Information and Computer Science (I&C SCI)

Courses

I&C SCI 3. Internet Technologies and their Social Impact. 4 Units.
Examines current Internet technologies and social implications at the individual, group, and societal level. Blogs, wikis, sharing of video, photos, and music, e-commerce, social networking, gaming, and virtual environments. Issues include privacy, trust, identity, reputation, governance, copyright, and malicious behavior.

(III)

I&C SCI 4. Human Factors for the Web. 4 Units.

Restriction: May not be taken for credit after IN4MATX 131.

(II)

I&C SCI 5. Global Disruption and Information Technology. 4 Units.
Explores how new forms of information technology may support transition to a sustainable civilization. Topics include design and implementation of IT systems, science of global change, online community building, and “green IT”. Activities involve reading, writing, discussion, and final project. Course may be offered online.

(II)

I&C SCI 6B. Boolean Algebra and Logic . 4 Units.
Relations and their properties; Boolean algebras, formal languages; finite automata.

Prerequisite: High school mathematics through trigonometry.

(Vb)

I&C SCI 6D. Discrete Mathematics for Computer Science. 4 Units.
Covers essential tools from discrete mathematics used in computer science with an emphasis on the process of abstracting computational problems and analyzing them mathematically. Topics include: mathematical induction, combinatorics, and recurrence relations.

Prerequisite: High school mathematics through trigonometry.

(Vb)

I&C SCI 6N. Computational Linear Algebra. 4 Units.
Matrices and linear transformations, systems of linear equations, determinants, linear vector spaces, eigenvalues and eigenvectors, orthogonal matrices, diagonalization, and least squares. Topics will be taught primarily from an algorithmic perspective, including computational solutions, applications, and numerical error analysis.

Overlaps with MATH 6G, MATH 3A.

(II, Vb)

I&C SCI 7. Introducing Modern Computational Tools. 4 Units.
A unified look at a spectrum of modern tools for building, solving, and analyzing simple computational models (deterministic and random) in diverse subject areas. Tools include those for numeric/symbolic computation, and those for acquiring, organizing, translating, processing, and displaying information.

(Va)

I&C SCI 8. Practical Computer Security. 4 Units.
Principles of practical computer security to enable students to defend themselves against malicious threats. Firewalls, anti-virus, secure setup of a wireless access point. Cryptography basics and its application. Embedded devices and related security issues.

(II)
Information and Computer Science (I&C SCI)

I&C SCI 10. How Computers Work. 4 Units.
Introduction to digital computer and communication systems. Capabilities and limitations of information technology. Representing information in digital form. Overview of computer organization, internet, operating systems, software. Human-computer interaction and social impact.

Restriction: May not be taken for credit after I&C SCI 51, I&C SCI 52, I&C SCI 105, or IN4MATX 43.

II

I&C SCI 11. The Internet and Public Policy. 4 Units.
How the Internet works. Current public policy issues concerning the Internet. Introductory economics. Communications law. Interactions between information technology, economics, and law. Case studies about Internet and communications policy.

Same as ECON 11.

II or III

I&C SCI 21. Introduction to Computer Science I. 6 Units.
Introduces fundamental concepts related to computer software design and construction. Develops initial design and programming skills using a high-level language. Fundamental concepts of control structures, data structures, and object-oriented programming.

Same as CSE 21.
Overlaps with I&C SCI H21, I&C SCI 31, EECS 10, EECS 12, ENGRMAE 10.

Restriction: CSE 21 or I&C SCI 21 may not be taken for credit if taken after IN4MATX 42.

II, Vb

I&C SCI H21. Honors Introduction to Computer Science I. 6 Units.
Introduces fundamental concepts of computer software design and construction. Develops initial design and programming skills using a high-level language. Fundamental concepts of control structures, data structures, functional and object-oriented programming. Introduces topics in computer organization and social impact of technology.

Overlaps with I&C SCI 21, I&C SCI 31, CSE 21, EECS 10, EECS 12, ENGR 10.

Restriction: Information and Computer Science, Computer Science Engineering, and Computer Science majors only. Campuswide Honors Program students only. May not be taken for credit after IN4MATX 42.

II, Vb

I&C SCI 22. Introduction to Computer Science II. 6 Units.
Abstract behavior of classic data structures (stacks, queues, sorted and unsorted maps), alternative implementations, analysis of time, and space efficiency.

Prerequisite: CSE 21 or I&C SCI 21 or I&C SCI H21. CSE 21 with a grade of C or better. I&C SCI 21 with a grade of C or better. I&C SCI H21 with a grade of C or better.

Same as CSE 22.
Overlaps with I&C SCI H22, CSE 22, CSE 42, I&C SCI 32, CSE 43.

II, Vb

I&C SCI H22. Honors Introduction to Computer Science II. 6 Units.
Abstract behavior of classic data structures (stacks, queues, sorted and unsorted maps), alternative implementations. Recursion. Mathematical analysis of time and space efficiency, program analysis and correctness, system design techniques, programming paradigms.

Prerequisite: I&C SCI H21 or I&C SCI 21 or CSE 21. I&C SCI H21 with a grade of B- or better. I&C SCI 21 with a grade of A or better. CSE 21 with a grade of A or better.

Overlaps with IN4MATX 42, CSE 22, CSE 42, I&C SCI 22, I&C SCI 33, CSE 43.

II, Vb
I&C SCI H23. Honors Introduction to Computer Science III. 4 Units.
Builds on ICS H22 with respect to mathematical tools and analysis. Focuses on fundamental algorithms in computer science, basic data structures for primary and secondary memory, storage allocation and management techniques, data description, and design techniques.

Prerequisite: I&C SCI H22 or I&C SCI 22 or IN4MATX 42. I&C SCI H22 with a grade of B- or better. I&C SCI 22 with a grade of A or better CSE 22 with a grade of A or better. IN4MATX 42 with a grade of A or better.

Overlaps with I&C SCI 46, CSE 46.

(Vb)

I&C SCI 31. Introduction to Programming. 4 Units.
Introduction to fundamental concepts and techniques for writing software in a high-level programming language. Covers the syntax and semantics of data types, expressions, exceptions, control structures, input/output, methods, classes, and pragmatics of programming.

Same as CSE 41.
Overlaps with I&C SCI 21, CSE 21, I&C SCI H21, EECS 10, EECS 12.

(II, Vb)

I&C SCI 32. Programming with Software Libraries. 4 Units.
Construction of programs for problems and computing environments more varied than in CSE41. Using library modules for applications such as graphics, sound, GUI, database, Web, and network programming. Language features beyond those in CSE41 are introduced as needed.

Prerequisite: I&C SCI 31 or CSE 41. I&C SCI 31 with a grade of C or better. CSE 41 with a grade of C or better.

Same as CSE 42.
Overlaps with I&C SCI 22, CSE 22, I&C SCI H22, IN4MATX 42.

(II and (VA or VB) .

I&C SCI 33. Intermediate Programming. 4 Units.
Intermediate-level language features and programming concepts for larger, more complex, higher-quality software. Functional programming, name spaces, modules, class protocols, inheritance, iterators, generators, operator overloading, reflection. Analysis of time and space efficiency.

Prerequisite: I&C SCI 32 or CSE 42. I&C SCI 32 with a grade of C or better. CSE 42 with a grade of C or better.

Same as CSE 43.
Overlaps with I&C SCI 33, I&C SCI 22, CSE 22, I&C SCI H22, IN4MATX 42.

(II, Vb)

I&C SCI 45C. Programming in C/C++ as a Second Language. 4 Units.

Prerequisite: I&C SCI 22 or CSE 22 or IN4MATX 42 or I&C SCI 33 or CSE 43. I&C SCI 22 with a grade of C or better. CSE 22 with a grade of C or better. IN4MATX 42 with a grade of C or better. I&C SCI 33 with a grade of C or better. CSE 43 with a grade of C or better.

Same as CSE 45C.

I&C SCI 45J. Programming in Java as a Second Language. 4 Units.
An introduction to the lexical, syntactic, semantic, and pragmatic characteristics of the Java language for experienced programmers. Emphasis on object-oriented programming, using standard libraries, and programming with automatic garbage collection.

Prerequisite: I&C SCI 33 or CSE 43. I&C SCI 33 with a grade of C or better. CSE 43 with a grade of C or better.

Overlaps with I&C SCI 22, CSE 22, I&C SCI 23, CSE 23, IN4MATX 45.

Restriction: I&C SCI 45J may not be taken for credit after I&C SCI 22, CSE 22, I&C SCI 23, CSE 23, or IN4MATX 45.
I&C SCI 46. Data Structure Implementation and Analysis. 4 Units.
Focuses on implementation and mathematical analysis of fundamental data structures and algorithms. Covers storage allocation and memory management techniques.

Prerequisite: CSE 45C or I&C SCI 45C. CSE 45C with a grade of C or better. I&C SCI 45C with a grade of C or better.

Same as CSE 46.
Overlaps with I&C SCI H23.

I&C SCI 51. Introductory Computer Organization. 6 Units.
Multilevel view of system hardware and software. Operation and interconnection of hardware elements. Instruction sets and addressing modes. Virtual memory and operating systems. Laboratory work using low-level programming languages. Course may be offered online.

Prerequisite: (I&C SCI 21 or CSE 21 or I&C SCI 31 or CSE 41 or IN4MATX 42) and I&C SCI 6B. IN4MATX 42 with a grade of C or better.

I&C SCI 52. Introduction to Software Engineering. 6 Units.
Introduction to concepts, methods, and current practice of software engineering. Study of large-scale software production; software life cycle models as an organizing structure; principles and techniques appropriate for each stage of production. Laboratory work involves a project illustrating these elements.

Prerequisite: I&C SCI 23. I&C SCI 23 with a grade of C or better.

Overlaps with I&C SCI 105, IN4MATX 43.

I&C SCI 53. Principles in System Design. 4 Units.
Principles and practice of engineering of computer software and hardware systems. Topics include techniques for controlling complexity; strong modularity using client-server design, virtual memory, and threads; networks; coordination of parallel activities; security and encryption; and performance optimizations.

Corequisite: I&C SCI 53L.
Prerequisite: I&C SCI 51.

I&C SCI 53L. Principles in System Design Library. 2 Units.
Required laboratory section and co-requisite for I&C SCI 53.

Corequisite: I&C SCI 53.
Prerequisite: I&C SCI 51.

I&C SCI 60. Computer Games and Society. 4 Units.
The study and critical analysis of computer games as art objects, cultural artifacts, gateways to virtual worlds, educational aids, and tools for persuasion and social change. Emphasis on understanding games in their historical and cultural context.

Overlaps with UNI STU 12A, UNI STU 12B, UNI STU 12C.

I&C SCI 61. Game Systems and Design. 4 Units.
Principles and usage of game design elements. Introduction to technologies that support modern computer games. Students design, implement, and critique several small games.

I&C SCI 62. Game Technologies and Interactive Media. 4 Units.
Technologies for interactive media and game design. Web-based software systems, virtual world platforms, and game engines. Emphasis on conceptual and architectural aspects of these technologies.

Prerequisite: I&C SCI 21 or CSE 21 or I&C SCI 31 or CSE 41 or IN4MATX 42. IN4MATX 42 with a grade of C or better.
I&C SCI 77A. Mathematics and Computation in the Digital Age: Introduction to Signal Processing. 4 Units.
Signals in Matlab; blurring, filtering; elements of linear algebra, statistics, optimization; blind matrix inversion; de-correlation method, stochastic gradient
descent method, applications to sounds and images.
Prerequisite: MATH 2B and I&C SCI 31.
Same as MATH 77A.
Restriction: Lower-division students only.
(II, Va)

I&C SCI 77B. Mathematics and Computation in the Digital Age: Introduction to Collaborative Filtering. 4 Units.
Basic concepts of collaborative filtering; clustering; matrix factorization and principal components analysis; regression; classification: naive Bayes classifier, decision trees, Perceptron (neural networks).
Prerequisite: MATH 2B and I&C SCI 31.
Same as MATH 77B.
Restriction: Lower-division students only.
(II, Va)

I&C SCI 77C. Mathematics and Computation in the Digital Age: Introduction to Image Processing. 4 Units.
Image de-noising, de-blurring, low pass filtering; image segmentation and classification; Sparse representation; visualization.
Prerequisite: MATH 2B and I&C SCI 31.
Same as MATH 77C.
Restriction: Lower-division students only.
(II, Va)

I&C SCI 77D. Mathematics and Computation in the Digital Age: Intro to Game Simulation and Analysis. 4 Units.
Combinatorial Game Theory--game classification, tree graphs, strategy analysis, Sprague Grundy functions, Bouton's Theorem; Zero-Sum and General-
Sum Game Theory--pay off matrices, Minimax Theorem, Nash equilibrium; machine learning--search algorithms.
Prerequisite: MATH 2B and I&C SCI 31.
Same as MATH 77D.
Restriction: Lower-division students only.
(II, Va)

I&C SCI 80. Special Topics in Information and Computer Science. 2-4 Units.
Studies in selected areas of information and computer sciences. Topics addressed vary each quarter.
Prerequisite: Prerequisites vary.
Repeatability: Unlimited as topics vary.

I&C SCI 90. New Students Seminar. 1 Unit.
Introduces students to the Donald Bren School of Information and Computer Sciences. Focuses on advising students making the transition to UCI, community building, and mostly surveying the technical areas within departments in ICS, via talks by faculty on their research.
Grading Option: Pass/no pass only.

I&C SCI 105. Digital Information Systems. 4 Units.
Design and analysis of digital information systems. Covers underlying database and network technology, and software engineering principles used to build these systems. Evaluating digital information systems, and recognizing common flaws and vulnerabilities.
Prerequisite: I&C SCI 10 or I&C SCI 21 or CSE 21 or I&C SCI H21 or IN4MATX 41. I&C SCI 10 with a grade of C or better. I&C SCI 21 with a grade of C or better. CSE 21 with a grade of C or better. I&C SCI H21 with a grade of C or better. IN4MATX 41 with a grade of C or better.
Overlaps with I&C SCI 52, IN4MATX 43.
I&C SCI 139W. Critical Writing on Information Technology. 4 Units.
Study and practice of critical writing and oral communication as it applies to information technology. Each student writes assignments of varying lengths, totaling at least 4,000 words.

Prerequisite: Satisfactory completion of the Lower-Division Writing requirement.
Restriction: Upper-division students only.

I&C SCI 160. Graphics Processors and Game Platforms. 4 Units.
Principles of computer architecture emphasizing hardware used with general purpose processor to support high-performance computer games and graphics engines.

Prerequisite: I&C SCI 51.
Overlaps with COMPSCI 152.

I&C SCI 161. Game Engine Lab. 4 Units.
The use of an open source game or graphics engine in the design and implementation of a computer game. Principles of game engine design. Students work on teams to design, implement, and evaluate new computer games based on an engine.

Prerequisite: I&C SCI 45C or I&C SCI 65.

I&C SCI 162. Modeling and World Building. 4 Units.
Use of 3D modeling software and related tools to design and create animated, textured models and expansive virtual worlds incorporating objects, scenes, and venues for activity within game worlds and online environments.

Prerequisite: COMPSCI 112.

I&C SCI 163. Mobile and Ubiquitous Games. 4 Units.
Design and technology of mobile games, including mixed reality gaming, urban games, and locative media. Case studies of significant systems. Uses and limitations of location-based technologies. Infrastructures and their relationships to gameplay and design.

Prerequisite: I&C SCI 61 and (I&C SCI 10 or I&C SCI 21 or I&C SCI 31 or IN4MATX 41).

I&C SCI 166. Game Design. 4 Units.
Game design takes into consideration psychology, narrative, platform features and limitations, marketing, computer science capabilities, human-computer interface principles, industry trends, aesthetic judgment, and other factors. Students focus on video game design through lectures, readings, presentations, implementation, and play testing.

Prerequisite: I&C SCI 61 and (IN4MATX 43 or I&C SCI 52).

I&C SCI 167. Multiplayer Game Systems. 4 Units.
Foundations and technologies that enable multiuser, networked, and persistent virtual environments. Emphasis on database design and management, network protocols, and concurrency control to accommodate large numbers of simultaneous users.

Corequisite: I&C SCI 160.
Prerequisite: I&C SCI 51.

I&C SCI 168. Multiplayer Game Project. 4 Units.
Designing and implementing a multiuser, networked, and persistent virtual environment or game. Emphasis on cultural aspects, community building, user interface issues and design, security, privacy, and economics.

Prerequisite: (I&C SCI 52 or IN4MATX 43) and I&C SCI 167. IN4MATX 43 with a grade of C or better.

I&C SCI 169A. Capstone Game Project I. 4 Units.
Students work in teams to design and implement a new computer game or virtual world. Emphasis on sound, art, and level design, building a community, cut scenes, production values, full utilization of hardware and software platform, and current industry trends.

Prerequisite: I&C SCI 168.
Grading Option: In progress only.
I&C SCI 169B. Capstone Game Project II. 4 Units.
Students work in teams to design and implement a new computer game or virtual world. Emphasis on sound, art, and level design, building a community, cut scenes, production values, full utilization of hardware and software platform, and current industry trends.

Prerequisite: I&C SCI 169A.

I&C SCI 192. Industrial or Public Sector Field Study. 2 Units.
Students participate in an off-campus, supervised internship for a minimum of 60 hours. Students apply classroom knowledge through internship projects in the private sector or nonprofit agencies.

Grading Option: Pass/no pass only.
Repeatability: May be taken for credit 2 times.

I&C SCI 193. Tutoring in ICS. 2 Units.
Principles and practice of providing technical assistance to novice learners in information and computer sciences.

Repeatability: May be taken for credit for 18 units.
Restriction: ICS Peer Tutoring Program students only.

I&C SCI H197. Honors Seminar. 2 Units.
an overview of computer science and selected recent trends in research. Students attend talks on current faculty research, with opportunities for discussion.

Grading Option: Pass/no pass only.
Restriction: Bren School of ICS Honors Program or Campuswide Honors Program students only.

I&C SCI 398A. Teaching Assistant Training Seminar. 2 Units.
Theories, methods, and resources for teaching computer science at the university level, particularly by teaching assistants. Classroom presentations, working with individuals, grading, motivating students. Participants will give and critique presentations and may be videotaped while teaching.

Grading Option: Satisfactory/unsatisfactory only.

I&C SCI 398B. Advanced Teaching Assistant Seminar. 4 Units.
Teaching computer science at the university level, emphasizing issues in teaching an entire course. Course organization, designing examinations and projects, grading, motivating students. Participants will begin to assemble teaching portfolios.

Prerequisite: I&C SCI 398A.

Grading Option: Satisfactory/unsatisfactory only.

I&C SCI 399. University Teaching. 4 Units.
Involves on-the-job experience for Teaching Assistants.

Repeatability: May be repeated for credit unlimited times.
Restriction: Teaching assistants only.