

CSU101 Computer Science and Its Applications (4 SH)

Introduces students to the field of computer science and the patterns of thinking that will enable them to become intelligent users of software tools in a problem-solving setting. Examines several important software applications so that students may develop the skills necessary to use computers effectively in their own disciplines. Prerequisites: An interest in learning about the applications of computer science. *Not for computer or information science majors.*

CSU200 Discrete Structures (4 SH)

Introduces the mathematical structures and methods that form the foundation of computer science. Discusses structures such as sets, tuples, sequences, lists, trees, and graphs. Discusses functions, relations, ordering, and equivalence relations. Discusses inductive and recursive definitions of structures and functions. Discusses principles of proof such as truth tables, inductive proof, and basic logic. Finally, discusses the counting techniques and arguments needed to estimate the size of sets, the growth of functions, and the space-time complexity of algorithms. Prerequisites: A solid foundation in basic mathematical thinking.

CSU201 Recitation for CSU200 (0 SH)

Co-requisite CSU200.

CSU211 Fundamentals of Computer Science 1 (4 SH)

Introduces the fundamentals of computer science by describing the functional and object-oriented styles of programming, examining basic sequential and recursive algorithms, and studying linear data structures including arrays and linear collection classes such as vectors, stacks, queues, and lists. Discusses elementary programming patterns. Presents techniques for the creation of simple graphical user interfaces. Applies these ideas to sample applications that illustrate the breadth of computer science. Prerequisites: An interest in learning about computer science in depth and a solid foundation in basic mathematical thinking. Co-requisite CSU212.

CSU212 Lab for CSU211 (1 SH)

Co-requisite CSU211.

CSU213 Fundamentals of Computer Science 2 (4 SH)

Continues CSU211. Examines object-oriented programming and associated algorithms using more complex data structures as the focus. Discusses nested structures and non-linear structures including hash tables, trees, and graphs. Emphasizes abstraction, encapsulation, inheritance, polymorphism, recursion, and object-oriented design patterns. Applies these ideas to sample applications that illustrate the breadth of computer science. Prerequisites: CSU211. In addition, CSU200 should be taken prior to CSU213 or concurrently. Co-requisite CSU214.

CSU214 Lab for CSU213 (1 SH)

Co-requisite CSU213.

CSU215 Algorithms & Data Structures for Engineers (4 SH)

Introduces algorithms and data structures for engineering students. Discusses data structures such as arrays, stacks, queues, and lists and the algorithms that manipulate these structures. Introduces simple algorithm analysis. Discusses classes and objects and presents the basic material about encapsulation, inheritance, and polymorphism. Introduces software development practices such as modular design, use of libraries, testing methods, and debugging techniques. Prerequisites: Restricted to Engineering students who have completed the introductory Engineering problem solving course (GEU111) or the equivalent. *Not for computer or information science majors.* Co-requisite CSU216.

CSU216 Lab for CSU215 (1 SH)

Co-requisite CSU215.

CSU221 Computer/Information Science Overview 1 (1 SH)

Introduces new students to computer and information science as a profession. Develops academic and career success skills such as time management, organizational skills, professional skills, and interpersonal skills. Prerequisites: Intended for freshmen majors in the College of Computer and Information Science or freshmen who intend to transfer into the college.

CSU222 Computer/Information Science Overview 2 (1 SH)

Continues topics from Computer/Information Science Overview 1. Prepares students for COOP through topics such as ethics, privacy, security, responsibility, and intellectual property. Exposes students to popular industry technologies. *To participate in COOP, students must take either CSU222 or CSU223.* Prerequisites: Intended for freshmen majors in the College of Computer and Information Science or freshmen who intend to transfer into the college.

CSU223 Computer/Information Science Coop Preparation (1 SH)

Prepares transfer students into Computer and Information Science for COOP through topics such as ethics, privacy, security, responsibility, and intellectual property. Exposes students to popular industry technologies. *To participate in COOP, students must take either CSU222 or CSU223.* Prerequisites: Intended for transfer students into the College of Computer and Information Science who are above the freshman level.

CSU231 Honors Freshman Seminar 1 (1 SH)

Introduces a variety of topics that extend the material in the standard freshman computer courses or go beyond the scope of these courses. Prerequisites: Restricted to honors freshman majors in the College of Computer and Information Science.

CSU232 Honors Freshman Seminar 2 (1 SH)

Introduces a variety of topics that extend the material in the standard freshman computer courses or go beyond the scope of these courses. Prerequisites: Restricted to honors freshman majors in the College of Computer and Information Science.

CSU277, CSU278, CSU279 Honors Adjunct (1SH)

Offers additional introductory academic experience by exploring course-related topics in greater depth with the professor. Available only to courses approved by the University Honors Program. Prerequisite: Honors program participation.

CSU290 Logic and Computation (4 SH)

Introduces formal logic and its connections to computer and information science. Offers an opportunity to learn to translate statements about the behavior of computer programs into logical claims and to gain the ability to prove such assertions both by hand and using automated tools. Considers approaches to proving termination, correctness, and safety for programs. Discusses notations used in logic, propositional and first order logic, logical inference, mathematical induction, and structural induction. Introduces the use of logic for modeling the range of artifacts and phenomena that arise in computer and information science. Prerequisites: CSU200, CSU211. Co-requisite CSU291.

CSU291 Lab for CS U290 (1 SH)

Co-requisite CSU290.

CSU370 Object-Oriented Design (4 SH)

Presents a comparative approach to object-oriented programming and design. Discusses the concepts of object, class, meta-class, message, method, inheritance, and genericity. Reviews forms of polymorphism in object-oriented languages. Contrasts the use of inheritance and composition as dual techniques for software reuse: forwarding versus delegation and subclassing versus sub-typing. Fosters a deeper understanding of the principles of object-oriented programming and design including software components, object-oriented design patterns, and the use of graphical design notations such as UML. Basic concepts in object-oriented design are illustrated with case studies in application frameworks and by writing programs in one or more object-oriented languages. Prerequisites: CSU213.

CSU380 Computer Organization (4 SH)

Introduces the basic design of computing systems: CPU, memory, input and output. Provides a complete introduction to assembly language: the basics of an instruction set plus experience in assembly language programming using a RISC architecture. Uses system calls and interrupt-driven programming to show the interaction with the operating system. Covers machine representation of integers, characters, and floating point numbers. Describes caches and virtual memory. Prerequisites: CSU213.

CSU390 Theory of Computation (4 SH)

Introduces the theory behind computers and computing aimed at answering the question: "What are the capabilities and limitations of computers?" Covers automata theory, computability, and complexity. The automata theory portion includes finite automata, regular expressions, non-determinism, non-regular languages, context-free languages, pushdown automata, and non-context-free languages. The computability portion includes Turing machines, the Church-Turing Thesis, decidable languages, and the Halting Theorem. The complexity portion includes big-O and small-o notation, the classes P and NP, the P versus NP question, and NP-completeness. Prerequisites: CSU213, PHLU215 (Symbolic Logic).

CSU430 Database Design (4 SH)

Studies the design of a database for use in a relational database management system. The entity-relationship model and normalization will be used in example problems. Relational algebra and then the SQL language will be presented. Advanced topics include triggers, stored procedures, indexing, elementary query optimization, and fundamentals of concurrency and recovery. Students will implement a database schema and short application programs on one or more commercial relational database management systems. Prerequisites: CSU213.

CSU477, CSU478, CSU479 Honors Adjunct (1SH)

Offers additional intermediate academic experience by exploring course-related topics in greater depth with the professor. Available only to courses approved by the University Honors Program. Prerequisite: Honors program participation.

CSU480 Systems & Networks (4 SH)

Introduces the basic concepts underlying computer operating systems and computer networks and provides hands-on experience with their implementation. Covers the basic structure of an operating system: application interfaces, processes, threads, synchronization, inter-process communication, processor allocation, deadlocks, memory management, file systems, and input/output control. Also introduces network architectures, network topologies, network protocols, layering concepts (i.e., ISO/OSI, TCP/IP reference models), communication paradigms (point-to-point vs. multicast/broadcast, connectionless vs. connection oriented), and networking API's (e.g., sockets). Uses examples from many real operating systems and networks (UNIX, MS-DOS, Windows, TCP/IP, Ethernet, ATM, token rings) to reinforce concepts. Prerequisites: CSU380.

CSU520 Artificial Intelligence (4 SH)

Introduces the fundamental problems, theories, and algorithms of the artificial intelligence field. Includes heuristic search; knowledge representation using predicate calculus; automated deduction and its applications; planning; machine learning. Additional topics may include game playing; uncertain reasoning and expert systems; natural language processing; logics for common-sense reasoning; ontologies; multi-agent systems. Prerequisites: CSU213, PHLU215 (Symbolic Logic).

CSU540 Computer Graphics (4 SH)

Charts a path through every major aspect of computer graphics with varying degrees of emphasis. Discusses hardware issues: size and speed; lines, polygons, and regions; modeling: objects and their relations; viewing: what can be seen (visibility and perspective); rendering: how it looks (properties of surfaces, light, and color); transformations: moving, placing, distorting, and animation; interaction: drawing, selecting, and transforming. Prerequisites: CSU213, MTHU371 (Linear Algebra).

CSU600 Senior Seminar (1 SH)

Requires students to give a 20-30 minute formal presentation on a topic of their choice in Computer Science. Prepares students for this talk by discussing methods of oral presentation, how to present technical material, how to choose what topics to present, overall organization of a talk, and use of presentation software and other vISUal aids. Prerequisites: Requires senior standing in CS or permission of instructor.

CSU610 Honors Senior Seminar (4 SH)

Offers a capstone course for computer science honors students. Exposes students to one or more topics of current interest in computer science. Requires students to prepare a one-hour presentation on a topic in computer science and to write a paper on that topic. Prerequisites: Requires honors senior standing in CS or permission of instructor.

CSU630 Database Internals (4 SH)

Explores the internals of database management systems. Explains how database systems store data on disk. Studies how to improve query efficiency using index techniques such as B+-tree, hash indices, and multi-dimensional indices. Describes how queries are executed internally and how database systems perform query optimizations. Introduces concurrency control schemes implemented by locking including hierarchical locking and key range locking. Describes lock table structure. Discusses how database systems can perform logging and recovery to avoid loss of data in case of system crashes. Prerequisites: CSU430.

CSU640 Network Fundamentals

Introduces the fundamental concepts of network protocols and network architectures. Presents the different harmonizing functions needed for the communication and efficient operation of computer networks. Provides in-depth coverage of data link control, medium access control, routing, end-to-end transport protocols, congestion and flow control, multicasting, naming, auto-configuration, quality of service, and network management. Studies the abstract mechanisms and algorithms as implemented in real world Internet protocols. Also covers the most common application protocols (email, web, and ftp). Prerequisites: CSU480.

CSU645 Network Security

Studies topics related to Internet architecture and cryptographic schemes in the context of security. Provides advanced coverage of the major Internet protocols including IP and DNS.

Examines denials of service, viruses, and worms and discusses techniques for protection. Covers cryptographic paradigms and algorithms such as RSA and Diffie-Hellman in sufficient mathematical detail. The advanced topics address the design and implementation of authentication protocols and existing standardized security protocols. Explores the security of commonly used applications like the web and email. Prerequisites: CSU480

CSU650 Topics in Computer Networks (4 SH)

This topics course has effectively been replaced by the pair of courses CSU640 and CSU645. If this course is offered in the future, it will do more advanced network topics. Prerequisites: CSU480.

CSU660 Programming Languages (4 SH)

Introduces a systematic approach to understanding the behavior of programming languages. Covers interpreters; static and dynamic scope; environments; binding and assignment; functions and recursion; parameter-passing and method dispatch; objects, classes, inheritance, and polymorphism; type rules and type checking; concurrency. Prerequisites: CSU370, CSU390.

CSU665 Compilers (4 SH)

Studies the construction of compilers and integrates material from earlier courses on programming languages, automata theory, computer architecture, and software design. Examines syntax trees; static semantics; type checking; typical machine architectures and their software structures; code generation; lexical analysis; and parsing techniques. Uses a hands-on approach with a substantial term project. Prerequisites: CSU380, CSU660.

CSU670 Software Development (4 SH)

Considers software development as a systematic process, involving specification, design, documentation, implementation, testing, and maintenance. Examines software process models; methods for software specification; modularity, abstraction, and software reuse; issues of software quality. Students, possibly working in groups, will design, document, implement, test, and modify software projects. Prerequisites: CSU370, CSU390.

CSU675 Web Development (4 SH)

Discusses Web development for sites that are dynamic, data driven, and interactive. Focuses on the software development issues of integrating multiple languages, assorted data technologies, and Web interaction. Considers ASP.NET, C#, HTTP, HTML, CSS, XML, XSLT, JavaScript, AJAX, RSS/Atom, SQL, and Web services. Requires each student to deploy individually designed Web experiments that illustrate the Web technologies and at least one major integrative Web site project. Students may work as a team with the permission of the instructor. Each student or team must also create extensive documentation of their goals, plans, design decisions, accomplishments, and user guidelines. All source files must be open and be automatically served by a sources server. Prerequisite: CSU370.

CSU677, CSU678, CSU679 Honors Adjunct (1SH)

Offers additional advanced academic experience by exploring course-related topics in greater depth with the professor. Available only to courses approved by the University Honors Program. Prerequisite: Honors program participation.

CSU680 Topics in Operating Systems (4 SH)

Studies advanced concepts underlying computer operating systems and computer networks. Examines in depth all major operating system and network components including: device drivers, network protocol stacks, memory managers, centralized and distributed file systems, inter-process communication mechanisms, real-time schedulers and security mechanisms. Additional components will be covered as time allows. Provides hands-on experience with the source code of commercial-grade operating systems and networks. Prerequisites: CSU480.

CSU690 Algorithms & Data (4 SH)

Introduces the basic principles and techniques for the design, analysis, and implementation of efficient algorithms and data representations. Discusses asymptotic analysis and formal methods for establishing the correctness of algorithms. Considers divide-and-conquer algorithms, graph traversal algorithms, and optimization techniques. Introduces information theory and covers the fundamental structures for representing data. Examines flat and hierarchical representations, dynamic data representations, and data compression. Concludes with a discussion of the relationship of the topics in this course to complexity theory and the notion of the hardness of problems. Prerequisites: CSU370, CSU390.

CSU700 Computer Science Thesis (4 SH)

Under faculty supervision, a student will prepare an undergraduate thesis. Prerequisites: Junior standing, at least eight 4 SH courses in computer science, permission of the instructor, and permission of the Undergraduate Committee.

CSU701 Computer Science Thesis Continuation (4 SH)

Under faculty supervision, a student will continue to prepare an undergraduate thesis. Prerequisites: CSU700, permission of the instructor, and permission of the Undergraduate Committee.

CSU900 Computer Science Topics (4 SH)

A lecture course in computer science on a topic not regularly taught in a formal course. Topics may vary from offering to offering. Prerequisites: CSU370, CSU380, CSU390, and permission of the instructor. May be taken up to three times for credit with different topics. Taking this course more than once requires the additional permission of the Undergraduate Committee.

CSU910 Computer Science Project (4 SH)

Under faculty supervision, a student will develop a substantial software or hardware artifact. Prerequisites: Middle year standing, at least eight 4 SH courses in computer science,

permission of the instructor, and permission of the Undergraduate Committee. May be taken up to three times for credit.

CSU921 Directed Study (1 SH)

CSU922 Directed Study (2 SH)

CSU923 Directed Study (3 SH)

CSU924 Directed Study (4 SH)

Under faculty supervision, a student will examine standard computer science material in fresh ways or new computer science material that is not covered in formal courses. Prerequisites: CSU370, CSU380, CSU390, and permission of the instructor. The total amount of credit from courses CSU921-924 and ISU921-924 may not exceed 12 semester hours. Taking more than one of these courses requires the additional permission of the Undergraduate Committee.

CSU970 Junior/Senior Project 1 (SH)

CSU971 Junior/Senior Project 2 (SH)

These two honors courses are not normally offered as lecture courses but may be available to individual honors students.

ISU277, ISU278, ISU279 Honors Adjunct (1SH)

Offers additional introductory academic experience by exploring course-related topics in greater depth with the professor. Available only to courses approved by the University Honors Program. Prerequisite: Honors program participation.

ISU300 Principles of Information Science (4 SH)

Surveys the key theories, concepts, and themes of information science. Examines information and communication technologies from the perspective of the people and organizations that generate and use information to achieve their goals. Topics include: information and decision making; human information processing; definition and types of information systems; behavioral impact of information technologies such as office automation, e-mail, and the World Wide Web; legal and policy issues such as privacy, censorship, intellectual property and information security. A course project will explore the use and impact of information technology in a selected domain (such as e-commerce, education, medicine, government, law enforcement or electronic publishing), focusing on both technical and behavioral issues. Prerequisites: CSU200, CSU211.

ISU470 Information System Design & Development (4 SH)

Discusses the planning, analysis, design, and implementation of computer-based information systems, focusing on the methodologies and procedures used in organizational problem solving and systems development. Topics include: the systems development life cycle; project management; requirements analysis and specification; feasibility and cost-benefit analysis; logical and physical design; prototyping; system validation, deployment, and post-implementation review. Additional topics may include: platform and database selection and integration issues; CASE tools; end-user training; maintenance; and object-oriented analysis and design. Prerequisites: ISU300, CSU370.

ISU477, ISU478, ISU479 Honors Adjunct (1SH)

Offers additional intermediate academic experience by exploring course-related topics in greater depth with the professor. Available only to courses approved by the University Honors Program. Prerequisite: Honors program participation.

ISU535 Information Retrieval (4 SH)

Discusses information retrieval including: document models, indexing, query techniques and results evaluation; text analysis for searching, indexing and compression; user interfaces for text and multimedia retrieval; digital libraries. Additional topics may include: parallel and distributed architectures; support for multimedia and image retrieval; specialized query strategies; advanced retrieval models. Coursework includes using and evaluating existing IR systems as well as implementing small-scale applications that illustrate indexing and retrieval strategies. Prerequisites: CSU370 and Statistics (ECNU350 or MTHU481).

ISU570 Human Computer Interaction (4 SH)

Studies the principles of human-computer interaction and the practice of user interface design. Discusses the major human information processing sub-systems (perception, memory, attention, and problem-solving), and how the properties of these systems influence the design of interactive systems. Reviews guidelines and specification languages for designing user interfaces, with an emphasis on toolkits of standard graphical-user-interface objects. Introduces usability metrics and evaluation methods. Additional topics may include: World Wide Web design principles and tools; wireless/mobile device interfaces; computer-supported cooperative-work; information visualization; virtual reality. Coursework includes designing user interfaces, creating working prototypes using a GUI toolkit, and evaluating existing interfaces using the methods studied. Prerequisites: CSU370.

ISU580 Empirical Research Methods (4 SH)

Students learn to critically evaluate and conduct empirical research, focusing on the use of empirical methods to study the effectiveness and organizational/social impact of information systems and technologies. Empirical research involves a number of broad steps including: identifying problems; developing specific hypotheses; collecting data relevant to the hypotheses; analyzing the data; and considering alternative explanations for the empirical findings. Some of the most commonly used research techniques including surveys, experiments, and ethnographic methods are discussed. Additional topics include the ethics of data collection and experimentation in behavioral science. Although the course focuses primarily on the relationship between formulating research questions and implementing the appropriate methods to answer them, students can expect to apply the statistical techniques learned in the course prerequisites. Prerequisites: ISU470 and Statistics (ECNU350).

ISU677, ISU678, ISU679 Honors Adjunct (1SH)

Offers additional advanced academic experience by exploring course-related topics in greater depth with the professor. Available only to courses approved by the University Honors Program. Prerequisite: Honors program participation.

ISU691 Information Science Field Study (1 SH)

Employs the student's cooperative education experience to observe and analyze the real-world interaction between information technology and its context of use. Students identify an aspect of their work environment to study, and make observations that will be the basis of an original Senior Research Paper. Course requirements include maintaining a journal of observations and experiences; participating in periodic electronic conferences with fellow students; and communicating regularly with the instructor to discuss the research project and the insights recorded in the journal. Prerequisites: ISU580. Restricted to majors in the Information Science degree program.

ISU692 Information Science Senior Project (5 SH)

This capstone course continues the work of Information Science Field Study to develop a sophisticated understanding of the interaction between technology and its context. Students

write an in-depth Research Paper that reflects upon and analyzes the observations and experiences of the Field Study using the information science literature to interpret and better understand those experiences. Students then participate in a seminar in which students present the results of their research. Prerequisites: ISU691. Restricted to majors in the Information Science degree program.

ISU700 Information Science Thesis (4 SH)

Under faculty supervision, a student will prepare an undergraduate thesis. Prerequisites: Junior standing, at least eight 4 SH courses in computer or information science, permission of the instructor, and permission of the Undergraduate Committee.

ISU701 Information Science Thesis Continuation (4 SH)

Under faculty supervision, a student will continue to prepare an undergraduate thesis. Prerequisites: ISU700, permission of the instructor, and permission of the Undergraduate Committee.

ISU900 Information Science Topics (4 SH)

A lecture course in information science on a topic not regularly taught in a formal course. Topics may vary from offering to offering. Prerequisites: ISU470 and permission of the instructor. May be taken up to three times for credit with different topics. Taking this course more than once requires the additional permission of the Undergraduate Committee.

ISU910 Information Science Project (4 SH)

Under faculty supervision, a student will work on a substantial project in information science. Prerequisites: Middle year standing, at least eight 4 SH courses in computer or information science, permission of the instructor, and permission of the Undergraduate Committee. May be taken up to three times for credit.

ISU921 Directed Study (1 SH)

ISU922 Directed Study (2 SH)

ISU923 Directed Study (3 SH)

ISU924 Directed Study (4 SH)

Under faculty supervision, a student will examine standard information science material in fresh ways or new information science material that is not covered in formal courses. Prerequisites: ISU470 and permission of the instructor. The total amount of credit from courses CSU921-924 and ISU921-924 may not exceed 12 semester hours. Taking more than one of these courses requires the additional permission of the Undergraduate Committee.

ISU970 Junior/Senior Project 1 (SH)

ISU971 Junior/Senior Project 2 (SH)

These two honors courses are not normally offered as lecture courses but may be available to individual honors students.