - It is recommended that you select general electives that satisfy specific Computer Science B.S. degree requirements.*
 - f. Computer competency3
 - An IU Southeast general requirement.*
 - CSCI C106
- II. Computer Science Requirements:
 - a. Core.....19
 - CSCI C201 (4)
 - CSCI C202 (4)
 - CSCI C237 (4)
 - CSCI C335 (4)
 - CSCI B3XX (3)
 - or CSCI B4XX (3)
 - or CSCI C3XX (3)
 - or CSCI C4XX (3)

- b. Concentration area (one area required)6-7
 - 1) Computer Media Option
 - CSCI A346 (3)
 - CSCI A348 (3)
 - 2) Computer Networking Option
 - CSCI A247 (3)
 - CSCI B438 (3)
 - 3) Database Systems Option
 - CSCI C343 (4)
 - CSCI B461 (3)
 - 4) Information Processing Option
 - CSCI C203 (3)
 - CSCI C320 (3)

Bachelor of Science in Computer Science

Note: These specific requirements may change so as to affect individuals who begin programs during the 1997 fall semester and thereafter. Candidates for the Bachelor of Science degree should first review "General Requirements for All Degrees at IUS" in this bulletin.

Requirements

To be admitted to the B.S. degree program in computer science a student must satisfy the IUS admission requirements. In addition, admission into the B.S. degree program requires that a student complete the following courses with a grade point average of at least 2.5 and have an overall grade point average of at least 2.5 in these computer science courses: C201 Computer Programming II, C202 Computer Programming, C237 Operating Systems Concepts, and C335 Computer Structures. These requirements must be met before attaining junior status (56 credit hours) in order to maintain a normal four-year schedule. Admission to this program will be limited to the number of students which can be effectively accommodated given the available resources. While completing the required basic computer science course work, the student is also required to fulfill the basic mathematics requirement (C251, and M119-M120 or M215-M216). This is necessary to maintain a normal four-year schedule and to meet the mathematics prerequisite requirements of the upper-level computer science courses.

Each student will select one of two major option areas in which to pursue advanced courses: (1) information systems and (2) science/mathematics. Within each option area there are required advanced sequences in computer science and related disciplines that enable students to tailor their advanced course work to meet any one of several career objectives. Please note that taking the course requirements for

both options on this degree may add up to a number less than the required 123 credit hours. The student should fulfill the remaining hours with electives.

Computer Science Electives

The following classes are approved electives for both the information systems and science/mathematics options:

- A247 Network Technologies and Administration
- A346 User-Interface Programming
- A348 Mastering the World Wide Web
- B438 Fundamentals of Computer Networks
- C203 COBOL and File Processing
- C320 Advanced COBOL
- C390 Individual Programming Lab
- C421 Computer Organization
- C422 Advanced Computer Organization
- C431 Assemblers and Compilers I
- C432 Assemblers and Compilers II
- C435 Operating Systems I
- C436 Operating Systems II
- C463 Artificial Intelligence I
- C464 Artificial Intelligence II
- C490 Seminar in Computer Science

Information Systems Option

The information systems option is for students who seek employment in business or industry after graduation, or who may pursue a graduate degree in information systems. Within this option the students may select courses that prepare them for careers in areas such as applications programming, business systems design and implementation, and information systems management.

The Bachelor of Science in Computer Science—Information Systems Option requires at least 123 credit hours:

- I. General Education Core:
 - a. Arts and Letters.....6
 - Two courses including:
 - Philosophy P250
 - b. Communication9
 - English W131
 - English W234
 - Speech S121
 - Research Writing R200
 - c. Computer competency3
 - An IU Southeast general requirement.
 - CSCI C106

- d. Mathematics.....12-16
 - Mathematics M215-M216 or
 - Mathematics M119-M120
 - Mathematics K300 or
 - Economics E280-E281
- e. Natural Sciences5-10
 - Physics P221-P222 or
 - Physics P201-P202 or
 - Physics P100
- f. Social Sciences9
 - Four courses including:
 - Psychology P101
 - Sociology S163
- II. Business Requirements.....24
 - A business minor degree is within easy reach after taking these courses; ask a computer science advisor for help.*
 - Accounting A201-A202
 - Business F301, L201, M301, P301
 - Economics E107-E108
- III. Computer Science Requirements:
 - a. Core45
 - CSCI C201 (4)
 - CSCI C202 (4)
 - CSCI C237 (4)
 - CSCI C251 (3)
 - CSCI C311 (4)
 - CSCI C335 (4)
 - CSCI C343 (4)
 - CSCI C445 (4)
 - CSCI C446 (4)
 - CSCI C455 (4)
 - CSCI B461 (3)
 - CSCI B4XX or C4XX (3)

Science/Mathematics Option

The science/mathematics option is designed for students who intend to work in the more technical areas of computer applications or who intend to pursue a graduate degree in computer science. Within this option students may select courses to prepare themselves for careers in areas such as systems software design and implementation and scientific computing applications.

The Bachelor of Science in Computer Science—Science/Mathematics Option requires at least 123 credit hours.

- I. General Education Core:
 - a. Arts and Letters.....6
Two courses including:
Philosophy P250
 - b. Communication9
English W131
English W234
Speech S121
Research Writing R200
 - c. Computer competency3
An IU Southeast general requirement.
CSCI C106
 - d. Social Sciences.....9
- II. Mathematics and Science Requirements:
 - a. Mathematics.....19
A math minor degree is within easy reach after taking these courses; ask a computer science advisor for help.
Mathematics M215-M216, M303, M360
An approved Mathematics 300- or 400-level course
 - b. Biological and Physical Sciences16
Sixteen credit hours including:
Chemistry C105-C106 or
Physics P221-P222
- III. Computer Science Requirements:
 - a. Core46
CSCI C201 (4)
CSCI C202 (4)
CSCI C237 (4)
CSCI C251 (3)
CSCI C311 (4)
CSCI C335 (4)
CSCI C343 (4)
CSCI C455 (4)
CSCI C4XX-C4XX sequence (6-8)
CSCI B4XX or C4XX (9)
 - b. Concentration area (one area required)9-14
 - 1) Computer Networking Option
CSCI A247 (3)
CSCI C237 (4)
CSCI C335 (4)
CSCI B438 (3)
 - 2) Database Systems Option
CSCI C343 (4)
CSCI B461 (3)
 - 3) Information Processing Option
BUS K321 (3)
CSCI C203 (3)
CSCI C320 (3)
 - 4) Information Technology Option
CSCI A247 (3)
CSCI A346 (3)
CSCI A348 (3)

Requirements for a Minor in Computer Science

Minimum of 16 credit hours to include:

- a. Core11
CSCI C201 (4)
CSCI C202 (4)
CSCI C251 (3)

C404 History of Chemistry II (1 cr.) P: Senior standing, consent of instructor. Development of significant chemical knowledge and concepts since 1830.

C409 Chemical Research (1-5 cr.; 10 cr. max.) To be elected only after consultation with the course director and the undergraduate advisor. Cannot be substituted for any course required in chemistry major. A research thesis is required. Fall Sem., Spring Sem., Summer.

C430 Inorganic Chemistry (3 cr.) P: C106 or C361 (or consent of instructor). R: C341. Structure and bonding of inorganic compounds, survey of chemistry of non-metal and metal elements, coordination compounds, organometallic compounds, mechanisms and reactions. Alternate Spring Sems.

C443 Organic Spectroscopy (3 cr.) P: C342. Elucidation of molecular structures by use of IR, UV, NMR, mass spectroscopy, and other methods. Alternate Summers.

C444 Organic Spectroscopy Laboratory (2 cr.) P or concurrent: C443 or consent of instructor. Hands-on instrumentation experimental work concerning detailed structure elucidation of organic compounds using Ultraviolet-Visible (UV-Vis), Infrared (IR), Nuclear Magnetic Resonance (NMR), and Gas Chromatography-Mass Spectrometry (GC-MS). (Lab fee required.) Alternate Summers.

C445 Advanced Organic Chemistry Laboratory (3-5 cr.) P or concurrent: C443 or consent of instructor. Experimental problems in organic analysis and synthesis. (Lab fee required.)

C470 Polymer Chemistry (3 cr.) P: 18 credit hours in chemistry, including C342. Introduction to syntheses, structures, properties, and uses of polymeric substances.

C483 Biological Chemistry (3 cr.) P or concurrent: C342. Introduction to structure, chemical properties, and interrelationships of biological substances. Fall Sem.

C490 Individual Study (cr. arr.; 6 cr. max.) P: Written permission of faculty member supervising the study. Must complete written report of each semester's work. Fall Sem., Spring Sem., Summer.

Computer Science (CSCI)

A201 Introduction to Programming (3 cr.) P: Two years of high school mathematics or M014. Fundamental programming constructs, including loops, arrays, classes, and files. General problem-solving techniques. Emphasis on modular programming, user-interface design, and developing good programming style. Not intended for computer science majors or minors.

A247 Network Technologies and Administration (3 cr.) P: Either C106, EDUC W200, or equivalent computer literacy. Introduction to network principles and current network technology, both hardware and software. Network administration tools and techniques. Laboratory provides practical experience.

A346 User-Interface Programming (3 cr.) P: C202 or equivalent experience. Learn to prototype and build graphical user interfaces for computer applications. Contemporary software design methodology. Students design and implement prototype interfaces to applications provided by the instructor. Extensive use is made of both commercial and experimental software tools.

A348 Mastering the World Wide Web (3 cr.) P: Two semesters of programming experience, or equivalent, and some knowledge of operating systems. Project-oriented course leading to ability to maintain a fully functional Web site. Topics include internet network protocols and Web programming, server administration, protocols, site design, and searching and indexing technologies.

C100 Computing Tools (1 cr.) An introduction to computing applications useful in college and career work. Topics include microcomputer operating systems, word processing, spreadsheet, database, and communications software, and other software applications. May be taken up to three times to satisfy the basic computer literacy requirement.

C106 Introduction to Computers and Their Use (3 cr.) An introduction to computers and their use in information systems: use of standard application programs; foundations of information systems design and development; survey of programming languages. Satisfies the basic computer literacy requirement.

C201 Computer Programming II (4 cr.) P: MATH M117. Computer programming and algorithms. Basic programming and program structure. Computer solutions of problems. A computer language will be taught. Lecture and discussion. Business majors cannot receive credit for C201 and C101 or C106.

C202 Computer Programming (4 cr.) P: C201. Computer programming, algorithms, program structure, arrays, stacks, queues, binary trees; procedures, functions, parameter-passing mechanisms, recursion vs. iteration, and issues of programming style. Computer solutions of problems such as data analysis, sorting, searching, and string and text manipulation.

C203 COBOL and File Processing (3 cr.) P: C201. Computer programming and algorithms. Applications to large file processing functions of an organization.

C237 Operating Systems Concepts (4 cr.) P: C202, C335. An investigation of the problems involved in the implementation of an operating system and some of the solutions. Topics such as multiprocessing, paging, interlocks, time-sharing, and scheduling. A specific operating system will be examined.

C251 Foundations of Digital Computing (3 cr.) P: C201. R: MATH M119 or MATH M215. Boolean algebra and propositional logic. Set algebra, including mappings and relations. Elements of graph theory and statistical analysis. Application of all topics to computer programming.

C311 Programming Languages (4 cr.) P: C202, C335. Systematic approach to programming languages. Relationships among languages, properties and features of languages, and the computer environment necessary to use languages. Lecture and laboratory.

C320 Advanced COBOL (3 cr.) P: C203. A continuation and extension of COBOL as taught in C203. Extensive use will be made of structured COBOL in the development of large programs requiring access to various file structures. Includes interactive menu and screen-driven programming.

C335 Computer Structures (4 cr.) P: C201. R: C202. Structure and internal operation of computers, stressing the architecture and assembly language programming of a specific computer. Additional topics include digital hardware and microprogramming. Lecture and laboratory.

C343 Data Structures (4 cr.) P: C202, C251. Systematic study of data structures encountered in computing problems, structure and use of storage media, methods of representing structure data, techniques for operation on data structures. Lecture and laboratory.

C390 Individual Programming Laboratory (1-3 cr.) P: C201. Student will design, program, verify, and document a special project assignment selected in consultation with the instructor. This course may be taken several times for up to a maximum of 6 credits. Prior to enrolling, a student must arrange for an instructor to supervise the course activity.

C405 A Survey of Computer Science (3 cr.) P: C343. A survey of senior-level topics in programming languages and operating systems for students minoring in computer science.

C421 Computer Organization (4 cr.) P: C251, C335. Organization, circuits, and logic design of digital computing systems. Course deals with the internal structure of computers. Some simple computers are designed. Experiments in basic computer circuitry are performed in the laboratory. A knowledge of electronics, while useful, is not a requirement. Lecture and laboratory.

C422 Advanced Computer Organization (3 cr.) P: C421 or equivalent. Basic computer hardware design problems. Alternative solutions illustrated by different computers.

C431-C432 Assemblers and Compilers I-II (3-3 cr.) P: C311, C335, and C343. Design and construction of assemblers, macroprocessors, linkers, loaders, and interpreters. Compiler design and construction, including lexical analysis, parsing, code generation, and optimization.

C435-C436 Operating Systems I-II (3-3 cr.) P: C311, C335, C343. Organization and construction of computer systems that manage computational resources. Topics include specification and implementation of concurrency, process scheduling, storage management, device handlers, mechanisms for event coordination such as interruption, exclusion, and synchronization. Extensive laboratory exercises.

B438 Fundamentals of Computer Networks (3 cr.) P: C237. Theory and practice of data communication between computing devices. Topics include network architecture and topology, wide-area networks, local-area networks, and ISO network layers.

C445-C446 Information Systems I-II (4-4 cr.) P: C343. Analysis, design, and implementation of information systems from user needs to a running system. Hardware organization and its impact on storage structures. Structures and techniques for accessing and updating information: primary and secondary indices, sequential

and multilinked files. Modeling of information using hierarchical, network, and relational techniques and operations with these models. Current database systems and query languages.

C451 Automata and Formal Grammars (3 cr.) P: C251 or concurrent MATH M403. Finite automata and regular grammars; context-free grammars and nondeterministic pushdown automata; deterministic pushdown automata; unsolvable problems and algorithms for solvable problems related to these classes of machines and grammars.

C455 Analysis of Algorithms (4 cr.) P: MATH M216 or M120 and C343. Models, algorithms, recurrences, summations, growth rates. Probabilistic tools, upper and lower bounds; worst-case and average-case analysis, amortized analysis, dynamization. Comparison-based algorithms: search, selection, sorting, hashing. Information extraction algorithms (graphs, databases). Graph algorithms: spanning trees, shortest paths, connectivity, depth-first search, breadth-first search.

B461 Database Concepts (3 cr.) P: C251, C335, and C343. Introduction to database concepts and systems. Topics include database models and systems: hierarchical, network, relational, and object-oriented; database design principles; structures for efficient data access; query languages and processing; database applications development; views; security; concurrency; recovery. Students participate in a project to design, implement, and query a database, using a standard database system.

C463 Artificial Intelligence I (3 cr.) P: C311 and C343. Historical roots, philosophical thesis, and goals of artificial intelligence research. Basic problem-solving methods. Heuristics and heuristic search. Game-playing programs. Reasoning and knowledge representation. Predicate calculus, semantic networks, frames and other representation systems. Introduction to production systems. Goal-directed systems.

C464 Artificial Intelligence II (3 cr.) P: C463. Advanced problem-solving techniques. Production systems continued. Programming languages for artificial intelligence systems. Natural-language understanding programs. Recognition and categorization. Artificial vision systems. Applications of artificial intelligence. Robotics.

C490 Seminar in Computer Science (1-3 cr.) Special topics in computer science. May be repeated for up to a maximum of 6 credits.

Y398 Internships in Professional Practice (S/F Grading) (1-6 cr.) P: Sophomore standing; approval of major department and the Office of Professional Practice Programs. Designed to provide opportunities for students to receive credit for selected career-related, full-time work. Evaluation by employer and faculty sponsor.

Mathematics (MATH)

Developmental Mathematics

M006 Elementary Mathematical Skills (3 cr.) Designed to review and/or teach basic mathematical operations of whole numbers, integers, fractions, decimals, percentages, ratio and proportion; geometry and measurement. Prepares students for M007 Elementary Algebra or M014 Basic Algebra. Credit does not apply toward a degree. Fall Sem., Spring Sem., Summer.

M007 Elementary Algebra (3 cr.) P: Proficiency in arithmetic and basic geometry, placement by exam, or M006. Designed to review and/or teach elementary operations of equations, inequalities, polynomials, factoring, and linear graphing. Prepares students for intermediate algebra or math for elementary teachers' courses. Credit does not apply toward a degree. Fall Sem., Spring Sem., Summer.

M007/M117 Combined Elementary/ Intermediate Algebra (6 cr.) P: M006 or placement into M007 by examination. Designed to cover the topics of both M007 and M117 in one semester: factoring; rational, polynomial, and exponential expressions; linear, quadratic, and radical equations; linear systems; functions and graphing. M007 credit does not apply toward a degree and M117 credit does not apply toward the arts and sciences distribution requirement.

Mathematics

Graphing calculators are required in many courses. Check the Schedule of Classes for information on the specific type of calculator for a given course. A mathematics resource lab with computer and tutoring resources is available in the Life Sciences Building. See <http://www.ius.edu/mathlab> for current information.

K300 Statistical Techniques (3 cr.) P: Two years of high school mathematics including algebra, placement by exam, M014, or M117. R: M118. An introduction to statistics. Nature of statistical data. Ordering and