

Quick Guide for the CS@CU MS Bridge Program in Computer Science

I. Bridge Program Curriculum

This Quick Guide is for CS@CU MS Bridge Program students completing their Bridge curriculum, typically over the first two or three semesters. CS@CU MS Bridge Program students study a foundational curriculum consisting of a core of three computer science courses and one Calculus course. Three more courses are then required depending on the student's intended MS specialization.

Math Requirement (3 points)

All CS@CU MS Bridge Program students are required to take **Calculus I (MATH UN1101, 3pts)** or its equivalent. Such a course covers functions, limits, single-variable differentiation, and single-variable integration.

CS Bridge Core Curriculum (10 points)

The foundational curriculum for CS@CU MS Bridge Program students is built with the following three required courses. These courses should be taken sequentially and will provide the necessary preparation for the MS tracks and advanced courses.

1. **Introduction to Computer Science and Programming in Java (COMS W1004, 3pts):** Covers fundamental concepts of computer science, algorithmic problem-solving capabilities, and introductory Java programming skills.
2. **Data Structures in Java (COMS W3134, 3pts):** Covers data types and structures; programming techniques for processing structures, storage management, and analysis of algorithms.
3. **Advanced Programming (COMS W3157, 4pts):** Covers practical programming techniques and tools for professional software construction, including writing code according to specifications and documentation. Taught in C and C++ in a UNIX environment; scripting languages and basic web programming included.

Calculus I and/or COMS W1004 (up to 6 points) may be waived on a case by case basis if taken with a B or higher grade at an accredited institution. Documentation must be provided.

Track Curriculum (9-10 points)

Alongside the Core, CS@CU MS Bridge Program students will take three more computer science or mathematics courses. Students will select these courses from one of the two tracks below. Each one is intended to prepare students for one of several tracks in the MS program.

Track A

This track is for students who intend to pursue the Foundations of Computer Science, Computer Security, Network Systems, or Software Systems track in the MS program.

1. **Discrete Mathematics (COMS W3203, 4pts)**: Covers logic and proofs, mathematical induction, modular arithmetic, counting theory, graph theory, and discrete probability.

Select two from the following:

2. **Computer Science Theory (COMS W3261, 3pts)**: Covers regular languages, context-free languages, Turing machines, Chomsky hierarchy, Church-Turing thesis, complexity theory, and NP-completeness.
3. **Fundamentals of Computer Systems (CSEE W3827, 3pts)**: Covers fundamentals of computer organization and digital logic.
4. **Calculus-Based Introduction to Statistics (STAT UN1201, 3pts)**: Covers random variables, probability distributions, parameter estimation, hypothesis testing, and maximum likelihood estimation.

Students interested in the Foundations of Computer Science track are recommended to take COMS W3261 and Statistics 1201. Students interested in the Software Systems track are recommended to take COMS W3261 and CSEE W3827. Students interested in the Computer Security or Network Systems track are recommended to take CSEE W3827 and either of the other two courses.

Track B

This track is for students who intend to pursue the Computational Biology, Machine Learning, Natural Language Processing, or Vision, Graphics, Interaction, and Robotics track in the MS program.

1. **Calculus III (MATH UN1201, 3pts)**: Covers vectors, vector-valued functions, functions of several variables, partial derivatives, gradients, surfaces, optimization, and the method of Lagrange multipliers.

2. **Computational Linear Algebra (COMS W3251, 4pts) or Linear Algebra (MATH UN2010, APMA 3101, 3pts)**: Covers vectors, matrices, systems of linear equations, vector spaces, linear transformations, eigenvalues and eigenvectors, and the singular value decomposition. COMS W3251 also includes a programming component in Python and introduces applications of linear algebra in computer science.

3. **Introduction to Probability and Statistics (IEOR E4150, 3pts)**: Covers probabilistic models, random variables, distributions, point and confidence interval estimation, maximum likelihood estimation, hypothesis testing, and linear regression. Multivariable calculus required. **Based on your selected track within the MS program, this course may be applied to your MS program requirements as a Track Elective**

Scheduling your CS Bridge Curriculum

A typical CS@CU MS Bridge Program student is expected to complete the Bridge curriculum in 2 or 3 semesters. If starting with COMS W1004, we recommend that a student begins in the summer semester so as to be ready to start the MS program in the fall of the following year.

Example Track A schedule:

Summer: COMS 1004, Calculus I

Fall: COMS 3134, COMS 3203

Spring: COMS 3157, two of COMS 3261, CSEE 3827, STAT 1201

Example Track B schedule:

Summer: COMS 1004, Calculus I

Fall: COMS 3134, Calculus III

Spring: COMS 3157, COMS 3251 or MATH 2010, STAT 4001 or IEOR 4150

Following successful completion of the CS@CU MS Bridge curriculum, students will seamlessly transition into the MS program coursework as described on the next page.

II. MS Program Curriculum

The Master of Science (MS) program provides a unique opportunity to develop leading-edge in-depth knowledge of specific computer science disciplines. The department currently offers concentration tracks covering eight such disciplines.

All students must complete the following requirements:

- Complete a total of 30 points.
- Maintain at least a 2.7 overall GPA.
- Satisfy [breadth requirements](#).
- Take at least 6 points of technical courses at the 6000-level.
- Only up to 3 points of your degree can be non-CS/non-track courses. Non-CS/non-track courses must be approved by your advisor. See track webpages for more information.

Students can choose from one of the tracks below. See track webpages for details on track requirements.

- [Computational Biology](#)
- [Computer Security](#)
- [Foundations of Computer Science](#)
- [Machine Learning](#)
- [Natural Language Processing](#)
- [Network Systems](#)
- [Software Systems](#)
- [Vision, Graphics, Interaction, and Robotics](#)
- [MS Personalized](#)
- [MS Thesis](#)