Computer Science

CS 498  **Special Topics**  credit: 0 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>41438</td>
<td>Lecture</td>
<td>GG</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>1105 - Siebel Center for Comp Sci</td>
<td>Garnett, G</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to students in the Computer Science department.
Restricted to students with Junior, Senior, or Graduate class standing.
Topic: Game Design, Development, and Implementation. In this course, you will learn principles of game design, game theory and current video game technologies related to single and multiplayer games and virtual worlds. Topics will include theory of games, story crafting, game engines, graphics, physics simulations, AI simulation, world design, play testing, multi-player interaction models, user interface design. You will work in teams to design and develop game concepts and then implement them in a semester-long video game design project. Meets with INFO 490 GG and MUSIC 404 C.

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<tbody>
<tr>
<td>31590</td>
<td>Lecture</td>
<td>JG3</td>
<td>10:00 AM - 10:50 AM</td>
<td>MWF</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Gunderson, J</td>
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Credit Hours: 3 hours
Topic: Designing Universally Accessible Web 2.0 Applications. This is a project driven course to develop the next generation of open source toolbars to help web application developers understand the accessibility features (or lack of) of their web applications to people with disabilities. Students will learn about web accessibility, universal design and functional accessibility features needed by people with disabilities to access web applications. Students will learn to use HTML, CSS, javascript, ARIA and the Open Ajax Accessibility Rule set to build accessible web widgets and develop toolbars for popular browsers and web application frameworks. This section is for undergraduate or graduate students. Meets with LIS 490, JG3 & JG4.

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<td>55690</td>
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<td>JG4</td>
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<td>MWF</td>
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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
Topic: Designing Universally Accessible Web 2.0 Applications. This is a project driven course to develop the next generation of open source toolbars to help web application developers understand the accessibility features (or lack of) of their web applications to people with disabilities. Students will learn about web accessibility, universal design and functional accessibility features needed by people with disabilities to access web applications. Students will learn to use HTML, CSS, javascript, ARIA and the Open Ajax Accessibility Rule set to build accessible web widgets and develop toolbars for popular browsers and web application frameworks. This section is graduate students only. Meets with LIS 490, JG3 & JG4.

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<tr>
<td>50445</td>
<td>Lecture-Discussion</td>
<td>LA</td>
<td>ARRANGED -</td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
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Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.
Topic: Undergraduate Research Laboratory In this apprenticeship-style, hands-on laboratory, students learn to i) Pose testable research questions; ii) Write competitive grant proposals; iii) Create novel solutions using software and/or hardware; iv) Draw
valid scientific conclusions; and v) Present and publish results, conclusions and other materials. This team-based course is for undergraduate students only.

52301  Lecture  MG3  11:00 AM - 12:15 PM  WF  1103 - Siebel Center for Comp Sci  Garzaran, M

Credit Hours: 3 hours
Topic: Program Optimization. Prerequisite: CS 225 and CS 232. The focus of this course is the study of techniques for the implementation of efficient computations in terms of time and power consumption. Specific topics include: performance monitoring tools and techniques, program analysis and transformations for performance improvement, locality enhancement, multi-core processing, programming multimedia extensions, algorithm selection, and autotuning. This section is for undergraduate students only.

52302  Lecture  MG4  11:00 AM - 12:15 PM  WF  1103 - Siebel Center for Comp Sci  Garzaran, M

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
Topic: Program Optimization. Prerequisite: CS 225 and CS 232. The focus of this course is the study of techniques for the implementation of efficient computations in terms of time and power consumption. Specific topics include: performance monitoring tools and techniques, program analysis and transformations for performance improvement, locality enhancement, multi-core processing, programming multimedia extensions, algorithm selection, and autotuning. This section is for graduate students only.

55504  Lecture  MS3  09:30 AM - 10:45 AM  WF  1103 - Siebel Center for Comp Sci  Cappello, F Hoefler, T Snir, M

Credit Hours: 3 hours
Topic: Hot Topics in High Performance Parallel Computing: Networks and Fault Tolerance. Large-scale computer systems such as Petascale or upcoming Exascale machines pose significant challenges on the system and software designers. In this course, we will address to very important topics in this design: HPC networking and Fault Tolerance. The network will soon be the most expensive and critical part of large machines and fault tolerance is needed to ensure correct operation under the increasing probability of failures of single elements. This course requires basic knowledge in graph theory and system architecture. This section is for undergraduate or graduate students.

55505  Lecture  MS4  09:30 AM - 10:45 AM  WF  1103 - Siebel Center for Comp Sci  Cappello, F Hoefler, T Snir, M

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
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54566  Lecture  MV3  03:30 PM - 04:45 PM  TR  1131 - Siebel Center for Comp Sci  Viswanathan, M

Credit Hours: 3 hours
Topic: Logical Systems. 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, CS 225, and CS 373, or instructor's consent. In particular, students should be familiar with inductive proofs, propositional logic syntax, ability to use quantifiers (for all 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 either undergraduate or graduate students.

### Credit Hours: 4 hours

**Course Title:** Logical Systems. 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, CS 225, and CS 373, or instructor’s consent. In particular, students should be familiar with inductive proofs, propositional logic syntax, ability to use quantifiers (for all 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 graduate students only.

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<tr>
<td>55128</td>
<td>Lecture</td>
<td>SM3</td>
<td>01:00 PM - 03:50 PM</td>
<td>Hart, J Stroila, M</td>
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### Credit Hours: 3 hours

**Course Title:** Mobile Augmented Reality for Pedestrian Navigation. In this course we will be concentrating on recent technology that facilitates the development of augmented reality pedestrian navigation applications: geo-referenced data (maps, LiDAR point clouds, panoramic images and depth maps, 3D models), smartphones (phone sensors: camera, GPS, accelerometer, compass), graphics engines (OpenGL ES) to overlay relevant information in the viewfinder, and, more recently, vision engines that perform natural feature detection and tracking in the video data captured with the phone camera. This is a project-focused class. We will build prototype applications for Nokia mobile phones using Commercial GIS/Map data. We will also read and present relevant papers. Several presenters from the Geospatial industry will come to talk about the latest relevant technology. This section is for either undergraduate or graduate students.

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