The Threads™ represent partial paths through the curriculum. Thus, a student weaves a degree from these Threads. Students are not forced to make Thread decisions very early in their academic careers; however, they may if they want. We define the Threads so they are flexible enough to allow for a variety of technical and creative experiences. Threads are coherent enough that students develop computing skills even if their focus shifts as they go along.

The Modeling - Simulation thread is intended for students interested in developing a deep understanding and appreciation of how natural and human-generated systems such as weather, biological processes, supply chains, or computers can be represented by mathematical models and computer software. Such models are widely used today to better understand and predict the behavior of such systems. Because these models are often described and represented by mathematical expressions, and the models themselves often deal with physical phenomena, a background in mathematics and the sciences is required. Combining this background with a deep knowledge in computer science will yield the basic tools necessary to transform abstract conceptual models to computer programs that execute efficiently on digital machines. The required coursework in this thread includes topics in continuous and discrete mathematics, the sciences, and computing. Elective courses enable students to further develop and apply their knowledge and skills to a specific discipline where Modeling - Simulation plays an important role.

The Systems and Architecture thread is where many of the practical skills of computing are learned. Like Theory, Systems and Architecture lies at the center of computing. It prepares students to create and evaluate computer architectures, systems, and languages across a variety of paradigms and approaches.

### Bachelor of Science in Computer Science - Thread: Modeling - Simulation & Systems and Architecture

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>APPH 1040</td>
<td>Scientific Foundations of Health</td>
<td>2</td>
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<tr>
<td>or APPH 10</td>
<td>The Science of Physical Activity and Health</td>
<td>2</td>
</tr>
<tr>
<td>ENGL 1101</td>
<td>English Composition I</td>
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</tr>
<tr>
<td>ENGL 1102</td>
<td>English Composition II</td>
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<tr>
<td>MATH 1552</td>
<td>Integral Calculus</td>
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### Core A - Essential Skills

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CS 1301</td>
<td>Introduction to Computing</td>
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### Core B - Institutional Options

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>CS 1100</td>
<td>Freshman Leap Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CS 1331</td>
<td>Introduction to Object Oriented Programming</td>
<td>3</td>
</tr>
<tr>
<td>CS 1332</td>
<td>Data Structures and Algorithms for Applications</td>
<td>3</td>
</tr>
<tr>
<td>CS 2050</td>
<td>Introduction to Discrete Mathematics for Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>or CS 2051</td>
<td>Honors - Induction to Discrete Mathematics for Computer Science</td>
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### Core E - Social Sciences

<table>
<thead>
<tr>
<th>Code</th>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 2111</td>
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<td>POL 1101</td>
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<td>3</td>
</tr>
<tr>
<td>PUBP 3000</td>
<td>American Constitutional Issues</td>
<td>9</td>
</tr>
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</table>

### Core F - Courses Related to Major

#### Lab Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>MATH 1551</td>
<td>Differential Calculus</td>
<td>2</td>
</tr>
<tr>
<td>MATH 1554</td>
<td>Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 156</td>
<td>Linear Algebra with Abstract Vector Spaces</td>
<td>4</td>
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</table>

### Concentration

<table>
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<tr>
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<tbody>
<tr>
<td>CS 1171</td>
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<td>Computer Organization and Programming</td>
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</tr>
<tr>
<td>CS 2200</td>
<td>Computer Systems and Networks</td>
<td>4</td>
</tr>
<tr>
<td>CS 3210</td>
<td>Design of Operating Systems</td>
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<td>CS 3510</td>
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<td>or CS 3511</td>
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<td>ECE 2031</td>
<td>Digital Design Laboratory</td>
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<tr>
<td>MATH 2552</td>
<td>Differential Equations</td>
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Select two of the following for Computational Science and Engineering:

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<tbody>
<tr>
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</tr>
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<td>CX 4140</td>
<td>Computational Modeling Algorithms</td>
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<td>Computer Simulation</td>
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<td>CX 4640</td>
<td>Numerical Analysis</td>
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Select one of the following for Software Systems Tools:

<table>
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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CS 3300</td>
<td>Introduction to Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CS 4240</td>
<td>Compilers, Interpreters, and Program Analyzers</td>
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### Junior Design Options (Capstone)

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<td>CS 4001</td>
<td>Computing, Society, and Professionalism</td>
<td>3</td>
</tr>
<tr>
<td>or CS 4002</td>
<td>Robots and Society</td>
<td>3</td>
</tr>
<tr>
<td>or CS 4726</td>
<td>Privacy, Technology, Policy, and Law</td>
<td>3</td>
</tr>
<tr>
<td>or SLS 3110</td>
<td>Technology and Sustainable Community Development</td>
<td>3</td>
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</table>

### Major Requirements

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<td>Compilers, Interpreters, and Program Analyzers</td>
<td>3</td>
</tr>
</tbody>
</table>
Select one of the following for Advanced Systems Architectures:  
1. CS 4210 Advanced Operating Systems  
2. CS 4220 Programming Embedded Systems  
3. CS 4290 Advanced Computer Organization  

Other Required Courses  
MATH 3012 Applied Combinatorics  

Select one of the following:  
1. MATH 3215 Introduction to Probability and Statistics  
2. MATH 3670 Probability and Statistics with Applications  
3. CEE 3770 Statistics and Applications  
4. ISYE 3770 Statistics and Applications or ISYE 2027 Probability with Applications & ISYE 2028 Basic Statistical Methods  

Free Electives  
Free Electives  

Total Credit Hours  

Pass-fail only allowed for Free Electives (max 6 credit hours), CS 1100, and CS 1171 (if required)  

1. Minimum grade of C required.  
2. Two of three lab sciences MUST be a sequence.  
3. Junior Design Options are as follows (students must pick one option and may not change):  
   a. Option 1 - LMC 3432, LMC 3431, CS 3311, CS 3312  
   b. Option 2 - ECE VIP courses and LMC 3403  
   c. Option 3 - Satisfy Georgia Tech Research Option.  
   d. Option 4 - CS 2701 (3 hours), CS 4699-I2P (3 hours), LMC 3403 (3 hours) + 9 hours OR CS 4699-I2P (6 hours), LMC 3403 (3 hours) = 9 hours  

Six credits of the Junior Design option are used as Major Requirements and the average credits of research/VIP (5 credit hours/2 credit hours) may be used as free electives. Students completing VIP for their junior design requirement will be required to complete at least three semesters of VIP. (VIP 1 + VIP 2 + VIP 3) (for a total of 5 credit hours) + LMC 3403 = 8 hours of VIP credit. Students using CREATE-X for junior design take at least 6 hours of CREATE-X Start-up Lab and Idea 2 Prototype (I2P) and 3 of the 6 hours must be I2P. Students take these 6 hours with LMC 3403 (3 hours) for a total of 9 hours. Extra three hours for CREATE-X option can be used in free electives.  

4. Two credit hours of MATH 1554 may count along with MATH 2550 to give Area F 18 credit hours.  

Cooperative Programs  
The College of Computing participates in the undergraduate and graduate Cooperative Programs. See links below for further Information:  
- Undergraduate Cooperative Plan (http://catalog.gatech.edu/academics/special-academic-programs/experiential-education/center-career-discovery-development)  
- Graduate Cooperative Plan (http://catalog.gatech.edu/academics/special-academic-programs/experiential-education/graduate-cooperative-plan)  

International Plan  
The College of Computing (http://www.cc.gatech.edu) has an approved BS CS International Plan that accommodates the unique requirements of this option discussed in the International Plan section of the catalog (http://www.catalog.gatech.edu/academics/special-academic-programs/international-plan).  

However, due to the flexible nature of the Threads curriculum, the International Plan designation may not be available with all of the Thread combinations. Efforts will be made to work with interested students to accommodate their individual circumstances with regard to the International Plan designator for the Bachelor of Science in Computer Science.  

Research Option  
To complete the Research Option in the College of Computing, students must:  
1. Complete at least nine units of undergraduate research  
   a. Over at least two, preferably three terms  
   b. Research may be for either pay or credit;  
2. Write an undergraduate thesis/report of research on their findings;  
3. Take  
   a. LMC 4701: Undergraduate Research Proposal Writing (taken during the first or second semester of research)  
   b. LMC 4702: Undergraduate Research Thesis Writing (taken during the thesis writing semester).  

Research Classes  
The following classes count toward fulfillment of the Research Option:  

Research for Credit  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>CS 2699</td>
<td>Undergraduate Research (Freshman and Sophomore)</td>
<td>1-12</td>
</tr>
<tr>
<td>CS 4699</td>
<td>Undergraduate Research (Junior and Senior)</td>
<td>1-12</td>
</tr>
<tr>
<td>CS 4980</td>
<td>Research Capstone Project</td>
<td>1-21</td>
</tr>
</tbody>
</table>

Research for Pay (Audit only)  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 2698</td>
<td>Undergraduate Research Assistantship (Freshman and Sophomore)</td>
<td>1-12</td>
</tr>
<tr>
<td>CS 4698</td>
<td>Undergraduate Research Assistantship (Junior and Senior)</td>
<td>1-12</td>
</tr>
</tbody>
</table>

To get credit toward completion of the Research Option for research for pay, students must be registered for the appropriate audit-only, research for pay class (CS 2698 or 4698). If work on research for pay begins after the close of registration and the student has not signed up for the appropriate class, unfortunately it is not possible to get credit toward the Research Option for work that term.  

A research project will also fulfill the capstone design requirement if the student registers for CS 4980 for one of the research terms. This is typically done the last semester of research, while taking LMC 4702.
Completion of the Research Option is noted on the student’s transcript. For more information, see www.urop.gatech.edu (http://www.urop.gatech.edu).

General Research Option Information (http://www.catalog.gatech.edu/academics/special-academic-programs/undergraduate-research-opportunities-program)

**BS/MS in Computer Science**

Students who want to pursue the BS/MS option must apply to the MSCS program after completing at least 60 hours of work towards the BSCS degree. Applicants should have a cumulative GPA of at least 3.4. This GPA must be maintained for the student to take graduate level courses.

Students admitted to the program will take 6 hours during their final undergraduate year to double count in both their BSCS and MSCS degrees; they should choose 3 hours of MS Core or Elective hours their fall semester and 3 hours of MS Core or Elective hours their spring semester that can count toward their thread hours and CS Specialization hours.

Visit College of Computing (https://www.cc.gatech.edu) for more information.