COMPUTER SCIENCE, BS

for the degree of Bachelor of Science in Computer Science

department website: https://cs.illinois.edu
department faculty: Computer Science Faculty (https://cs.illinois.edu/people/faculty/)
overview of college admissions & requirements: The Grainger College of Engineering (https://grainger.illinois.edu/admissions/)
college website: https://grainger.illinois.edu/

The Computer Science curriculum provides both a broad and deep knowledge of the theory, design, and application of computer systems, with an emphasis on software systems. Because computing is ubiquitous, application areas involve virtually any field imaginable - from developing gene sequencing algorithms via techniques in computational biology, to designing user interfaces for mobile applications; from designing methods for high frequency trading, to creating computer generated graphics and special effects in the gaming industry; and from creating embedded real time systems to be deployed in medical devices, to analyzing social data from internet communication patterns. During the first two years the curriculum provides a strong foundation in mathematics, science, and computation. Advanced coursework in areas of the student's choosing follows in the second two years, which include either a senior thesis or a senior project. Graduates may go on to graduate study or leading positions in industry.

A combined B.S.-M.S. and B.S-M.C.S. degree program is available. The admission and course requirements are described on the Computer Science website (https://cs.illinois.edu/academics/graduate/fifth-year-masters-programs/5-year-bs-ms-program/).

for the degree of Bachelor of Science in Computer Science

Graduation Requirements

Minimum Technical GPA (https://wiki.illinois.edu/wiki/display/ugadvice/Degree+Requirements/#DegreeRequirements-TechnicalGPARequirement): 2.0
TGPA is required for CS and Math courses. See Technical GPA (https://wiki.illinois.edu/wiki/display/ugadvice/Degree+Requirements/#DegreeRequirements-TechnicalGPARequirement) to clarify requirements.

Minimum Overall GPA: 2.0
Minimum hours required for graduation: 128 hours
General education: Students must complete the Campus General Education (https://courses.illinois.edu/gened/DEFAULT/DEFAULT/) requirements including the campus general education language requirement.

Orientation and Professional Development

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 100</td>
<td>Freshman Orientation (optional course highly recommended may be used to help meet free elective requirements)</td>
<td>1</td>
</tr>
<tr>
<td>CS 210</td>
<td>Ethical &amp; Professional Issues</td>
<td>2 or 3</td>
</tr>
<tr>
<td>or CS 211</td>
<td>Ethical and Professional Conduct</td>
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Foundational Mathematics and Science

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>MATH 221</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus II</td>
<td>3</td>
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<tr>
<td>MATH 241</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 415</td>
<td>Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 257</td>
<td>Linear Algebra with Computational Applications</td>
<td></td>
</tr>
<tr>
<td>or MATH 416</td>
<td>Abstract Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>PHYS 211</td>
<td>University Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>University Physics: Elec &amp; Mag</td>
<td>4</td>
</tr>
</tbody>
</table>

One Science elective course:

Students must take one course from the Natural Science & Technology (NST) list, in addition to those taken as part of the General Education requirements. The course must be a course that is allowed for credit by the Grainger College of Engineering.

Exceptions to the list are: ASTR 100, PHYS 101 and PHYS 102, and CHEM 101.

Students who select either ASTR 121, ASTR 122, or ASTR 150 to satisfy the Science Elective requirement will not be allowed to take ASTR 131 and ASTR 132 as free elective (maximum of 4 credit hours of ASTR 100-level can count towards graduation requirements for all Grainger College of Engineering Undergraduates)

Computer Science Technical Core

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CS 124</td>
<td>Introduction to Computer Science I (Intro to Computer Science I)</td>
<td>3</td>
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<tr>
<td>CS 128</td>
<td>Introduction to Computer Science II (Intro to Computer Science II)</td>
<td>3</td>
</tr>
<tr>
<td>CS 173</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS 222</td>
<td>Software Design Lab (Software Design Lab)</td>
<td>1</td>
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<tr>
<td>CS 225</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CS 233</td>
<td>Computer Architecture</td>
<td>4</td>
</tr>
<tr>
<td>CS 241</td>
<td>System Programming</td>
<td>4</td>
</tr>
<tr>
<td>CS 361</td>
<td>Probability &amp; Statistics for Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 357</td>
<td>Numerical Methods I</td>
<td>3</td>
</tr>
<tr>
<td>CS 374</td>
<td>Introduction to Algorithms &amp; Models of Computation</td>
<td>4</td>
</tr>
<tr>
<td>CS 421</td>
<td>Programming Languages &amp; Compilers</td>
<td>3</td>
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</table>

Total Hours: 35

Information listed in this catalog is current as of 06/2021
**Technical Electives**

Students must take a minimum of (6) six additional technical electives with at least eighteen (18) cumulative credit hours and chosen from CS 397 and the CS 400-level courses, not including CS 400, CS 401, CS 402, CS 403 or CS 407. CS 500-level courses may be used as technical electives, but only with special permission from the CS Academic Office. CS 397 and CS 499 may be used with a cumulative maximum of six (6) credits from them counting as technical electives. One "CS-like" course in another department (e.g., ECE) may also be counted as a CS 400-level course with permission of the CS Academic Office. Non-CS tech electives will not be considered in focus areas.

At least one (1) of the CS courses used for technical electives must be chosen from the list below of CS courses satisfying the team project requirement.

### Team Project Course List:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 417</td>
<td>Virtual Reality (Virtual Reality)</td>
<td>3</td>
</tr>
<tr>
<td>CS 427</td>
<td>Software Engineering I</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 428</td>
<td>Software Engineering II</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 429</td>
<td>Software Engineering II, ACP</td>
<td>3</td>
</tr>
<tr>
<td>CS 437</td>
<td>Topics in Internet of Things (Topics in Internet of Things)</td>
<td>3</td>
</tr>
<tr>
<td>CS 465</td>
<td>User Interface Design</td>
<td>4</td>
</tr>
<tr>
<td>CS 467</td>
<td>Social Visualization</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 493</td>
<td>Senior Project II, ACP</td>
<td>3</td>
</tr>
<tr>
<td>CS 494</td>
<td>Senior Project II</td>
<td>3</td>
</tr>
<tr>
<td>CS 497</td>
<td>CS Team Project</td>
<td>1 to 3</td>
</tr>
</tbody>
</table>

At least three (3) of the CS courses used for technical electives must be chosen from a single focus area, from among the list of focus areas listed below. The team project course may be used as one of them.

CS 498 Special Topics and CS 598 Special Topics classes may be included in a focus area by department approval.

### Software Foundations:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 407</td>
<td>Cryptography (Cryptography)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 409</td>
<td>The Art of Web Programming (The Art of Web Design)</td>
<td>3</td>
</tr>
<tr>
<td>CS 422</td>
<td>Programming Language Design</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 426</td>
<td>Compiler Construction</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 427</td>
<td>Software Engineering I</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 428</td>
<td>Software Engineering II</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 429</td>
<td>Software Engineering II, ACP</td>
<td>3</td>
</tr>
<tr>
<td>CS 474</td>
<td>Logic in Computer Science (Logic in Computer Science)</td>
<td>3 or 4</td>
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<tr>
<td>CS 476</td>
<td>Program Verification</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 477</td>
<td>Formal Software Development Methods</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 492</td>
<td>Senior Project I</td>
<td>3</td>
</tr>
<tr>
<td>CS 521</td>
<td>Advanced Topics in Programming Systems (Advanced Topics in Programming Systems)</td>
<td>4</td>
</tr>
<tr>
<td>CS 522</td>
<td>Programming Language Semantics</td>
<td>4</td>
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<tr>
<td>CS 524</td>
<td>Concurrent Progmr Languages</td>
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</tr>
<tr>
<td>CS 526</td>
<td>Advanced Compiler Construction</td>
<td>4</td>
</tr>
<tr>
<td>CS 527</td>
<td>Topics in Software Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CS 528</td>
<td>Obj-Oriented Progrm &amp; Design</td>
<td>4</td>
</tr>
<tr>
<td>CS 576</td>
<td>Topics in Automated Deduction</td>
<td>2 to 4</td>
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</table>

### Algorithms and Models of Computation:

<table>
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<tr>
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<tbody>
<tr>
<td>CS 407</td>
<td>Cryptography (Cryptography)</td>
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<tr>
<td>CS 413</td>
<td>Intro to Combinatorics</td>
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<tr>
<td>CS 473</td>
<td>Algorithms</td>
<td>4</td>
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<tr>
<td>CS 474</td>
<td>Logic in Computer Science (Logic in Computer Science)</td>
<td>3 or 4</td>
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<tr>
<td>CS 475</td>
<td>Formal Models of Computation</td>
<td>3 or 4</td>
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<tr>
<td>CS 476</td>
<td>Program Verification</td>
<td>3 or 4</td>
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<tr>
<td>CS 477</td>
<td>Formal Software Development Methods</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 481</td>
<td>Advanced Topics in Stochastic Processes &amp; Applications</td>
<td>3 or 4</td>
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<tr>
<td>CS 482</td>
<td>Simulation</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 571</td>
<td>Combinatorial Mathematics</td>
<td>4</td>
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<tr>
<td>CS 572</td>
<td>Extremal Graph Theory</td>
<td>4</td>
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<tr>
<td>CS 573</td>
<td>Algorithms</td>
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<td>CS 574</td>
<td>Randomized Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>CS 575</td>
<td>Methods of Combinatorics</td>
<td>4</td>
</tr>
<tr>
<td>CS 576</td>
<td>Topics in Automated Deduction</td>
<td>2 to 4</td>
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<tr>
<td>CS 579</td>
<td>Computational Complexity</td>
<td>4</td>
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<tr>
<td>CS 580</td>
<td>Topics in Algorithmic Game Theory (Topics in Algorithmic Game Theory)</td>
<td>4</td>
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<tr>
<td>CS 583</td>
<td>Approximation Algorithms</td>
<td>4</td>
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<tr>
<td>CS 584</td>
<td>Embedded System Verification</td>
<td>4</td>
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### Intelligence and Big Data:

<table>
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<th>Code</th>
<th>Title</th>
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<tr>
<td>CS 410</td>
<td>Text Information Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 411</td>
<td>Database Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 412</td>
<td>Introduction to Data Mining</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 414</td>
<td>Multimedia Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 416</td>
<td>Data Visualization (Data Visualization)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 440</td>
<td>Artificial Intelligence</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 441</td>
<td>Applied Machine Learning (Applied Machine Learning)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 445</td>
<td>Computational Photography</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 446</td>
<td>Machine Learning</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 447</td>
<td>Natural Language Processing</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 448</td>
<td>Audio Computing Laboratory (Audio Computing Laboratory)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 464</td>
<td>Topics in Societal and Ethical Impacts of Computer Technology (Topics in Societal and Ethical Impacts of Computer Technology)</td>
<td>3</td>
</tr>
<tr>
<td>CS 466</td>
<td>Introduction to Bioinformatics</td>
<td>3 or 4</td>
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<tr>
<td>CS 467</td>
<td>Social Visualization</td>
<td>3 or 4</td>
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<tr>
<td>CS 469</td>
<td>(Computational Advertising)</td>
<td>3</td>
</tr>
<tr>
<td>CS 510</td>
<td>Advanced Information Retrieval</td>
<td>4</td>
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<tr>
<td>CS 511</td>
<td>Advanced Data Management</td>
<td>4</td>
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<tr>
<td>CS 512</td>
<td>Data Mining Principles</td>
<td>4</td>
</tr>
<tr>
<td>CS 514</td>
<td>Advanced Topics in Network Science (Advanced Topics in Network Science)</td>
<td>4</td>
</tr>
<tr>
<td>CS 540</td>
<td>Deep Learning Theory (Deep Learning Theory)</td>
<td>4</td>
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Information listed in this catalog is current as of 06/2021
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CS 542</td>
<td>Statistical Reinforcement Learning (Statistical Reinforcement Learning)</td>
<td>4</td>
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<tr>
<td>CS 543</td>
<td>Computer Vision</td>
<td>4</td>
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<tr>
<td>CS 544</td>
<td>Optimiz in Computer Vision</td>
<td>4</td>
</tr>
<tr>
<td>CS 545</td>
<td>Machine Learning for Signal Processing (Machine Learning for Signal Processing)</td>
<td>4</td>
</tr>
<tr>
<td>CS 546</td>
<td>Advanced Topics in Natural Language Processing (Advanced Topics in NLP)</td>
<td>4</td>
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<tr>
<td>CS 548</td>
<td>Models of Cognitive Processes</td>
<td>4</td>
</tr>
<tr>
<td>CS 562</td>
<td>Advanced Topics in Security, Privacy, and Machine Learning (Advanced Topics in Security, Privacy, and ML)</td>
<td>4</td>
</tr>
<tr>
<td>CS 567</td>
<td>Social Signals and Social Media (Social Signals and Social Media)</td>
<td>4</td>
</tr>
<tr>
<td>CS 576</td>
<td>Topics in Automated Deduction</td>
<td>2 to 4</td>
</tr>
<tr>
<td>CS 409</td>
<td>The Art of Web Programming (The Art of Web Design)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 416</td>
<td>Data Visualization (Data Visualization)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 417</td>
<td>Virtual Reality (Virtual Reality)</td>
<td>3 or 4</td>
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<td>CS 441</td>
<td>Applied Machine Learning (Applied Machine Learning)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 460</td>
<td>Security Laboratory</td>
<td>3 or 4</td>
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<tr>
<td>CS 461</td>
<td>Computer Security I</td>
<td>4</td>
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<tr>
<td>CS 463</td>
<td>Computer Security II</td>
<td>3 or 4</td>
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<td>CS 464</td>
<td>Topics in Societal and Ethical Impacts of Computer Technology (Topics in Societal and Ethical Impacts of Computer Technology)</td>
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<tr>
<td>CS 465</td>
<td>User Interface Design</td>
<td>4</td>
</tr>
<tr>
<td>CS 467</td>
<td>Social Visualization</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 468</td>
<td>Tech and Advertising Campaigns</td>
<td>3</td>
</tr>
<tr>
<td>CS 469</td>
<td>(Computational Advertising)</td>
<td>3</td>
</tr>
<tr>
<td>CS 470</td>
<td>Current Topics in Computing Education Research (Current Topics in Computing Education Research)</td>
<td>4</td>
</tr>
<tr>
<td>CS 514</td>
<td>Advanced Topics in Network Science (Advanced Topics in Network Science)</td>
<td>4</td>
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<tr>
<td>CS 562</td>
<td>Advanced Topics in Security, Privacy, and Machine Learning (Advanced Topics in Security, Privacy, and ML)</td>
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<tr>
<td>CS 563</td>
<td>Advanced Computer Security</td>
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<tr>
<td>CS 565</td>
<td>Human-Computer Interaction</td>
<td>4</td>
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<tr>
<td>CS 566</td>
<td>(Experimental HCI)</td>
<td>4</td>
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<tr>
<td>CS 567</td>
<td>Social Signals and Social Media (Social Signals and Social Media)</td>
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**Human and Social Impact:**

<table>
<thead>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CS 409</td>
<td>The Art of Web Programming (The Art of Web Design)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 414</td>
<td>Multimedia Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 417</td>
<td>Virtual Reality (Virtual Reality)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 418</td>
<td>Interactive Computer Graphics</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 419</td>
<td>Production Computer Graphics</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 445</td>
<td>Computational Photography</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 448</td>
<td>Audio Computing Laboratory (Audio Computing Laboratory)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 465</td>
<td>User Interface Design</td>
<td>4</td>
</tr>
<tr>
<td>CS 467</td>
<td>Social Visualization</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 468</td>
<td>Tech and Advertising Campaigns</td>
<td>3</td>
</tr>
<tr>
<td>CS 469</td>
<td>(Computational Advertising)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 519</td>
<td>Scientific Visualization</td>
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<tr>
<td>CS 545</td>
<td>Machine Learning for Signal Processing (Machine Learning for Signal Processing)</td>
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<td>CS 556</td>
<td>Human-Computer Interaction</td>
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<td>CS 557</td>
<td>Scientific Visualization</td>
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</tr>
<tr>
<td>CS 558</td>
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**Scientific, Parallel, and High Performance Computing:**

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<th>Course Title</th>
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<tr>
<td>CS 407</td>
<td>Cryptography (Cryptography)</td>
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<tr>
<td>CS 423</td>
<td>Operating Systems Design</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 424</td>
<td>Real-Time Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 425</td>
<td>Distributed Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 431</td>
<td>Embedded Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 435</td>
<td>Cloud Networking (Cloud Networking)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 436</td>
<td>Computer Networking Laboratory</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 437</td>
<td>Topics in Internet of Things (Topics in Internet of Things)</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 438</td>
<td>Communication Networks</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 439</td>
<td>Wireless Networks</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 460</td>
<td>Security Laboratory</td>
<td>3 or 4</td>
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<tr>
<td>CS 461</td>
<td>Computer Security I</td>
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<tr>
<td>CS 463</td>
<td>Computer Security II</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 483</td>
<td>Applied Parallel Programming</td>
<td>4</td>
</tr>
<tr>
<td>CS 484</td>
<td>Parallel Programming</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 523</td>
<td>Advanced Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>CS 524</td>
<td>Concurrent Progrm Languages</td>
<td>4</td>
</tr>
<tr>
<td>CS 525</td>
<td>Advanced Distributed Systems</td>
<td>4</td>
</tr>
<tr>
<td>CS 537</td>
<td>Advanced Topics in Internet of Things (IoT) (Advanced Topics in Internet of Things)</td>
<td>4</td>
</tr>
<tr>
<td>CS 538</td>
<td>Advanced Computer Networks</td>
<td>4</td>
</tr>
<tr>
<td>CS 562</td>
<td>Advanced Topics in Security, Privacy, and Machine Learning (Advanced Topics in Security, Privacy, and ML)</td>
<td>4</td>
</tr>
<tr>
<td>CS 563</td>
<td>Advanced Computer Security</td>
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Computer Science, BS

**Machines:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CS 423</td>
<td>Operating Systems Design</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 424</td>
<td>Real-Time Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 426</td>
<td>Compiler Construction</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 431</td>
<td>Embedded Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 433</td>
<td>Computer System Organization</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 484</td>
<td>Parallel Programming</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 523</td>
<td>Advanced Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>CS 526</td>
<td>Advanced Compiler Construction</td>
<td>4</td>
</tr>
<tr>
<td>CS 533</td>
<td>Parallel Computer Architecture</td>
<td>4</td>
</tr>
<tr>
<td>CS 534</td>
<td>Advanced Topics in Computer Architecture</td>
<td>4</td>
</tr>
<tr>
<td>CS 536</td>
<td>Fault-Tolerant Dig Syst Design</td>
<td>4</td>
</tr>
<tr>
<td>CS 541</td>
<td>Computer Systems Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CS 584</td>
<td>Embedded System Verification</td>
<td>4</td>
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</table>

**Computer Science Advanced Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 241</td>
<td>System Programming</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 243</td>
<td>Fault-Tolerant Dig Syst Design</td>
<td>4</td>
</tr>
<tr>
<td>CS 246</td>
<td>Compiler Construction</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 251</td>
<td>Parallel Programming</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CS 252</td>
<td>Advanced Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>CS 254</td>
<td>Advanced Compiler Construction</td>
<td>4</td>
</tr>
<tr>
<td>CS 256</td>
<td>Parallel Computer Architecture</td>
<td>4</td>
</tr>
<tr>
<td>CS 258</td>
<td>Advanced Topics in Computer Architecture</td>
<td>4</td>
</tr>
<tr>
<td>CS 260</td>
<td>Fault-Tolerant Dig Syst Design</td>
<td>4</td>
</tr>
<tr>
<td>CS 264</td>
<td>Computer Systems Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CS 268</td>
<td>Embedded System Verification</td>
<td>4</td>
</tr>
</tbody>
</table>

Students must take for a letter grade a minimum of two (2) advanced elective courses comprising at least six (6) credit hours. These advanced elective courses must be distinct from courses used to satisfy the technical electives. They may be chosen from CS 397 Individual Study and the 400-level coursework offered for letter grade in ANY area offered at the University of Illinois at Urbana-Champaign. It is expected that students will select these additional advanced courses in a way that best augments their program of study. Consultation with a faculty mentor is highly encouraged. A maximum of six (6) credit hours of CS 397 may be used in the combination of technical electives and advanced electives.

**Electives**

The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts.

Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree.

**Total Hours of Curriculum to Graduate** 128

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1. External transfer students take ENG 300 instead.
2. MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.
3. The Grainger College of Engineering approved liberal education course list can be found here [https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-GeneralEducationElectives](https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-GeneralEducationElectives). Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.

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4. The Grainger College of Engineering restrictions to free electives can be found here [https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-FreeElectives](https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-FreeElectives) for the degree of Bachelor of Science in Computer Science.

**Suggested Sequence**

The curriculum sequence below is a suggested sequence, as all Grainger Engineering students work with a department academic advisor to achieve their educational goals, specific to their needs and preparation. Dynamic and Static curricular maps, which include prerequisite sequencing, can be found here [https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/cs-map/](https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/cs-map/).

**First Year**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td></td>
</tr>
<tr>
<td>First Semester</td>
<td>15-14</td>
</tr>
<tr>
<td>Second Semester</td>
<td>15-16</td>
</tr>
<tr>
<td>Second Year</td>
<td></td>
</tr>
<tr>
<td>First Semester</td>
<td>16</td>
</tr>
<tr>
<td>Second Semester</td>
<td>17</td>
</tr>
<tr>
<td>Third Year</td>
<td></td>
</tr>
<tr>
<td>First Semester</td>
<td>2</td>
</tr>
<tr>
<td>Second Semester</td>
<td>3</td>
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</table>

**First Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CS 100</td>
<td>Freshman Orientation</td>
<td>1</td>
</tr>
<tr>
<td>CS 124</td>
<td>Introduction to Computer Science I</td>
<td>3</td>
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<tr>
<td>ENG 100</td>
<td>Engineering Orientation</td>
<td>0</td>
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<tr>
<td>MATH 221</td>
<td>Calculus I</td>
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<tr>
<td>Science elective</td>
<td>3</td>
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<tr>
<td>RHET 105</td>
<td>Writing and Research</td>
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**Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CS 128</td>
<td>Introduction to Computer Science II</td>
<td>3</td>
</tr>
<tr>
<td>CS 173</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus II</td>
<td>3</td>
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<tr>
<td>General education elective</td>
<td>3</td>
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**Third Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CS 210</td>
<td>Ethical Professional Issues</td>
<td>2</td>
</tr>
<tr>
<td>CS 241</td>
<td>System Programming</td>
<td>4</td>
</tr>
<tr>
<td>CS 357</td>
<td>Numerical Methods I</td>
<td>3</td>
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</table>
CS Technical elective\(^8\) 3
Free Elective 4

**Semester Hours** 16

**Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CS 374 Introduction to Algorithms Models of Computation</td>
<td>4</td>
</tr>
<tr>
<td>CS Technical electives(^8)</td>
<td>6</td>
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<tr>
<td>General Education elective(^5)</td>
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</table>

**Semester Hours** 16

**Fourth Year**

**First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CS 421 Programming Languages Compilers</td>
<td>3</td>
</tr>
<tr>
<td>CS Technical electives(^8)</td>
<td>6</td>
</tr>
<tr>
<td>General Education electives(^5)</td>
<td>3</td>
</tr>
<tr>
<td>Free electives</td>
<td>5</td>
</tr>
</tbody>
</table>

**Semester Hours** 17

**Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
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<tr>
<td>CS Technical electives(^8)</td>
<td>9</td>
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<tr>
<td>Free electives</td>
<td>7</td>
</tr>
</tbody>
</table>

**Semester Hours** 16

**Total Hours:** 128

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1. This optional course is highly recommended for freshmen, who may use it to help meet free elective requirements.

2. MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

3. Students must take one course from the Natural Science & Technology (NST) list, in addition to those taken as part of the General Education Requirements. The course must be one that is allowed for credit by the Grainger College of Engineering.

4. RHET 105 (or an alternative Composition I sequence) is taken either in the first or second semester of the first year, according to the student’s UIN (Spring if your UIN is Odd). General Education Elective is taken the other semester. Composition I guidelines can be found at [http://catalog.illinois.edu/general-information/degree-general-education-requirements/](http://catalog.illinois.edu/general-information/degree-general-education-requirements/) under Written Communication Requirement.

5. Students must take 6 hours from the campus General Education Social and Behavioral Sciences list, 6 hours from campus General Education Humanities and the Arts list, and 6 hours from a liberal education list approved by the college or from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course, (ii) one non-western culture(s) course, and (iii) one U.S. Minority Culture(s) course from the General Education cultural studies lists. Most students select general education courses that simultaneously satisfy these cultural studies requirements.

6. MATH 415 or MATH 416 may be substituted

7. CS 211 may be substituted. The extra 1 credit hour difference between CS 210 and CS 211 will apply to free electives.

8. To be chosen from a departmentally approved list ([https://cs.illinois.edu/academics/undergraduate/degree-program-options/bs-computer-science-engineering/#technical-electives](https://cs.illinois.edu/academics/undergraduate/degree-program-options/bs-computer-science-engineering/#technical-electives)), and to include at least three courses from a single focus area.