

Double-counting policies are to be construed within the larger double-counting policy of the student's home school. Double-counting policies are detailed on each School's Bulletin and/or Catalogue.

The CS department allows the following courses in the CS Core and Mathematics requirement to be double-counted with another major, minor, or concentration. No other courses can be double-counted with another program.

- COMS W1004
- Any calculus courses (including Honors Math A and B)
- One Linear Algebra course
- One Probability/Statistics course

Grading

Barnard does not allow a grade of D to count towards any major. Consult with your advisor.

Guidelines for all Computer Science Majors and Concentrators

The following requirements are new as of the academic year 2023-2024. Students who declared a CS major in the academic year 2022-2023 or earlier have the option to follow the old requirements.

Students who declared a CS major in the academic year 2022-2023 or earlier have the option to follow the requirements listed below or to follow the old requirements. The old requirements are noted on the Undergraduate Programs pages of the Computer Science Department website (<https://www.cs.columbia.edu/education/undergraduate/>).

Please note that the information on the department website is more accurate than the information in the archived Bulletins. Students with questions about which requirements to follow are advised to talk with the Director of Undergraduate Studies.

Courses

Students may receive credit for only one of the following two courses:

- COMS W1004 Introduction to Computer Science and Programming in Java
- COMS W1005 Introduction to Computer Science and Programming in MATLAB.

Students may receive credit for only one of the following three courses:

- COMS W3134 Data Structures in Java
- COMS W3136 ESSENTIAL DATA STRUCTURES
- COMS W3137 HONORS DATA STRUCTURES # ALGOL

However, COMS W1005 and COMS W3136 cannot be counted towards the Computer Science major, minor, and concentration.

Transfer and Double Counting

Up to four transfer courses are accepted toward the major. Up to two transfer courses are accepted toward the minor or concentration. Calculus, linear algebra, and probability/statistics courses can be transferred in addition to the four/two-course limits.

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The CS department allows the following courses in the CS Core and Mathematics requirement to be double-counted with another major, minor, or concentration. No other courses can be double-counted with another program.

- COMS W1004
- Any calculus courses (including Honors Math A and B)
- One Linear Algebra course
- One Probability/Statistics course

Grading

A maximum of one course worth no more than 4 points passed with a grade of D may be counted toward the major or concentration.

Major in Computer Science

Please read *Guidelines for all Computer Science Majors and Concentrators* above.

Please read *Guidelines for all Computer Science Majors and Concentrators* above.

Please read *Guidelines for all Computer Science Majors and Minors* above.

All majors should confer with their program adviser each term to plan their programs of study. Students considering a major in computer science are encouraged to talk to a program adviser during their first or second year. The Computer Science major is composed of four basic components: The Mathematics Requirement, the Computer Science Core, the Area Foundation Courses, and the Computer Science Electives.

Program of Study

Adjustments were made to the course lists below in March 2023.

Students who declared before Spring 2024 should see the Department of Computer Science website for the old requirements.

For students who declare in Spring 2024 and beyond:

Mathematics Requirement (6-11 points)

Calculus Requirement: Select one of the following courses:

MATH UN1201	CALCULUS III
MATH UN1205	ACCELERATED MULTIVARIABLE CALC
APMA E2000	MULTV. CALC. FOR ENGI # APP SCI

Note that MATH UN1201 (Calculus III) requires Calculus I as a prerequisite but does NOT require Calculus II. MATH UN1205 and APMA E2000, however, require both Calculus I and Calculus II as prerequisites.

Linear Algebra Requirement: Select one of the following courses:

COMS W3251	COMPUTATIONAL LINEAR ALGEBRA (recommended)
MATH UN2010	LINEAR ALGEBRA
MATH UN2015	Linear Algebra and Probability
MATH UN2020	Honors Linear Algebra
APMA E2101	INTRO TO APPLIED MATHEMATICS
APMA E3101	APPLIED MATH I: LINEAR ALGEBRA

Probability / Statistics Requirement: Select one of the following courses:

MATH UN2015	Linear Algebra and Probability
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IEOR E3658	PROBABILITY FOR ENGINEERS
STAT UN1201	CALC-BASED INTRO TO STATISTICS
STAT GU4001	INTRODUCTION TO PROBABILITY AND STATISTICS

NOTE: Math 2015 Linear Algebra and Probability may simultaneously satisfy both linear algebra and probability requirements without the need to take additional classes thus reducing the total number of points required.

Recommended (3-4 points)

ENGI E1006	INTRO TO COMP FOR ENG/APP SCI (recommended but not required)
or COMS W1002	COMPUTING IN CONTEXT

Computer Science Core (20-21 points):

First Year

COMS W1004	Introduction to Computer Science and Programming in Java
or COMS W1007	

Sophomore Year

COMS W3134	Data Structures in Java
or COMS W3137	HONORS DATA STRUCTURES # ALGOL
COMS W3157	ADVANCED PROGRAMMING
COMS W3203	DISCRETE MATHEMATICS

Junior and Senior Year

Complete the remaining required core courses:

COMS W3261	COMPUTER SCIENCE THEORY
CSEE W3827	FUNDAMENTALS OF COMPUTER SYSTS

Area Foundation Courses (9 to 12 points):

Select three from the following list:

COMS W4111	INTRODUCTION TO DATABASES
COMS W4113	FUND-LARGE-SCALE DIST SYSTEMS
COMS W4115	PROGRAMMING LANG # TRANSLATORS
COMS W4118	OPERATING SYSTEMS I
COMS W4119	COMPUTER NETWORKS
COMS W4152	Engineering Software-as-a-Service
COMS W4156	ADVANCED SOFTWARE ENGINEERING
COMS W4160	COMPUTER GRAPHICS
COMS W4167	COMPUTER ANIMATION
COMS W4170	USER INTERFACE DESIGN
COMS W4181	SECURITY I
CSOR E4231	ANALYSIS OF ALGORITHMS I
COMS W4236	INTRO-COMPUTATIONAL COMPLEXITY
COMS W4701	ARTIFICIAL INTELLIGENCE
COMS W4705	NATURAL LANGUAGE PROCESSING
COMS W4731	Computer Vision I: First Principles
COMS W4733	COMPUTATIONAL ASPECTS OF ROBOTICS
CBMF W4761	COMPUTATIONAL GENOMICS
COMS W4771	MACHINE LEARNING
CSEE W4824	COMPUTER ARCHITECTURE
CSEE W4868	SYSTEM-ON-CHIP PLATFORMS

Computer Science Electives (9 to 12 points)

Any three COMS courses or jointly offered computer science courses such as CSXX or XXCS course that are worth at least 3 points and are

at the 3000 level or above. This includes 3000-level courses offered by Barnard CS.

Restrictions

Note: No more than 6 points of project/thesis courses (COMS W3902, W3998, W4901) can count toward the major. COMS W3999 Fieldwork cannot be used as a CS Elective.

No more than one course from each set below may be applied towards the computer science major:

- IEOR E3658, STAT UN1201, MATH UN2015
- MATH UN2015, MATH UN2010, APAM E3101, COMS W3251
- COMS W4771, COMS W4721

Major in Computer Science–Mathematics

For a description of the joint major in computer science–mathematics, see the *Mathematics* section in this bulletin.

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For a description of the joint major in mathematics–computer science, see the *Mathematics* section in this catalog.

Major in Information Science

Please read *Guidelines for all Computer Science Majors and Concentrators* above.

The major in information science requires a minimum of 33 points, including a core requirement of five courses. Adjustments were made to the course lists below in March 2022.

The elective courses must be chosen with a faculty adviser to focus on the modeling and use of information within the context of a disciplinary theme. After discussing potential selections, students prepare a proposal of study that must be approved by the faculty adviser. In all cases, the six courses must be at the 3000 level or above, with at least three courses chosen from computer science. Following are some example programs. For more examples or templates for the program proposal, see a faculty adviser.

Note: In most cases, additional courses will be necessary as prerequisites in order to take some of the elective courses. This will depend on the student's proposed program of study.

Core Requirement

COMS W1001	Introduction to Information Science
or COMS W1002	Computing in Context
COMS W1004	Introduction to Computer Science and Programming in Java
COMS W3107	Clean Object-Oriented Design
COMS W3134	Data Structures in Java
STAT GU4001	INTRODUCTION TO PROBABILITY AND STATISTICS