## Computer Science

**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.

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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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<tbody>
<tr>
<td>35989</td>
<td>Lecture-Discussion</td>
<td>CXZ</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Zhai, C</td>
</tr>
</tbody>
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Credit Hours: 4 hours

**Topic:** Advanced Topics in Information Retrieval. Prerequisite: Background in one of the following areas: information retrieval, machine learning, natural language processing or data mining. This graduate-level course involves lectures, student presentations, and research projects on major research topics in information retrieval.

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<tr>
<td>49828</td>
<td>Lecture-Discussion</td>
<td>HI</td>
<td>01:00 PM - 03:50 PM</td>
<td>M</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Berlin, R Schatz, B</td>
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Credit Hours: 4 hours

**Topic:** Healthcare Infrastructure. Healthcare is the largest industry in the country, but the current infrastructure for providing healthcare is not viable. Recent advances in information technology promise radically different infrastructure that could provide a viable model for providing healthcare. This course will examine healthcare infrastructure through lectures and discussions, through text readings and web sites. There is a particular focus on measuring the health of populations, in the demographic era of chronic illness. Information sources are discussed in detail from medical literature and records to health brochures and monitors. There are no pre-requisites for this course, but students encouraged to use background experiences. Practical topics will be emphasized with the aim of revolutionizing an industry in transition. A semester project will be required, on information technology aspects of population health measurement. This section meets with LIS 590, Section HI.

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<tr>
<td>55918</td>
<td>Lecture-Discussion</td>
<td>LVK</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Kale, L</td>
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Credit Hours: 4 hours

**Topic:** Parallel Methods for Combinatorial Search. Combinatorial search problems occur in multiple domains including operations research and artificial intelligence. Solving them often requires a large computation. It is therefore desirable to use parallel machines, such as multicore desktops, clusters or supercomputers, for solving them. This course will study different categories of combinatorial search problems, and strategies for effective parallelization of each. The categories covered will include feasible-solution search, A* search, bi-directional search, branch-and-bound, and-or trees, and game-trees. Several broadly applicable techniques, including prioritization, load balancing, and use of distributed data-structures will be covered as well. We will also introduce languages including Charm++ that are suitable for this domain. Programming knowledge in C/C++ is required as a pre-requisite.

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<th>Instructor</th>
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<tr>
<td>46032</td>
<td>Lecture-Discussion</td>
<td>MAN</td>
<td>11:00 AM - 12:15 PM</td>
<td>WF</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Prabhakaran, M</td>
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Credit Hours: 4 hours

**Topic:** Applied Cryptography. This course is intended to provide a theoretically sound foundation in applied cryptography. We shall see fundamental cryptographic notions as well as higher level applications. The course will involve one project, which can involve theoretical and/or applied work.
Credit Hours: 4 hours  
Topic: Software Verification. Scientific methods for engineering reliable software is a grand challenge in computer science. This course is dedicated to studying state-of-the-art techniques for ensuring high reliability of software. We will study several techniques, ranging from testing, type-checking, static analysis, and formal verification, for ensuring correctness to ensure safety and security. The course will be driven by extensive student presentations of research papers and projects aimed to learn, explore, and perhaps even accomplish new research. The course will involve a project, aligned with the student's research area if possible. Graduate students already working on verification, security, or programming languages, with some basic knowledge of formal methods in verification, are encouraged to attend. The course will differ from CS476 as we will not be using rewriting techniques, and from CS477 as it will be more in-depth and research-oriented.

Credit Hours: 4 hours  
Topic: Distributed Algorithms. Prerequisites: ECE 428 or ECE 438. Distributed algorithms for wired networks, including algorithms for consensus, clock synchronization, mutual exclusion, broadcast; proofs of correctness of distributed algorithms; fault-tolerant distributed algorithms; distributed algorithms for wireless networks. Meets with ECE 598, Section NV, 54453.

Credit Hours: 4 hours  
Topic: Advanced Computer Networks. Advanced concepts in computer networks, including TCP and congestion control, quality of service, naming, routing, wireless networks, Internet architecture, measurement, network security, and selected recent research directions. Course consists of lectures, readings, and a term project. Prerequisite: CS 241 or ECE 391; one of MATH 461, MATH 463, ECE 313.

Credit Hours: 4 hours  
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).

Credit Hours: 4 hours  
Topic: Mobile/Wireless Computing. Wireless communication devices have become very common, even replacing traditional Ethernet cards in mobile computers. The nature of the communication services provided by such wireless devices differs drastically from wireline services, requiring different techniques at all layers of the protocol stack. The goal of this course is to explore these challenges in the context of many different networking environments, including ad hoc networks, sensor networks, mesh networks, delay tolerant networks, and last hop wireless networks. Prerequisite: CS 438 (Computer Networks) or the equivalent. It is assumed that students taking this class have prior knowledge of computer network protocols and architectures.
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<th>Course Code</th>
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<th>Topic</th>
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<tr>
<td>40105</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR 1131 - Siebel Center for Comp Sci</td>
<td>Har-Peled, S</td>
<td>4 hours</td>
<td>Randomized Algorithms. The last two decades have witnessed a tremendous growth in the area of randomized algorithms. During this period, randomized algorithms went from being a tool in computational number theory to finding widespread application in many types of algorithms. Two benefits of randomization have spearheaded this growth: simplicity and speed. This course presents the basic concepts in the design and analysis of randomized algorithms at a level accessible to advanced undergraduates and to graduate students. The aim is to touch upon various branches of the study of randomized algorithms. In the end of this course, one should be able to design and/or analyze a randomized algorithm for your favorite problem. For topics covered, see class notes from previous semester: <a href="http://valis.cs.uiuc.edu/~sariel/teach/notes/rand_alg/notes.pdf">http://valis.cs.uiuc.edu/~sariel/teach/notes/rand_alg/notes.pdf</a></td>
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<tr>
<td>43668</td>
<td>12:30 PM - 01:45 PM</td>
<td>WF 1304 - Siebel Center for Comp Sci</td>
<td>Lavalle, S</td>
<td>4 hours</td>
<td>Sensing, Actuation, and Computation. Material: Sensor models, visibility sensors, sensor networks, inference problems, information spaces, actuation models, minimalist planning, visual sweeps, searching with limited information, pursuit-evasion games, sensor-based navigation tasks, coordinate-free models, stochastic models, nontraditional communication models, sensor-centric models of computation, decidability and complexity for actuated sensor systems.</td>
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<tr>
<td>46041</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR 1111 - Siebel Center for Comp Sci</td>
<td>Abdelzaher, T</td>
<td>4 hours</td>
<td>Sensors and Green Computing. An emerging application area for sensing comes from the domain of green computing. This paper-reading course investigates recent advances in the broad realm of energy saving to reduce the carbon footprint of modern computing and engineered systems. A holistic coverage is given ranging from single device issues to algorithms for reducing power consumption of data centers. The course includes an experimental project on an energy testbed.</td>
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