BACHELOR OF SCIENCE IN COMPUTER SCIENCE - THREAD: MODELING - SIMULATION & THEORY

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 Theory thread is where computing meets itself. Theory teaches students the theoretical and mathematical foundations underlying a wide range of computational disciplines. Early preparation includes discrete mathematics, algorithms, and complexity. Knowledge goals are for students to mature in development and analysis of abstract models for mathematics, algorithms, and complexity. Knowledge goals are for students the theoretical and mathematical foundations underlying a wide range of computational disciplines. Early preparation includes discrete mathematics, algorithms, and complexity. Knowledge goals are for students to mature in development and analysis of abstract models for mathematics, algorithms, and complexity. Knowledge goals are for students the theoretical and mathematical foundations underlying a wide range of computational disciplines. Early preparation includes discrete mathematics, algorithms, and complexity. Knowledge goals are for students to mature in development and analysis of abstract models for mathematics, algorithms, and complexity. Knowledge goals are for students the theoretical and mathematical foundations underlying a wide range of computational disciplines. Early preparation includes discrete mathematics, algorithms, and complexity. Knowledge goals are for students to mature in development and analysis of abstract models for mathematics, algorithms, and complexity.

Wellness
APPH 1040 Scientific Foundations of Health 2
or APPH 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 1 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 4
MATH 1551 Differential Calculus 2

MATH 1554 Linear Algebra 4 4

Core E - Social Sciences
Select one of the following:
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 2 4
CS 1100 Freshman Leap Seminar 1
CS 1331 Introduction to Object Oriented Programming 1 3
CS 1332 Data Structures and Algorithms for Applications 1 3
CS 2050 Introduction to Discrete Mathematics for Computer Science 1 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 1 3
CS 4001 Computing, Society, and Professionalism 1 3
or CS 4002 Robots and Society 3

Junior Design Options (Capstone)
Junior Design Option 1,3 6

Concentration
CS 1171 Introductory Computing in MATLAB 1
CS 2110 Computer Organization and Programming 1 4
CS 2200 Computer Systems and Networks 1 4
CS 3510 Design and Analysis of Algorithms 1 3
or CS 3511 Design and Analysis of Algorithms, Honors 3
CS 4510 Automata and Complexity Theory 1 3
CS 4540 Advanced Algorithms 1 3
MATH 2552 Differential Equations 1 4
MATH 3406 A Second Course in Linear Algebra 1 3
Select two of the following for Computational Science and Engineering: 1

CS 4641 Machine Learning 1
CX 4140 Computational Modeling Algorithms 1
CX 4220 Introduction to High Performance Computing 1
CX 4230 Computer Simulation 1
CX 4640 Numerical Analysis I 1
Select one of the following for Advanced Mathematics: 1 3
MATH 4022 Introduction to Graph Theory 3
MATH 4032 Combinatorial Analysis 3
MATH 4150 Introduction to Number Theory 3

Other Required Courses
MATH 3012 Applied Combinatorics 3
Select one of the following:
MATH 3215 Introduction to Probability and Statistics 3

Bachelor of Science in Computer Science - Thread: Modeling - Simulation & Theory
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<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<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 2 Probability with Applications &amp; ISYE 2 and Basic Statistical Methods</td>
<td></td>
</tr>
</tbody>
</table>

Free Electives

Free Electives  11

Total Credit Hours  126

Pass-fail only allowed for Free Electives (max 6 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):
   - 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.

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.

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>
<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).

Contact Us

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