Class Schedule - Fall 2018

Computer Science

Computer Science
Interim Department Head: Vikram Adve
Department Office: 2232 Siebel Center, 201 N. Goodwin Avenue, Urbana
Phone: 333-3426
www.cs.illinois.edu

CS 100  Freshman Orientation  credit: 1 hours.
Introduction to Computer Science as a field and career for computer science majors. Overview of the field and specific examples of problem areas and methods of solution.

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Restricted to First Time Freshman students.
Restricted to Computer Science or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics or Computer Science & Crop Sciences major(s). Restricted to Undergrad - Urbana-Champaign.

CS 101  Intro Computing: Engrg & Sci  credit: 3 hours.
Fundamental principles, concepts, and methods of computing, with emphasis on applications in the physical sciences and engineering. Basic problem solving and programming techniques; fundamental algorithms and data structures; use of computers in solving engineering and scientific problems. Intended for engineering and science majors. Prerequisite: MATH 220 or MATH 221.

Students must register for one lab-discussion and one lecture section. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

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Quantitative Reasoning II course.
Restricted to Undergrad - Urbana-Champaign.

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Quantitative Reasoning II course.

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Quantitative Reasoning II course.
CS 105  Intro Computing: Non-Tech  credit: 3 hours.
Computing as an essential tool of academic and professional activities. Functions and interrelationships of computer system components: hardware, systems and applications software, and networks. Widely used application packages such as spreadsheets and databases. Concepts and practice of programming for the solution of simple problems in different application areas. Intended for non-science and non-engineering majors. Prerequisite: MATH 112.

Students must register for one lab-discussion and one lecture section.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

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Quantitative Reasoning I course.
Restricted to Undergrad - Urbana-Champaign.

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CS 125  *Intro to Computer Science*  credit: 4 hours.

Basic concepts in computing and fundamental techniques for solving computational problems. Intended as a first course for computer science majors and others with a deep interest in computing. Prerequisite: Three years of high school mathematics or MATH 112.

Students must register for one lab-discussion and one lecture section. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

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Quantitative Reasoning I course.
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Quantitative Reasoning I course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

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Quantitative Reasoning I course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

CS 126  **Software Design Studio**  credit: 3 hours.
Fundamental principles and techniques of software development. Design, documentation, testing, and debugging software, with a significant emphasis on code review. Credit is not given for both CS 242 and CS 126. Prerequisite: CS 125. For majors only.

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Instructor Approval Required
Restricted to Computer Science or Statistics & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics or Computer Science & Crop Sciences major(s).
Restricted to First Time Freshman students.

**CS 173  Discrete Structures**  credit: 3 hours.
Discrete mathematical structures frequently encountered in the study of Computer Science. Sets, propositions, Boolean algebra, induction, recursion, relations, functions, and graphs. Credit is not given for both CS 173 and MATH 213. Prerequisite: One of CS 125, ECE 220; one of MATH 220, MATH 221.
Students must register for a lecture and discussion section.

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Restricted to Undergrad - Urbana-Champaign.

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Restricted to Undergrad - Urbana-Champaign.

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**CS 196 Freshman Honors credit: 1 hours.**

Offered for honors credit in conjunction with other 100-level computer science courses taken concurrently. A special examination may be required for admission to this course. May be repeated. Prerequisite: Concurrent registration in another 100-level computer science course (see Schedule).
CS 199 Undergraduate Open Seminar in Computer Science credit: 0 TO 5 hours.
Topics vary. Approved for Letter and S/U grading. May be repeated.

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Credit Hours: 1 hours
Intro Pedagogy Practicum
Instructor Approval Required
Introductory Pedagogy Practicum Prerequisite: High scores in CS 125 and a strong desire to help others with Introduction to Computer Science.
Investigate approaches to learning and teaching introductory computer science topics through research, discussion and course development. Implement and test new ideas in a classroom format, via online videos, lab section and one-on-one instruction and web-delivered media and apps for introductory computer science students.

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Credit Hours: 1 hours
Pedagogy Practicum
Instructor Approval Required
Pedagogy Practicum Prerequisite: High scores in CS 125 and a strong desire to help others with Introduction to Computer Science.
Investigate approaches to learning and teaching introductory computer science topics through research, discussion and course development. Implement and test new ideas in a classroom format, via online videos, lab section and one-on-one instruction and web-delivered media and apps for introductory computer science students.

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Credit Hours: 4 hours
Problem Solving W/Data Struct
Not intended for Computer Engineering or Computer Science or Electrical Engineering or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s).

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Credit Hours: 1 hours
Real World Cases Scient Comput
Numerical Methods in Scientific and Engineering Applications. Co-requisite: CS 357. In this class, students will work in teams brainstorming the solution and setup of real world applications of numerical methods in scientific and engineering problems. These activities will be offered through guided worksheets, in which students will have the opportunity to develop and improve skills such as problem solving, effective teamwork and critical thinking.
Credit Hours: 1 hours
Real World Cases Scient Comput
Numerical Methods in Scientific and Engineering Applications. Co-requisite: CS 357. In this class, students will work in teams brainstorming the solution and setup of real world applications of numerical methods in scientific and engineering problems. These activities will be offered through guided worksheets, in which students will have the opportunity to develop and improve skills such as problem solving, effective teamwork and critical thinking.

Credit Hours: 1 hours
Even More Practice
Topic: Even More Practice (EMP) is a one-credit course designed for CS 125 students who think that they might benefit from extra practice and instruction. Students will receive help analyzing algorithms; solving computational problems; and understanding, writing, and debugging computer programs. Examples will be drawn from material covered in CS 125. Graded pass/fail. Requires concurrent enrollment in CS 125.

Credit Hours: 2 hours
Instructor Approval Required
This course is for students that have dropped CS 225, this helps prepare the student to re-take CS 225 next semester.

CS 210 Ethical & Professional Issues credit: 2 hours.
Ethics for the computing profession. Ethical decision-making; licensing; intellectual property, freedom of information, and privacy. Credit is not given for both CS 210 and ECE 316. Prerequisite: CS 225. Junior standing required.

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Restricted to Undergrad - Urbana-Champaign.
Restricted to O/C Engineering City Scholars students.

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CS 225  **Data Structures**  credit: 4 hours.

Data abstractions: elementary data structures (lists, stacks, queues, and trees) and their implementation using an object-oriented programming language. Solutions to a variety of computational problems such as search on graphs and trees. Elementary analysis of algorithms. Prerequisite: CS 125 or ECE 220; CS 173 or MATH 213.

Students must register for one lecture-discussion and one lecture section.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister
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Quantitative Reasoning II course.

Fagen-Ulmschneider, W
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**LAPTOP LAB SECTION** -- Student are required to bring their own computer to this lab section.
Quantitative Reasoning II course. 
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

<table>
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Quantitative Reasoning II course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

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Quantitative Reasoning II course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

CS 233  **Computer Architecture**  credit: 4 hours.
Fundamentals of computer architecture: digital logic design, working up from the logic gate level to understand the function of a simple computer; machine-level programming to understand implementation of high-level languages; performance models of modern computer architectures to enable performance optimization of software; hardware primitives for parallelism and security. Prerequisite: CS 125 and CS 173; credit or concurrent enrollment in CS 225.

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Restricted to Undergrad - Urbana-Champaign.

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Restricted to Undergrad - Urbana-Champaign.

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Laboratory

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</table>
**CS 241  System Programming**  credit: 4 hours.

Basics of system programming, including POSIX processes, process control, inter-process communication, synchronization, signals, simple memory management, file I/O and directories, shell programming, socket network programming, RPC programming in distributed systems, basic security mechanisms, and standard tools for systems programming such as debugging tools. Credit is not given for both CS 241 and ECE 391. Prerequisite: CS 225; credit or concurrent registration in CS 233.

Students must register for one lecture and one discussion section.

<table>
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<p>| 51471| Discussion/Recitation| ADB     | 10:30 AM - 11:50 AM | R    | 0218 - Siebel Center for Comp Sci | Angrave, L  |</p>
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**CS 242  Programming Studio**  credit: 3 hours.
Intensive programming lab intended to strengthen skills in programming. Prerequisite: CS 241.
<table>
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Restricted to Computer Science or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics or Computer Science&Crop Sciences major(s). Restricted to students with Senior class standing. Restricted to Undergrad - Urbana-Champaign. For up-to-date information about CS course restrictions, please see the following link: [http://go.cs.illinois.edu/CSregister](http://go.cs.illinois.edu/CSregister)

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CS 296 **Honors Course** credit: 1 hours.
Group projects for honors credit in computer science. Sections of this course are offered in conjunction with other 200-level computer science courses taken concurrently. A special examination may be required for admission to this course. May be repeated. Prerequisite: Concurrent registration in another 200-level computer science course (see Schedule).

Restricted to Undergrad - Urbana-Champaign. Honors Section 25 is for students registered in CS 225 Data Structures

Credit Hours: 1 hours
Restricted to Undergrad - Urbana-Champaign. Honors section 33 is for students registered in CS 233 Computer Architecture
CS 357  **Numerical Methods I**  credit: 3 hours.
Fundamentals of numerical methods for students in science and engineering; floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations; various applications in science and engineering; programming exercises and use of high quality mathematical library routines. Same as MATH 357. Credit is not given for CS 357 if credit for CS 450 has been earned. (Counts for advanced hours in LAS). Prerequisite: A 100-level computer science course; MATH 225 or MATH 415; MATH 241.

<table>
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Restricted to Undergrad - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 361  **Probability & Statistics for Computer Science**  credit: 3 hours.
Introduction to probability theory and statistics with applications to computer science. Topics include: visualizing datasets, summarizing data, basic descriptive statistics, conditional probability, independence, Bayes theorem, random variables, joint and conditional distributions, expectation, variance and covariance, central limit theorem. Markov inequality, Chebyshev inequality, law of large numbers, Markov chains, simulation, the PageRank algorithm, populations and sampling, sample mean, standard error, maximum likelihood estimation, Bayes estimation, hypothesis testing, confidence intervals, linear regression, principal component analysis, classification, and decision trees. Same as STAT 361. Credit is not given for both CS 361 and ECE 313. Prerequisite: MATH 220 or 221; credit or concurrent registration in MATH 225. For majors only.

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Restricted to Undergrad - Urbana-Champaign.
CS 374 **Introduction to Algorithms & Models of Computation**  credit: 4 hours.
Analysis of algorithms, major paradigms of algorithm design including recursive algorithms, divide-and-conquer algorithms, dynamic programming, greedy algorithms, and graph algorithms. Formal models of computation including finite automata and Turing machines. Limitations of computation arising from fundamental notions of algorithm and from complexity-theoretic constraints. Reductions, undecidability and NP-completeness. Same as ECE 374. Prerequisite: CS 225; MATH 225 or MATH 415.

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### CS 397  Individual Study  
credit: 1 TO 3 hours.  
May be repeated. Prerequisite: Consent of instructor.

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Instructor Approval Required  
Students must see the CS Department to receive the appropriate CRN for the instructor.

### CS 398  Special Topics  
credit: 1 to 4 hours.  
Subject offerings of new and developing areas of knowledge in computer science intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

<table>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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</thead>
</table>

# Introduction to Data Science

**Credit Hours:** 4 hours

Introduction to Data Science

**CS 410 Text Information Systems**  credit: 3 OR 4 hours.

Theory, design, and implementation of text-based information systems. Text analysis, retrieval models (e.g., Boolean, vector space, probabilistic), text categorization, text filtering, clustering, retrieval system design and implementation, and applications to web information management. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

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Credit Hours: 4 hours

Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.

This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply.

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Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign. Restricted to MCS:Computer Sci Online -UIUC.

Additional Coursera ID verification and ProctorU fees may apply.

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Credit Hours: 4 hours

Restricted to Undergrad - Urbana-Champaign.

Additional Coursera ID verification and ProctorU fees may apply.

# Database Systems

**Credit Hours:** 4 hours

Examined of the logical organization of databases: the entity-relationship model; the hierarchical, network, and relational data models and their languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity; concurrency control, and distributed database systems. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineerng -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, NDEG:Undergrad Nondeg-CE-UIUC, or MCS: Computer Sci Online-UIUC. Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see [http://engineering.illinois.edu/online/courses/](http://engineering.illinois.edu/online/courses/).

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Credit Hours: 3 hours

For up-to-date information about CS course restrictions, please see the following link: [http://go.cs.illinois.edu/CSregister](http://go.cs.illinois.edu/CSregister)
Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 412 Introduction to Data Mining  credit: 3 OR 4 hours.
Concepts, techniques, and systems of data warehousing and data mining. Design and implementation of data warehouse and on-line analytical processing (OLAP) systems; data mining concepts, methods, systems, implementations, and applications. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

<table>
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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, NDEG:Undergrad Nondeg-CE-UIUC, or MCS: Computer Sci Online-UIUC. Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

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Credit Hours: 3 hours
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 413 Intro to Combinatorics  credit: 3 OR 4 hours.
Same as MATH 413. See MATH 413.

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Credit Hours: 3 hours

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Credit Hours: 4 hours
Departmental Approval Required

CS 418 Interactive Computer Graphics  credit: 3 or 4 hours.
Basic mathematical tools and computational techniques for modeling, rendering, and animating 3-D scenes. Same as CSE 427. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225; MATH 225 or MATH 415; MATH 241.

Students will register for a lecture and a discussion section.

<table>
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<tr>
<th>CRN</th>
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Credit Hours: 3 hours
This course will be taught in a novel format: The instructor will be recorded with a live camera as part of a production for future online delivery. Students will form the “live studio audience”, viewing the instructor and slides on a screen. For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
This course will be taught in a novel format: The instructor will be recorded with a live camera as part of a production for future online delivery. Students will form the “live studio audience”, viewing the instructor and slides on a screen. For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 419  Production Computer Graphics  credit: 3 OR 4 hours.
Advanced methods for representing, displaying, and rendering two-, three-, and four-dimensional scenes. General algebraic curves and surfaces, splines, Gaussian and bump-function representation, fractals, particle systems, constructive solid geometry methods, lighting models, radiosity, advanced ray-tracing methods, surface texturing animation techniques, data visualization methods. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 418.

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Credit Hours: 3 hours
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 420  Parallel Progrmg: Sci & Engrg  credit: 3 OR 4 hours.
Fundamental issues in design and development of parallel programs for various types of parallel computers. Various programming models according to both machine type and application area. Cost models, debugging, and performance evaluation of parallel programs with actual application examples. Same as CSE 402 and ECE 492. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

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Credit Hours: 3 hours
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 421  Progrmg Languages & Compilers  credit: 3 OR 4 hours.
Structure of programming languages and their implementation. Basic language design principles; abstract data types; functional languages; type systems; object-oriented languages. Basics of lexing, parsing, syntax-directed translation, semantic analysis, and code generation. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 233 and CS 373.
### CS 424 Real-Time Systems  credit: 3 OR 4 hours.
Supervisory control aspects of Cyber Physical Systems (CPS): fundamentals of reliability analysis, real-time scheduling, simple feedback control, software fault tolerance architecture, wireless networking and energy saving, principles of safety critical system engineering. Student groups design and demonstrate supervisory control architecture for a robot. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241.

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Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
### CS 425  **Distributed Systems**  credit: 3 OR 4 hours.

Protocols, specification techniques, global states and their determination, reliable broadcast, transactions and commitment, security, and real-time systems. Same as ECE 428. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241 or ECE 391.

<table>
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Credit Hours: 4 hours
Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply.

### CS 426  **Compiler Construction**  credit: 3 OR 4 hours.

Compiler structure, syntax analysis, syntax-directed translation, automatically constructed recognizers, semantic analysis, code generation, intermediate language, optimization techniques. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 421.

<table>
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<tr>
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Credit Hours: 4 hours
Instructor Approval Required
Overflow section for Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions

For up-to-date information about CS course restrictions, please see the following link: [http://go.cs.illinois.edu/CSregister](http://go.cs.illinois.edu/CSregister)
CS 427  **Software Engineering I**  credit: 3 OR 4 hours.
Software process, analysis and design. Software development paradigms, system engineering, function-based analysis and design, and object-oriented analysis and design. Course will use team-projects for hands-on exercises. Same as CSE 426. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225 and CS 373.

<table>
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Credit Hours: 4 hours
Restricted to MCS:Computer Sci Online -UIUC.
This course is only for students that are in the Computer Science MCS/MCS-DS Program offered on the Coursera platform. Additional Coursera ID verification and ProctorU fees may apply.

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign. Restricted to MCS:Computer Sci Online -UIUC. Additional Coursera ID verification and ProctorU fees may apply.

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</table>

Credit Hours: 3 hours
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

<table>
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<tr>
<th>CRN</th>
<th>Type</th>
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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 433  **Computer System Organization**  credit: 3 OR 4 hours.
Computer system analysis and design. Organizational dependence on computations to be performed; speed and cost of parts and overall machines; instruction set design; pipeline and vector machines; memory hierarchy design. Same as CSE 422. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 233.
<table>
<thead>
<tr>
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<th>Type</th>
<th>Section</th>
<th>Time</th>
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Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

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<tr>
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<td>Lecture</td>
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</table>

Credit Hours: 3 hours
Design, application, analysis, and evaluation of the communication network protocols and software systems that make up modern cloud and network infrastructures. Emphasis on identifying problems, proposing alternative solutions, and hands-on construction and experimentation with real-world implementations. Multiple programming team projects. Prerequisite: CS 241

<table>
<thead>
<tr>
<th>CRN</th>
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</table>

Credit Hours: 4 hours
Design, application, analysis, and evaluation of the communication network protocols and software systems that make up modern cloud and network infrastructures. Emphasis on identifying problems, proposing alternative solutions, and hands-on construction and experimentation with real-world implementations. Multiple programming team projects. Prerequisite: CS 241

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Credit Hours: 4 hours

CS 436 **Computer Networking Laboratory**  credit: 3 OR 4 hours.
Same as ECE 435. See ECE 435.
An online virtualized networking laboratory environment will be provided for students in the online section. Additionally, an optional wireless spectrum analyzer will be provided for students in the online section to purchase (<$100) if they wish to perform more advanced WiFi experiments that go beyond the required course material.

CS 438 Communication Networks credit: 3 OR 4 hours.
Layered architectures and the OSI Reference Model; design issues and protocols in the transport, network, and data link layers; architectures and control algorithms of local-area, point-to-point, and satellite networks; standards in networks access protocols; models of network interconnection; overview of networking and communication software. Same as ECE 438. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241 or ECE 391; one of ECE 313, MATH 461, MATH 463.

<table>
<thead>
<tr>
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</table>

Credit Hours: 3 hours
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

<table>
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</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 440 Artificial Intelligence credit: 3 OR 4 hours.
Major topics in and directions of research in artificial intelligence: AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Same as ECE 448. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225 or ECE 391.

<table>
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<tr>
<th>CRN</th>
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Credit Hours: 3 hours
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

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</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 446 Machine Learning credit: 3 OR 4 hours.
Theory and basic techniques in machine learning. Major theoretical paradigms and key concepts developed in machine learning in the context of applications such as natural language and text processing, computer vision, data mining, adaptive computer systems and others. Review of several supervised and unsupervised learning approaches: methods for learning linear representations; on-line learning, Bayesian methods; decision-trees; features and kernels; clustering and dimensionality reduction. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 373 and CS 440.
## CS 447  **Natural Language Processing**  credit: 3 OR 4 hours.
Part-of-speech tagging, parsing, semantic analysis and machine translation. Relevant linguistics concepts from morphology (word formation) and lexical semantics (the meaning of words) to syntax (sentence structure) and compositional semantics (the meaning of sentences). 3 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both CS 447 and LING 406. Prerequisite: CS 374.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<td>12:30 PM - 01:45 PM</td>
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<td>Hockenmaier, J</td>
</tr>
</tbody>
</table>

## CS 450  **Numerical Analysis**  credit: 3 or 4 hours.
Linear system solvers, optimization techniques, interpolation and approximation of functions, solving systems of nonlinear equations, eigenvalue problems, least squares, and quadrature; numerical handling of ordinary and partial differential equations. Same as CSE 401, ECE 491, and MATH 450. 3 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both CS 450 and CS 457. Prerequisite: CS 101 or CS 125; CS 357 or MATH 415; MATH 285.

<table>
<thead>
<tr>
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</tr>
</tbody>
</table>
## CS 461  Computer Security I  credit: 4 hours.

Fundamental principles of computer and communications security and information assurance: ethics, privacy, notions of threat, vulnerabilities, and risk in systems, information warfare, malicious software, data secrecy and integrity issues, network security, trusted computing, mandatory and discretionary access controls, certification and accreditation of systems against security standards. Security mechanisms: authentication, auditing, intrusion detection, access control, cryptography, security protocols, key distribution. Same as ECE 422. 4 undergraduate hours. 4 graduate hours. Prerequisite: CS 241 or ECE 391.

<table>
<thead>
<tr>
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<td>MWF</td>
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</table>

For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister
CS 465  **User Interface Design**  credit: 3 or 4 hours.
A project-focused course covering fundamental principles of user interface design, implementation, and evaluation. Small teams work on a term-long project that involves: analysis of the problem domain, user skills, and tasks; iterative prototyping of interfaces to address user needs; conducting several forms of evaluation such as cognitive walkthroughs and usability tests; implementation of the final prototype. Non-technical majors may enroll as non-programmers who participate in all aspects of the projects with the possible exception of implementation. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.
<table>
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Credit Hours: 3 hours

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Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.

CS 473  **Algorithms**  credit: 4 hours.

Design and analysis techniques, approximation algorithms, randomized algorithms and amortized analysis, and advanced topics such as network flow, linear programming, and dynamic data structures, among others. Same as CSE 414 and MATH 473. 4 undergraduate hours. 4 graduate hours. Prerequisite: CS 374, and one of CS 361, MATH 461, or STAT 400.

<table>
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</table>

For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 481  **Stochastic Processes & Applic**  credit: 3 OR 4 hours.
Same as IE 410. See IE 410.

<table>
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Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

CS 483  Applied Parallel Programming  credit: 4 hours.
Same as CSE 408 and ECE 408. See ECE 408.

<table>
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<tr>
<th>CRN</th>
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Restricted to students with Junior, Senior, or Graduate class standing.

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<th>CRN</th>
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</table>

Restricted to students with Junior, Senior, or Graduate class standing.

CS 484  Parallel Programming  credit: 3 OR 4 hours.
Techniques for the programming of all classes of parallel computers and devices including shared memory and distributed memory multiprocessors, SIMD processors and co-processors, and special purpose devices. Key concepts in parallel programming such as reactive and transformational programming, speculation, speedup, isoefficiency, and load balancing. Synchronization primitives, libraries and languages for parallel programming such as OpenMP and MPI, performance monitoring, program tuning, analysis and programming of numerical and symbolic parallel algorithms. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241.

<table>
<thead>
<tr>
<th>CRN</th>
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Credit Hours: 4 hours
Additional ProctorU fees may apply This is a pilot course and no additional seats will be released.
<table>
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<th>CRN</th>
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<th>Days</th>
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</table>

**CS 491 Seminar**  credit: 0 TO 4 hours.
Seminar on topics of current interest as announced in the Class Schedule. 0 to 4 undergraduate hours. 0 to 4 graduate hours. Approved for S/U grading only. May be repeated in the same or separate terms if topics vary to a maximum of 4 hours. Prerequisite: As specified for each topic offering, see Class Schedule or departmental course description.

Credit Hours: 1 hours
Adv Competitive Algorithm Prog
Title: Introduction to Competitive Algorithmic Programming This course introduces the algorithms and concepts necessary to compete effectively in the ACM International Collegiate Programming Contest (ICPC) and similar contests. It is highly recommended for students intending to compete in the 2016 ICPC Mid-Central Regional contest. The course requires participation in practice contests and weekly completion of short problem sets. Topics covered include standard library classes and data structures useful for programming contest problems, basic complexity analysis, dynamic programming, graph algorithms, number theory, combinatorics, computational geometry, combinatorial games, and competitive programming contest strategy. Prerequisites: Must have programming competency in Java or C++ and preferably have taken CS 225 Data Structures.

Credit Hours: 2 hours
Cyber Security Scholar Program Instructor Approval Required Topic: Information Assurance and Trust Seminar. This course is an undergraduate seminar for students admitted to the Illinois Cyber Security Scholar Program. In addition, this course would be open and serve as an orientation seminar to all college of engineering undergraduate student interested in topics of information assurance and trust. The seminars will feature information assurance subject matter expert guest speakers from industry and government, community leaders, distinguished external researchers, faculty, and students discussing both the technical challenges and limitations of IA. Standard information assurance topics such as authentication, data integrity, ethics, and cyber security will be covered. This course will meet CSL 232

Credit Hours: 1 hours
Functional Programming Language Topic: Functional Programming Languages and related mathematical constructs
CS 493  **Senior Project II, ACP**  credit: 3 hours.
Continuation of CS 492. Identical to CS 494 except for an additional writing component. See CS 494. 3 undergraduate hours. No graduate credit. Credit is not given for both CS 493 and a project course in another engineering department for the same project. Prerequisite: CS 492.

This course satisfies the General Education Criteria for a:
Advanced Composition

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67877</td>
<td>Lecture-Discussion</td>
<td>CS</td>
<td>04:00 PM - 04:50 PM</td>
<td>W</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Woodley, M</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Advanced Composition course.
Restricted to Computer Science major(s).
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 494  **Senior Project II**  credit: 3 hours.
Continuation of CS 492. 3 undergraduate hours. No graduate credit. Credit is not given for both CS 494 and a project course in another engineering department for the same project. Prerequisite: CS 492.

<table>
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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>67878</td>
<td>Lecture-Discussion</td>
<td>CS</td>
<td>04:00 PM - 04:50 PM</td>
<td>W</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Woodley, M</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to Computer Science major(s). Restricted to students with Junior or Senior class standing.
For up-to-date information about CS course restrictions, please see the following link: http://go.cs.illinois.edu/CSregister

CS 497  **CS Team Project**  credit: 1 TO 3 hours.
Student teams work with CS faculty to complete a significant project requiring advanced knowledge of CS principles. Project topics vary. 1 to 3 undergraduate hours. No graduate credit. May be repeated in the same term up to 6 hours, if topics vary; may be repeated in separate terms. Prerequisite: For majors only; junior or senior standing required.

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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
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<tbody>
<tr>
<td>69124</td>
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</tbody>
</table>
## CS 498  **Special Topics**  credit: 1 to 4 hours.
Subject offerings of new and developing areas of knowledge in computer science intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 1 to 4 undergraduate hours. 1 to 4 graduate hours. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>61482</td>
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<td>Bambenek, J Campbell, R Kesan, J</td>
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<tr>
<td>61483</td>
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<td>AB2</td>
<td>01:00 PM - 01:50 PM</td>
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<td>70418</td>
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<td>AB3</td>
<td>02:00 PM - 02:50 PM</td>
<td>W</td>
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<tr>
<td>61457</td>
<td>Lecture</td>
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<td>09:30 AM - 10:45 AM</td>
<td>MW</td>
<td>1310 - Digital Computer Laboratory</td>
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</tr>
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</table>

**Digital Forensics**

**Credit Hours: 4 hours**  
Digital forensics concerns the acquisition and investigation of evidence from all devices capable of storing digital data and is often related to the prosecution of cyber crime and fraud. The class introduces the process of forensic investigation, chain of custody, forensics analysis, court proceedings and the legal justice system. It includes examination of digital storage and network traffic from personal computers, enterprise systems, embedded devices, and mobiles. Laboratory student exercises will use the tools and techniques of digital forensics investigators. Prerequisite: a basic knowledge of computer science concepts including operating systems and networking. Information about pre-requisites and the self-assessment quiz can be seen at this link - http://publish.illinois.edu/digitalforensics1/prerequisite/

<table>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<td>AM1</td>
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<td>1404 - Siebel Center for Comp Sci</td>
<td>Forsyth, D Walker, T</td>
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</table>

**Credit Hours: 3 hours**  
Applied Machine Learning
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<thead>
<tr>
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<th>Location</th>
<th>Instructor</th>
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<tr>
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<td>02:00 PM - 03:20 PM</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2013 - Electrical &amp; Computer Eng Bldg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Miller, A</td>
<td></td>
</tr>
<tr>
<td><strong>Credit Hours: 3 hours</strong></td>
<td></td>
<td></td>
<td>Applied Cryptography</td>
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<tr>
<td>68912</td>
<td>Lecture</td>
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<td></td>
<td></td>
<td></td>
<td>2013 - Electrical &amp; Computer Eng Bldg</td>
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<td>Miller, A</td>
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<td><strong>Credit Hours: 4 hours</strong></td>
<td></td>
<td></td>
<td>Applied Cryptography Restricted to Graduate - Urbana-Champaign.</td>
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<tr>
<td>70185</td>
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<td></td>
<td>1404 - Siebel Center for Comp Sci</td>
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<td><strong>Credit Hours: 3 hours</strong></td>
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<td></td>
<td>1103 - Siebel Center for Comp Sci</td>
<td>Gunter, C</td>
</tr>
<tr>
<td><strong>Credit Hours: 3 hours</strong></td>
<td></td>
<td></td>
<td>Cyber Dystopia Section Info: Analyzing the Adverse Impacts of Advances in Computer Technology. The information revolution is bringing changes that are not always seen as positive to the people they affect. Nevertheless there is a strong feeling that the changes it brings are inevitable and that our efforts should be devoted to advancing, enjoying, and profiting from cyber technologies rather than restraining them. But do our efforts in this direction risk the emergence of a cyber dystopia in which many, perhaps most, people are significantly harmed by technology advances? This course focuses on insights into the downsides of this technological progress. We will characterize key aspects of the problem, assess their severity, predict their future, speculate on how much of what we are facing is inevitable, and think about what steps might avoid the most undesirable outcomes. This will be guided by reading and class discussion of recent works on the topic and a project. Learn more from the course web site <a href="https://tinyurl.com/cyberdystopia">https://tinyurl.com/cyberdystopia</a>.</td>
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<tr>
<td>70961</td>
<td>Online</td>
<td>CNO</td>
<td>ARRANGED -</td>
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<td>Godfrey, P</td>
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<tr>
<td><strong>Credit Hours: 4 hours</strong></td>
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<td></td>
<td>Cloud Networking Restricted to MCS:Computer Sci Online -UIUC. Course description: Computer communication networks are among the most important and influential global infrastructures that humanity has created. The goal of this course is to provide a foundational view of communication networks, with a focus on networks enabling modern hyperscale cloud computing. In the first part of this course, we’ll study the principles upon which the Internet and other computer networks are built, and how those principles translate into deployed protocols. In the second part of this course, we build on those principles to learn how to build a network infrastructure that provides the agility to deploy virtual networks on a shared infrastructure, that enables both efficient transfer of big data and low latency communication, and that enables applications to be federated across countries and continents. Topics will include: switching; intradomain routing; the Internet Protocol and interdomain networking; reliability, flow control, congestion control, and their embodiment in TCP; quality of service; network applications; cloud network requirements and traffic patterns; data center network architecture; virtualized and software-defined networks; and wide-area connectivity. The course will involve a significant amount of Unix-based network programming and assumes some familiarity with C or C++. One shorter programming project employs Python. Students will implement realistic network protocols, and gain the perspective of real-world networking challenges through interviews with industry professionals and academic researchers. This course is only for students that are in the Computer Science MCS/MCS-DS Program offered on the Coursera platform. Additional Coursera ID verification and ProctorU fees may apply.</td>
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<tr>
<td>Course Code</td>
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<td>70470</td>
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<tr>
<td>66333</td>
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<td>HS3</td>
<td>11:00 AM - 12:15 PM</td>
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</table>
advertising including electronic billboards, moving objects (banners atop taxi cabs) and algorithmic synthesis of personalized advertisements. This class will also discuss issues related to consumer privacy.

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<tr>
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<td>HS4</td>
<td>11:00 AM - 12:15 PM</td>
<td>WF 1310 - Digital Computer Laboratory, Sundaram, H</td>
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</tbody>
</table>

Credit Hours: 4 hours
Computational Advertising
Restricted to Graduate - Urbana-Champaign.
This class will survey the emerging landscape of computational advertising. It will provide students with a thorough understanding of the technologies including web-search, auctions, behavioral targeting, mechanisms for viral marketing, that underpin the display of advertisements on a variety of locations. These locations include web pages (banner ads), on prominent search engines (text ads), on social media platforms, as well as cell phones. The students shall also learn about new research areas in computational advertising including electronic billboards, moving objects (banners atop taxi cabs) and algorithmic synthesis of personalized advertisements. This class will also discuss issues related to consumer privacy.

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<tbody>
<tr>
<td>70198</td>
<td>Lecture-Discussion</td>
<td>KA3</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR 1131 - Siebel Center for Comp Sci, Kirlik, A</td>
</tr>
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</table>

Credit Hours: 3 hours
Experimental Methods for HCI
Course description: This course covers conceiving, designing, performing, analyzing data and reporting the results of experiments and usability/UX tests in HCI and empirically evaluating interactive technologies in engineering generally. Topics include defining research questions, selecting experimental objects, tasks, and participants, the ethical protection of subjects, selecting experimental designs, mitigating threats to validity, the collection and analysis of both qualitative and quantitative data, and reporting experimental research in publications. Both parametric and nonparametric data analysis are covered, including the most commonly used inferential statistical tests such as repeated- and independent-measures ANOVA, post-hoc Tukey, Wilcoxon, Mann-Whitney, Kruskal-Wallis and others. Statistical material is taught using methods based on mathematical foundations rather than with statistical software languages or packages in order to provide both a rigorous and intuitive understanding to complement the convenience these programming environments provide in research practice. Grades are based mainly on homework and 2 exams.

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<tr>
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<td>KA4</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR 1131 - Siebel Center for Comp Sci, Kirlik, A</td>
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</table>

Credit Hours: 4 hours
Experimental Methods for HCI
Restricted to Graduate - Urbana-Champaign.
Course description: This course covers conceiving, designing, performing, analyzing data and reporting the results of experiments and usability/UX tests in HCI and empirically evaluating interactive technologies in engineering generally. Topics include defining research questions, selecting experimental objects, tasks, and participants, the ethical protection of subjects, selecting experimental designs, mitigating threats to validity, the collection and analysis of both qualitative and quantitative data, and reporting experimental research in publications. Both parametric and nonparametric data analysis are covered, including the most commonly used inferential statistical tests such as repeated- and independent-measures ANOVA, post-hoc Tukey, Wilcoxon, Mann-Whitney, Kruskal-Wallis and others. Statistical material is taught using methods based on mathematical foundations rather than with statistical software languages or packages in order to provide both a rigorous and intuitive understanding to complement the convenience these programming environments provide in research practice. Grades are based mainly on homework and 2 exams.

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</table>

Credit Hours: 4 hours
Cloud Networking
Restricted to Graduate - Urbana-Champaign. Restricted to MCS:Computer Sci Online -UIUC. Additional Coursera ID verification and ProctorU fees may apply

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<tr>
<td>70197</td>
<td>Lecture-Discussion</td>
<td>MV3</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR 1103 - Siebel Center for Comp Sci, Viswanathan, M</td>
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</table>
Credit Hours: 3 hours
Logic
This course will provide an introduction to mathematical logic from the perspective of computer science, emphasizing decidable fragments of logic and decision algorithms. The topics covered will be motivated by applications in artificial intelligence, databases, formal methods and theoretical computer science. The goal of the course is to prepare students for using logic as a formal tool in computer science. The course will roughly cover the following topics (in this order): syntax, semantics and proof theory of propositional logic, sat-solvers, syntax of first-order, the resolution proof system, syntax of second-order logic, connections between monadic second order logic and regular languages (word and tree, finite and infinite), tree-width and Courcelle’s theorem with applications to parametric complexity, finite model theory and descriptive complexity, games and inexpressiveness. Prerequisite: Courses CS 173, and CS 374 or instructor's consent. In particular, students should be familiar with inductive proofs, propositional logic syntax, ability to use quantifiers (forall and exists) to express simple properties in first-order logic, basic properties of finite graphs, simple graph algorithms, finite automata and regular languages, deterministic and non-deterministic computational models, and complexity classes like NP. This section is for either undergraduate or graduate students.

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Credit Hours: 4 hours
Logic
Restricted to Graduate - Urbana-Champaign.

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<tr>
<td>40091</td>
<td>Lecture</td>
<td>02:00 PM - 03:15 PM</td>
<td>MW</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
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</table>

Credit Hours: 3 hours
Virtual Reality
Fundamentals of virtual reality systems, including geometric modeling, transformations, graphical rendering, optics, the human vision system, the vestibular system, interface design, human factors, developer recommendations, and technological issues. Implementation exercises and a final project are included. Extensive programming background not required.

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<tr>
<td>40092</td>
<td>Lecture-Discussion</td>
<td>02:00 PM - 03:15 PM</td>
<td>MW</td>
<td>1404 - Siebel Center for Comp Sci</td>
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Credit Hours: 4 hours
Virtual Reality
Restricted to Graduate - Urbana-Champaign.
Fundamentals of virtual reality systems, including geometric modeling, transformations, graphical rendering, optics, the human vision system, the vestibular system, interface design, human factors, developer recommendations, and technological issues. Implementation exercises and a final project are included. Extensive programming background not required.

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<tr>
<td>67900</td>
<td>Lecture</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Kravets, R</td>
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</table>

Credit Hours: 3 hours
Wireless Network Lab
Wireless networks are everywhere in our world, one laptops, smartphones, sensor and the new IoT devices popping up everywhere. Understanding how wireless networks work and why they break is the key to their successful deployment and integration. In the first half of this class, we focus on the basics of wireless networking, from the physical transmission of radio signals to the impact of lossy communication on higher layer routing and transport protocols. The second half of the class is dedicated to student let topics, including sensor networks, IoT, security and privacy, energy conservation and general performance improving techniques. Over the course of the semester, students design and implement a group project using a variety of wireless devices and technologies, ending with a project report and a poster presentation of their work.

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<tr>
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<td>1302 - Siebel Center for Comp Sci</td>
<td>Kravets, R</td>
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</table>
Credit Hours: 4 hours
Wireless Network Lab
Restricted to Graduate - Urbana-Champaign.

Wireless networks are everywhere in our world, one laptops, smartphones, sensor and the new IoT devices popping up everywhere. Understanding how wireless networks work and why they break is the key to their successful deployment and integration. In the first half of this class, we focus on the basics of wireless networking, from the physical transmission of radio signals to the impact of lossy communication on higher layer routing and transport protocols. The second half of the class is dedicated to student let topics, including sensor networks, IoT, security and privacy, energy conservation and general performance improving techniques. Over the course of the semester, students design and implement a group project using a variety of wireless devices and technologies, ending with a project report and a poster presentation of their work.

CS 499  **Senior Thesis**  credit: 3 hours.
Research and thesis development experience in computer science underguidance of a faculty member. Literature search, oral presentation, analysis and implementation, paper preparation, and completion of a written thesis. 3 undergraduate hours. No graduate credit. May be repeated to a maximum of 6 hours. Prerequisite: Consent of instructor.

This course satisfies the General Education Criteria for a:
Advanced Composition

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<tr>
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<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>10465</td>
<td>Independent Study</td>
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</tbody>
</table>

Advanced Composition course.
Instructor Approval Required
Students must see the CS Department to receive the appropriate CRN for the instructor.

CS 510  **Advanced Information Retrieval**  credit: 4 hours.
Advanced concepts, models, and algorithms in information retrieval and major recent developments in the field, including historical milestones in information retrieval research, evaluation methodology, vector space retrieval model, probabilistic retrieval models, learning to rank algorithms, probabilistic topic models, information retrieval systems, text analytics, and topics of research frontiers in information retrieval. 4 graduate hours. No professional credit. Prerequisite: One of CS 410, CS 412, CS 446 or LING 406.

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<th>Instructor</th>
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<td>0216 - Siebel Center for Comp Sci</td>
<td>Zhai, C</td>
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</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

CS 513  **Theory & Practice of Data Cleaning**  credit: 4 hours.
Same as IS 532. See IS 532.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
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<tr>
<td>70342</td>
<td>Lecture-Discussion</td>
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<td>R</td>
<td>242 - Grad Sch of Lib &amp; Info Science</td>
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70344  Online   AO   ARRANGED -                          -  Ludaescher, B

Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UlUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply. Meets with IS 532.

CS 522  Programming Language Semantics credit: 4 hours.
Theory of programming languages including functional programming, meta-circular interpreters, typed, untyped and polymorphic lambda-calculi, and denotational semantics. Prerequisite: CS 422 and CS 426.

<table>
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<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>54414</td>
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<td>R</td>
<td>09:30 AM - 10:45 AM</td>
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</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

CS 523  Advanced Operating Systems credit: 4 hours.
Advanced concepts in operating system design and coverage of recent research directions. Resource management for parallel and distributed systems. Interaction between operating system design and computer architectures. Process management, virtual memory, interprocess communication, context switching, parallel and distributed file system designs, persistent objects, process and data migration, load balancing, security, protection. Term projects. Prerequisite: CS 423, CS 425, and CS 433.

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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
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<td>Campbell, R</td>
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</table>

Restricted to Graduate - Urbana-Champaign.

CS 541  Computer Systems Analysis credit: 4 hours.
Same as ECE 541. See ECE 541.

<table>
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Restricted to Graduate - Urbana-Champaign.

CS 548  Models of Cognitive Processes credit: 4 hours.
Formal models and concepts in automated cognition; integrating machine learning and prior knowledge; current approaches and detailed analyses of the role of reasoning in the learning process; computational complexity and fundamental tradeoffs between expressiveness and tractability; implications for state-of-the-art artificial intelligence areas such as automated planning, the semantic web, relational learning, structured prediction, latent models, structure learning, theory formation, etc.; philosophical and psychological aspects of integrating analytic and empirical evidence. Same as ECE 548. Prerequisite: CS 440 or CS 446.

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</table>

Credit Hours: 4 hours
CS 549  **Seminar in Cognitive Science** credit: 2 OR 4 hours.
Same as PSYC 514, ANTH 514, EPSY 551, LING 570, and PHIL 514. See PSYC 514.

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<tr>
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</table>

Restricted to Graduate - Urbana-Champaign.
Meets with PSYC/PHIL 357.

CS 556  **Iterative & Multigrid Methods** credit: 4 hours.
Comprehensive treatment of algebraic and multigrid iterative methods to solve systems of equations, primarily linear equations arising from discretization of partial differential equations. Same as CSE 511.

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<tr>
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<th>Section</th>
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</table>

Restricted to Graduate - Urbana-Champaign.

CS 563  **Advanced Computer Security** credit: 4 hours.
Current research trends in computer and network security. Privacy, tamper-resistance, unwanted traffic, monitoring and surveillance, and critical infrastructure protection. Subtopics will vary depending upon current research trends. Students work in teams in close coordination with the course instructor to develop one of the topics in depth by carrying out background research and an exploratory project. Same as ECE 524. Prerequisite: CS 461 or CS 463.

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Restricted to Graduate - Urbana-Champaign.

CS 571  **Combinatorial Mathematics** credit: 4 hours.
Same as MATH 580. See MATH 580.

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</table>
Restricted to Graduate - Urbana-Champaign. Not intended for MS:Economics:Policy Econ -UIUC, MS: Financial Engineering, MENG:Mechanical Engineering-UIUC, MENG:Elec & Computer Eng-UIUC, or MENG:Engineering:Comp Eng-UIUC. Undergraduate students may register with approval. For more information go to room 313 AH. Students from the following programs must contact the Director of Graduate Studies in Mathematics to request permission to register for the course: Restricted to Graduate - Urbana-Champaign. Not intended for MS:Economics:Policy Econ -UIUC, MS:Economics:Policy Econ -UIUC, MS: Financial Engineering, MENG:Mechanical Engineering-UIUC, MENG:Elec & Computer Eng-UIUC, or MENG:Engineering:Comp Eng-UIUC

CS 581 Algorithmic Genomic Biology  credit: 4 hours.
Same as BIOE 540. See BIOE 540.

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CS 591 Advanced Seminar  credit: 0 TO 4 hours.
Seminar on topics of current interest as announced in the Class Schedule. Approved for S/U grading only. May be repeated in the same or separate terms if topics vary. Prerequisite: As specified for each topic offering, see Class Schedule or departmental course description.

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</table>

Credit Hours: 1 hours
Advanced Compiler Technology
Restricted to Graduate - Urbana-Champaign.
Topic: Advanced Compiler Technology. Prerequisite: CS 426.

Credit Hours: 1 hours
Cloud Computing Research
Restricted to Graduate - Urbana-Champaign.
Topic: Cloud Computing Research.

Credit Hours: 1 hours
Formal Methods Seminar
Restricted to Graduate - Urbana-Champaign.

Credit Hours: 1 hours

page 47 - Computer Science, Fall 2018
Human-Computer Interaction  
Restricted to Graduate - Urbana-Champaign.  
Topic: Seminar in Human-Computer Interaction. Undergrad student must have permission of the instructor to register. This seminar will meet in 4405 SC.

<table>
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<td>-</td>
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Credit Hours: 1 hours  
Distributed Systems Seminar  
Instructor Approval Required  
Restricted to Graduate - Urbana-Champaign.  
Topic: Advanced Seminar in Distributed Systems. Prerequisite: CS 598IG or CS 425 or any basic course on distributed systems.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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Credit Hours: 1 hours  
Scientific Computing Seminar  
Restricted to Graduate - Urbana-Champaign.  

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<tr>
<td>41977</td>
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<td>0216 - Siebel Center for Comp Sci</td>
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Credit Hours: 1 hours  
PHD Orientation Seminar  
Restricted to Computer Science major(s). Restricted to Graduate - Urbana-Champaign.  
Topic: Orientation for new PhD students.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Instructor</th>
<th>Days</th>
<th>Time</th>
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<td>41614</td>
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<td>1 hours</td>
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</table>

Credit Hours: 1 hours  
Security Reading Seminar  
Restricted to Graduate - Urbana-Champaign.  
Topic: Security Reading Seminar. Prerequisite: A prior course in security or CS423 or consent of instructor.

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<tr>
<th>CRN</th>
<th>Type</th>
<th>Instructor</th>
<th>Days</th>
<th>Time</th>
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<td>1 hours</td>
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Credit Hours: 1 hours  
Software Engineering Seminar  
Instructor Approval Required  
Restricted to Graduate - Urbana-Champaign.  
Topic: Software Engineering Research Seminar. This seminar is about software engineering research, not focusing on practice. Most meetings discuss recent or seminal research papers. If interested in the seminar, please sign up to the soft-eng mailing list from http://wiki.cites.illinois.edu/wiki/display/SoftEng

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<tr>
<th>CRN</th>
<th>Type</th>
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<th>Credit Hours</th>
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Credit Hours: 1 hours  
Teaching Assistant Training  
Restricted to Graduate - Urbana-Champaign.  
Topic: TA Seminar; Teaching Assistant Training.
Text Mining Seminar

Topic: Text Information Management and Analysis

Text data are rich in semantic content and often contain valuable information such as human opinions and preferences. They play an important role in all big data applications. Text mining is the process of converting big unstructured text data into actionable knowledge to support user tasks and decision making. CS 591txt is a seminar on current topics in the text mining field, which is closely related to data mining, natural language processing, information retrieval, and machine learning. Students will read, discuss, and analyze the latest research in text mining techniques and applications.

CS 597  Individual Study  credit: 2 TO 16 hours.

Individual study or reading in a subject not covered in normal course offerings. May be repeated. Prerequisite: Consent of instructor.

CS 598  Special Topics  credit: 2 TO 4 hours.

Subject offerings of new and developing areas of knowledge in computer science intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

Credit Hours: 4 hours
Cyber-Physical-Human Systems
Restricted to Graduate - Urbana-Champaign.
This course is oriented to engineering and computer science students who would like their research on interactive systems and technologies to be informed by relevant research in the social, behavioral and cognitive sciences, and to students in these sciences who would like their research to be relevant to technology or engineering design. The format will combine group projects and seminar discussions based on readings to be provided from the "Oxford Handbook of Cognitive Engineering" (J.D. Lee & A. Kirlik, 2013, NY: OUP), whose table of contents (list of topics to be covered) can be found on OUP and related websites. Open to graduate students and to senior undergraduates by permission of instructor.
Credit Hours: 4 hours  
Lang/Abst f High-Perf Sci Comp  
Restricted to Graduate - Urbana-Champaign.  
Languages and Abstractions for High-Performance Scientific Computing This practically-oriented class considers programming language tooling for the construction of high-performance numerically-based software targeting distributed-memory GPU and wide-vector multi-core machines. Topics covered include: Machine Abstractions and Hardware Realities, Kernels and the Anatomy of High-Performance Code, Measuring and Understanding Performance (Types of measurements, performance counters and derived quantities, instrumentation and measurement error), Construction and Design of Domain-Specific Languages (array and scalar languages, parallel primitives, intermediate representations, metaprogramming), Translation and Compilation Techniques (symbolic manipulation, interfacing with computer algebra, kernel fusion, polyhedral representation and transformation), Code Generation and Just-in-Time Compilation, Performance Modeling and Tuning. Prerequisites: Knowledge of C and Python, interest in numerical applications, prior exposure to GPU programming and elementary compiler concepts.

<table>
<thead>
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<th>Course</th>
<th>Lecture/Discussion</th>
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</table>

Credit Hours: 4 hours  
Adversarial Machine Learning  
Restricted to Graduate - Urbana-Champaign.  
Machine learning has seen a remarkable rate of adoption in recent years across a broad spectrum of industries and applications. Many applications of machine learning techniques are adversarial in nature, insofar as the goal is to understand adversarial strategies and therefore detect or defend against attacks. Forensic analysis of malware, which incorporates clustering, anomaly detection, and even vision systems in autonomous vehicles, are all potentially subject to attack. In response to these concerns, there is an emerging literature on adversarial machine learning, which spans both the analysis of vulnerabilities in machine learning algorithms and algorithmic techniques which yield more robust learning. In this class, we will survey an array of these issues and techniques from both the cybersecurity and machine learning research areas. In particular, we consider the problems of adversarial evasion, where the attacker changes behavior to escape being detected, and poisoning, where training data itself is corrupted. We discuss both the evasion and poisoning attacks and the associated defensive techniques in deep neural networks and other machine learning models. We also consider techniques and applications of generative adversarial networks (GANs). Prerequisites: This course is restricted to students with machine learning and deep learning background. The students should be comfortable implementing and training standard deep neural networks in standard frameworks like pytorch or tensorflow.

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<tr>
<th>Course</th>
<th>Lecture</th>
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Credit Hours: 4 hours  
Deep Learning  
Restricted to Graduate - Urbana-Champaign.

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Credit Hours: 4 hours  
Software Testing for All  
Restricted to Graduate - Urbana-Champaign.  
Topic: Software Testing for All Description: If you develop or study any kind of software, you should consider taking a course on software testing for fun and profit. Testing is by far the most widely used method for improving software quality in practice. The importance of testing is growing as software controls increasingly many domains, e.g., self-driving cars, cryptocurrency, medical devices, or Internet of Things, to name just a few. This course aims to help students improve their testing skills, be it for practice or research. The course will be seminar style, including projects tailored for each student.

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<tr>
<th>Course</th>
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Credit Hours: 4 hours  
Data Mining Capstone  
Restricted to Graduate - Urbana-Champaign. Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.
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<tr>
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<td>Restricted to Graduate - Urbana-Champaign. Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC. Restricted to online MCS-DS students. Additional ID Verification Coursera and ProctorU fees may apply. For more details on this course section, please see <a href="http://engineering.illinois.edu/online/courses/">http://engineering.illinois.edu/online/courses/</a>. Non-Degree seeking students may enroll on a space-available basis with consent. To request enrollment, please complete the “Non-Degree Enrollment Request Form” here: <a href="https://illinois.edu/fb/sec/9478165">https://illinois.edu/fb/sec/9478165</a> Sections (and CRNs) for on-campus, degree-seeking students are: STAT 578 A1 (30959). Equivalency: CS 598 section DSO (CRN 69343) is equivalent to STAT 578 section DSO (CRN 48733). This is not true for all sections of CS 598 and STAT 578: it only applies to these specific sections in the fall 2017 term. Since this is not an official cross-listing, they might not automatically be recognized as equivalent for your degree audit. To determine whether extra steps need to be completed for either section to count towards your degree, contact your advisor. For up-to-date information about statistics course registration, please see our registration update pages: go.illinois.edu/StatisticsRegistration</td>
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<td>Restricted to Graduate - Urbana-Champaign. This course focuses on modern machine learning techniques in computational biology, including probabilistic modeling, feature selection, graphical models, approximate inference and learning, Monte Carlo methods and neural networks. Students will learn the development of the theoretical concepts for these methods and the applications of these methods to a variety of problems in computational biology. This course is appropriate for graduate students in computer science, bioengineering, mathematics and statistics. Familiarity with basic statistics, probability and algorithms is expected.</td>
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<tr>
<td>64618</td>
<td>Lecture-Discussion</td>
<td>JT</td>
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<td>Credit Hours: 4 hours</td>
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<td>Energy-Efficient Computer Architecture</td>
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<td>Restricted to Graduate - Urbana-Champaign. Topic: Energy-Efficient Computer Architecture This course will discuss recent issues and research trends in designing computer architectures for energy efficiency. The course will start with an analysis of process variation and wear-out, which constrains and affects energy efficiency. We will examine models and techniques for variation tolerance at different levels. They include body biasing, processors with timing speculation, and variation-aware application scheduling. We will then focus on low-voltage computer architecture, which is our best hope for energy efficiency. We will examine how to reduce voltage guard-bands and manage voltage droops. Higher-level techniques include pipeline design for low voltage, efficient eDRAM refresh, extensive power gating, and effective on-chip controllers. Next, we will consider 3D architectures and how they can improve energy efficiency. Finally, we will focus on extreme-scale computer architectures, which are designed from the ground up for energy efficiency. They will bring together all of the concepts discussed in the course into a single platform. Pre-requisite courses: Required: CS433 or equivalent; Recommended: CS533 or equivalent</td>
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<tr>
<td>42378</td>
<td>Lecture-Discussion</td>
<td>KGK</td>
<td>11:00 AM - 12:15 PM</td>
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<td>Credit Hours: 4 hours</td>
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Social Spaces on the Internet
Restricted to Graduate - Urbana-Champaign.

Topic: Social Spaces on the Internet
Social Spaces on the Internet. The Internet is home to a panoply of varieties of human interaction. Social media, interactive games, telepresence, online environments, and simple text e-mails now mediate our normal experiences of education, medicine, politics, business, sociality, collective action, and more. Unbeknownst to many users, these systems incorporate algorithmic interventions that alter prior expectations. As the Internet has become an infrastructure for social life and society itself, our ability to measure and represent that society is transforming. This class explores the presentation of self, the presentation of collectives, the presentation of news, and social dynamics in these online spaces — and how algorithmic intervention shapes them from the perspective of social signalling theory. Topics covered include: resumes of the 22nd century, why people share “fake” news, the mitigation of trolling, ethics, and bias in social media systems. Upon completion of this course, students will have an up-to-date understanding of the design of social media interfaces with incentive structures from social signalling theory.

Credit Hours: 4 hours
Advanced Multimedia Systems
Restricted to Graduate - Urbana-Champaign.

Advanced Multimedia Systems Topic: Advanced Multimedia Systems. Multimedia data and underlying systems and networks that service multimedia (multi-modal sensory) data are becoming ubiquitous. In the "Advanced Multimedia Systems" class we will explore major advances that are made in multimedia data, systems and networks to enable next generation multimedia applications such as Skype, YouTube, Flickr and others. We will take the end-to-end approach and explore an integrated view of multimedia transport protocols and Quality of Service, Content Distribution and Peer-to-Peer networks, multi-modal synchronization, machine learning and deep learning techniques for multi-modal data, services such as Voice-over-IP, Video Conferencing, Video-on-Demand, and subjective and objective Quality of Experience evaluation methods for next generation multimedia applications.

Credit Hours: 4 hours
Statistical Reinforcement Learning
Restricted to Graduate - Urbana-Champaign.

Statistical Reinforcement Learning Topic: Theory of reinforcement learning, with a focus on sample complexity analyses. Reinforcement learning is a machine learning paradigm for sequential decision-making. The course will provide the necessary background and the mathematical tools for understanding the statistical properties of RL algorithms and the challenges. Specific material will include: (1) basics of bandits and Markov Decision Processes, (2) finite sample guarantees of approximate dynamic programming (both tabular and function approximation), (3) importance sampling and Monte-Carlo methods, (4) state abstraction theory, (5) PAC exploration theory, (6) advanced topics, such as exploration theory in large state spaces. Prerequisites: probability and statistics, linear algebra, and basic concepts of machine learning. Some familiarity with Markov chains and numerical analysis are also recommended. Restriction(s): Restricted to Graduate - Urbana-Champaign

Credit Hours: 4 hours
Machine Learning for Signal Processing
Restricted to Graduate - Urbana-Champaign.

Topic: Machine Learning for Signal Processing. Prerequisite: Linear algebra, Probability theory. Today we see an increasing need for machines that can understand complex real-world signals, such as speech, images, movies, music, biological and mechanical readings, etc. In this course we will cover the fundamentals of machine learning and signal processing as they pertain to this goal, as well as exciting recent developments. We will learn how to decompose, analyze, classify, detect and consolidate signals, and examine various commonplace operations such as finding faces from camera feeds, organizing personal music collections, designing speech dialog systems and understanding movie content. The course will consist of lectures and student projects and presentations. Students are expected to have a working knowledge of linear algebra, probability theory, and programming skills to carry an implementation of a final project (preferably in MATLAB, but all languages are welcome).
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<tr>
<th>Credit Hours: 4 hours</th>
<th>Practical Statistical Learning</th>
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<td>Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.</td>
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<tr>
<th>Course Code</th>
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<th>Prerequisite</th>
<th>Schedule</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>71083</td>
<td>Online</td>
<td>PSP</td>
<td>ARRANGED</td>
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<td>Liang, F</td>
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<th>Credit Hours: 4 hours</th>
<th>Practical Statistical Learning</th>
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<td>Additional Coursera ID verification and ProctorU fees may apply. This is a pilot course and no additional seats will be released</td>
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<td>63395</td>
<td>Lecture-Discussion</td>
<td>RK</td>
<td>11:00 AM - 12:15 PM</td>
<td>WF</td>
<td>1105 - Siebel Center for Comp Sci</td>
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<th>Credit Hours: 4 hours</th>
<th>HCI for ML</th>
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<td>Restricted to Graduate - Urbana-Champaign.</td>
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Explores the use of data-driven methods to support creative design processes by examining recent work in human computer-interaction, product design, cognitive science, machine learning, graphics, vision, and natural language processing. Students will read and discuss recent papers from these fields, and work in teams on a multi-week project to build data-driven tools to solve real-world design problems. Practical data mining and machine learning knowledge is emphasized: crowdsourcing and web scraping, model and feature selection, parameter tuning. The course has no formal prerequisites, but students should be algorithmically and programmatically mature.

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<td>70200</td>
<td>Lecture-Discussion</td>
<td>RM</td>
<td>02:00 PM - 03:15 PM</td>
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<td>1105 - Siebel Center for Comp Sci</td>
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<tr>
<th>Credit Hours: 4 hours</th>
<th>Algorithmic Game Theory</th>
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Description: Algorithmic game theory has become more relevant than ever before with the advent of online markets, ad auctions, social networks, and recommendation systems, where rational agents interact to achieve selfish goals. The last two decades have witnessed the development of a rich theory in this area and deep mathematical connections have been established. The first half of the course will provide a broad introduction to games and market models, solution concepts, equilibrium computation & complexity, price of anarchy, auctions, and others. The second half will address a selection of advanced topics and research projects.

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<td>67898</td>
<td>Lecture-Discussion</td>
<td>RTS</td>
<td>09:30 AM - 10:45 AM</td>
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<th>Credit Hours: 4 hours</th>
<th>Real Time Systems</th>
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<td>Restricted to Graduate - Urbana-Champaign.</td>
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Modern Real Time Systems The landscape of real time computing has changed greatly. IoTs, robots, self-driving cars, drones and smart cities are coming. Sensors and actuators drivers are now integrated into miniature computers, and multicore chips with GPU are already in the market. • What are the application models and platform technologies assumed by existing real time computing technologies? • What are existing technology’s limitations in i) supporting the new needs and ii) exploiting capabilities of new platforms? • How do we bring an existing technology, e.g., real time computing, into a new era? In the 90's, the instructor’s team brought the then older state of the art real time computing technology into the then modern era, winning IEEE’s 2016 Simon Ramo Medal that awards members with exceptional achievements in system engineering and science. Let’s identify the opportunities offered by the “new continent” known as modern real time computing. This class is more about how to do research than a technology deep diving.

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<tr>
<td>46042</td>
<td>Lecture-Discussion</td>
<td>SS</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1214 - Siebel Center for Comp Sci</td>
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| Credit Hours: 4 hours | Advance Bioinformatics |
This course introduces a selection of topics in bioinformatics (mostly genomics) with a focus on probabilistic methods and statistical analysis, as well as basic principles of data science and computational sciences. Who this is for: The course will help graduate students aspiring to become bioinformatics researchers as well as students who are interested in data sciences in general and are looking for interesting applications. The course is less ideal for students interested in a casual exposure to the buzz surrounding bioinformatics. A research project (conceptualization and implementation) is a major component of the course grade, making the course unsuitable for students with little or no programming experience. Syllabus will tentatively include: Basic Molecular Biology, Probability/Statistics (probabilistic modeling, hypothesis testing, sampling), Introduction to Selected Bioinformatics topics (such as sequence alignment, enhancer prediction, epigenomics, modeling of gene expression, modeling of population evolution), and research paper reading on the selected topics.

67236  Lecture-Discussion  TEL  03:30 PM - 04:45 PM  MW  1214 - Siebel Center for Comp Sci  Telgarsky, M

Credit Hours: 4 hours
Machine Learning Theory
Restricted to Graduate - Urbana-Champaign.
This course will cover both basic material and certain advanced topics in machine learning theory. The core of the course will investigate the standard statistical learning theory model, along with its usual decoupling into representation, optimization, and generalization. The course will also touch on other learning models, for instance active learning and online learning. Specific material will include neural networks, linear regression, SVMs, boosting, consistency, VC dimension, Rademacher complexity, dimensionality reduction, and k-means. Grades will be based on homework and a final project. Prerequisites: basic probability, basic linear algebra.

70199  Lecture-Discussion  TMC  11:00 AM - 12:15 PM  WF  1103 - Siebel Center for Comp Sci  Chan, T

Credit Hours: 4 hours
Geometric Approx Algorithms
Restricted to Graduate - Urbana-Champaign.
Topic: Geometric Approximation Algorithms We study approximation algorithms in computational geometry -- how to solve problems involving geometric data faster when we do not need exact answers, with provable guarantees on the quality of the solutions. We will examine a variety of problems, about approximating the shape of point clouds (e.g., convex hull, diameter, width, and minimum enclosing ball), proximity (e.g., nearest neighbors, spanners, and minimum spanning trees), range counting, clustering (e.g., k-center), shortest paths in geometric graphs, and geometric versions of NP-hard optimization problems (e.g., set cover, independent set, and traveling salesman). A variety of techniques will be encountered (grids, quadtrees, coresets or sketching, random sampling, separators, linear programming relaxation, dimensionality reduction, etc.). Prerequisite: CS 374 or equivalent.

70394  Lecture-Discussion  TXU  02:00 PM - 03:15 PM  TR  1103 - Siebel Center for Comp Sci  Xu, T

Credit Hours: 4 hours
Reliability of Cloud-Scale Sys
Restricted to Graduate - Urbana-Champaign.
The purpose of this course is to teach the principles and practices of reliability engineering in modern "cloud-scale" systems, and expose students to the research of software and system reliability. We will look at how large-scale systems fail in the real world, and we will study the state-of-the-art reliability techniques and practices, including those widely adopted in industry and new ideas proposed by academia. This is a research-oriented seminar course with a major course project. Website: https://tianyin.github.io/cs598-fa18/

CS 599  Thesis Research  credit: 0 TO 16 hours.
Approved for S/U grading only. May be repeated.
Instructor Approval Required
Restricted to Computer Science major(s). Restricted to Graduate - Urbana-Champaign.
Students must see the CS Department to receive the appropriate CRN for the instructor.