

# BACHELOR OF SCIENCE IN COMPUTER SCIENCE - THREAD: THEORY & SYSTEMS AND ARCHITECTURE

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 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.

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 applications ranging from theoretical computer science to computational physics, biology, mathematics, economics, and optimization.

Code	Title	Credit Hours
<b>Wellness</b>		
APPH 1040	Scientific Foundations of Health	2
	or APPH 10 The Science of Physical Activity and Health	
<b>Core A - Essential Skills</b>		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus	4
<b>Core B - Institutional Options</b>		
CS 1301	Introduction to Computing <sup>1</sup>	3
<b>Core C - Humanities</b>		
Any HUM	( <a href="http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-c/">http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-c/</a> )	6
<b>Core D - Science, Math, &amp; Technology</b>		
PHYS 2211	Introductory Physics I <sup>2</sup>	4
Lab Science <sup>2</sup>		4
MATH 1551	Differential Calculus	2
MATH 1554	Linear Algebra <sup>4</sup>	4
	or MATH 1554 Linear Algebra with Abstract Vector Spaces	
<b>Core E - Social Sciences</b>		
Choose one of the following:		3
HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	

PUBP 3000	American Constitutional Issues	
Any SS	( <a href="http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-e/">http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-e/</a> )	9
<b>Core F - Courses Related to Major</b>		
Lab Science <sup>2</sup>		4
CS 1100	Freshman Leap Seminar	1
CS 1331	Introduction to Object Oriented Programming <sup>1</sup>	3
CS 1332	Data Structures and Algorithms for Applications <sup>1</sup>	3
CS 2050	Introduction to Discrete Mathematics for Computer Science <sup>1</sup>	3
	or CS 2051 Honors - Induction to Discrete Mathematics for Computer Science	
MATH 2550	Introduction to Multivariable Calculus <sup>4</sup>	2
<b>Major Requirements</b>		
CS 2340	Objects and Design <sup>1</sup>	3
CS 4001	Computing, Society, and Professionalism <sup>1</sup>	3
	or CS 4002 Robots and Society	
	or CS 4726 Privacy, Technology, Policy, and Law	
	or SLS 3110 Technology and Sustainable Community Development	
<b>Junior Design Options (Capstone)</b>		
Junior Design Option <sup>1,3</sup>		6
<b>Concentration</b>		
CS 2110	Computer Organization and Programming <sup>1</sup>	4
CS 2200	Computer Systems and Networks <sup>1</sup>	4
CS 3210	Design of Operating Systems <sup>1</sup>	3
CS 3220	Computer Structures: Hardware/Software Codesign of a Processor <sup>1</sup>	3
CS 3510	Design and Analysis of Algorithms <sup>1</sup>	3
	or CS 3511 Design and Analysis of Algorithms, Honors	
ECE 2031	Digital Design Laboratory <sup>1</sup>	2
CS 4510	Automata and Complexity Theory <sup>1</sup>	3
CS 4540	Advanced Algorithms <sup>1</sup>	3
Select one of the following for Systems Software Tools: <sup>1</sup>		3
CS 3300	Introduction to Software Engineering	
CS 4240	Compilers, Interpreters, and Program Analyzers	
Select one of the following for Advanced Systems Architectures: <sup>1</sup>		3
CS 4210	Advanced Operating Systems	
CS 4220	Programming Embedded Systems	
CS 4290	Advanced Computer Organization	
MATH 3406	A Second Course in Linear Algebra <sup>1</sup>	3
Select one of the following for Advanced Mathematics: <sup>1</sup>		3
MATH 4022	Introduction to Graph Theory	
MATH 4032	Combinatorial Analysis	
MATH 4150	Introduction to Number Theory	
<b>Other Required Courses</b>		
MATH 3012	Applied Combinatorics	3
Select one of the following:		3
MATH 3215	Introduction to Probability and Statistics	
MATH 3670	Probability and Statistics with Applications	
CEE 3770	Statistics and Applications	
ISYE 3770	Statistics and Applications	

or ISYE 2027 Probability with Applications  
& ISYE 2028 Basic Statistical Methods

<b>Free Electives</b>	
Free Electives	8
<b>Total Credit Hours</b>	<b>126</b>

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

- 1 Minimum grade of a 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.
  - 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 overage 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

Code	Title	Credit Hours
CS 2699	Undergraduate Research (Freshman and Sophomore)	1-12
CS 4699	Undergraduate Research (Junior and Senior)	1-12
CS 4980	Research Capstone Project	1-21

### Research for Pay (Audit only)

Code	Title	Credit Hours
CS 2698	Undergraduate Research Assistantship (Freshman and Sophomore)	1-12
CS 4698	Undergraduate Research Assistantship (Junior and Senior)	1-12

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) (<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.