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.

### Code Title Credit Hours

#### Wellness
- APH 1040 Scientific Foundations of Health 2
- or APH 10 The Science of Physical Activity and Health

#### Core A - Essential Skills
- ENGL 1101 English Composition I 3
- ENGL 1102 English Composition II 3
- MATH 1552 Integral Calculus 4

#### Core B - Institutional Options
- CS 1301 Introduction to Computing 3

#### Core C - Humanities
- Any HUM (http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-c) 6

#### Core D - Science, Math, & Technology
- PHYS 2211 Introductory Physics I 4
- Lab Science 2

#### Core E - Social Sciences
- HIST 2111 The United States to 1877 3
- HIST 2112 The United States since 1877 3
- INTA 1200 American Government in Comparative Perspective 3
- POL 1101 Government of the United States 3
- PUBP 3000 American Constitutional Issues 3
- Any SS (http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-e) 9

#### Core F - Courses Related to Major
- Lab Science 4
- CS 1100 Freshman Leap Seminar 1
- CS 1331 Introduction to Object Oriented Programming 3
- CS 1332 Data Structures and Algorithms for Applications 3
- CS 2050 Introduction to Discrete Mathematics for Computer Science 3
- or CS 2051 Honors · Induction to Discrete Mathematics for Computer Science
- MATH 2550 Introduction to Multivariable Calculus 4 2

#### Major Requirements
- CS 2340 Objects and Design 3
- CS 4001 Computing, Society, and Professionalism 3
- or CS 4002 Robots and Society 3
- or CS 4726 Privacy, Technology, Policy, and Law 3
- or SLS 3110 Technology and Sustainable Community Development 3

#### Junior Design Options (Capstone)
- Junior Design Option 1, 3

#### Concentration
- CS 1171 Introductory Computing in MATLAB 1
- CS 2110 Computer Organization and Programming 4
- CS 2200 Computer Systems and Networks 4
- CS 3210 Design of Operating Systems 3
- CS 3220 Computer Structures: Hardware/Software Codesign of a Processor 3
- CS 3510 Design and Analysis of Algorithms 3
- or CS 3511 Design and Analysis of Algorithms, Honors 3
- ECE 2031 Digital Design Laboratory 1 2
- MATH 2552 Differential Equations 4
- Select two of the following for Computational Science and Engineering: 1 6
- CS 4641 Machine Learning
- CX 4140 Computational Modeling Algorithms
- CX 4220 Introduction to High Performance Computing
- CX 4230 Computer Simulation
- CX 4640 Numerical Analysis I
- Select one of the following for Software Systems Tools: 3
- CS 3300 Introduction to Software Engineering
- CS 4240 Compilers, Interpreters, and Program Analyzers
Select one of the following for Advanced Systems Architectures:  
<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 4210</td>
<td>Advanced Operating Systems</td>
</tr>
<tr>
<td>CS 4220</td>
<td>Programming Embedded Systems</td>
</tr>
<tr>
<td>CS 4290</td>
<td>Advanced Computer Organization</td>
</tr>
</tbody>
</table>

Other Required Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 3012</td>
<td>Applied Combinatorics</td>
</tr>
</tbody>
</table>

Select one of the following:  
<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 3215</td>
<td>Introduction to Probability and Statistics</td>
</tr>
<tr>
<td>MATH 3670</td>
<td>Probability and Statistics with Applications</td>
</tr>
<tr>
<td>CEE 3770</td>
<td>Statistics and Applications</td>
</tr>
<tr>
<td>ISYE 3770</td>
<td>Statistics and Applications</td>
</tr>
<tr>
<td>or ISYE 2027</td>
<td>Probability with Applications</td>
</tr>
<tr>
<td>&amp; ISYE 2028</td>
<td>Basic Statistical Methods</td>
</tr>
</tbody>
</table>

Free Electives

Free Electives 9

Total Credit Hours 126

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

Minimum grade of C required.
Two of three lab sciences MUST be a sequence.
Junior Design Options are as follows (students must pick one option and may not change):  
- Option 1 - LMC 3432, LMC 3431, CS 3311, CS 3312
- Option 2 - ECE VIP courses and LMC 3403
- Option 3 - Satisfy Georgia Tech Research Option.
- 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-IP 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.

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>
<th>Credit Hours</th>
</tr>
</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.