

## **Bridge to Computer Science**

### **Winter 2023**

#### **To contact professors:**

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#### **Program Pre-requisites**

Students must complete undergraduate study before taking the CS Bridge Program.

#### **Program Description**

The bridge program is an intensive study of the required topics which are requisite information for general admission into the NYU-Tandon CSE graduate program. Conventionally, covering these topics take three to four semesters to complete and must be done sequentially. Under the bridge program, you will complete your studies in one, intensive, semester which includes all of the material from the conventional courses in a more compact form. The bridge will require as much as 100 hours of study, but scheduling of each module can be done at a time of your discretion, due to the online nature of the program. Working at an average of about 30-40 hours of study each week, the bridge program will be completed in one semester. You are expected, and required to attend a weekly online meeting as well.

#### **Program Objectives**

By the end of the CS Bridge Program students should have:

1. Basic understanding of how data is represented and how computers execute instructions to use and modify data in order to solve problems.
2. Understanding of computational thinking: how to develop algorithms using decisions, repetition, and decomposition into manageable components to solve problems.
3. Ability to implement and test moderate sized programs in C++, using constructs including variables, operators, decision statements, loops, functions, and built-in data types.
4. Ability to understand basic object-oriented programming concepts.
5. Ability to code, use, analyze the performance of, and modify fundamental data structures.
6. Have a firm understanding of operating systems topics related to processes, threads, thread concurrency, deadlocks, and memory management.
7. Understanding of fundamental concepts in discrete math

## **Program Structure**

**The CS Bridge Program is conducted entirely online, which means you do not have to be on campus to complete any portion of it. You will participate in the program using NYU LMS (Brightspace) located at <https://brightspace.nyu.edu>.**

- The program will run 17 weeks, from 1/3 to 4/30.  
During this time, we will have 15 weeks, numbered ‘week 1’ through ‘week 15’. In each such week, you learn new material.  
In addition, we have two special weeks:
  - ‘Catch-up week’ - from 2/27 to 3/05. This week gives you the opportunity to catch up on topics you feel less comfortable with. During this week, you will have your second exam.
  - ‘Exam week’ - from 4/24 to 4/30. During this week, you will have your fourth exam.
- Some lectures will become available at the beginning of each week and will be delivered through Active Learning Modules in NYU LMS (Brightspace).
- Weekly 3-hour webinar sessions, where we would discuss the lecture and/or present new material.

These meetings will typically run on evenings. Unless announced otherwise, these meetings will take place on Wednesday 4:00pm - 7:00pm Eastern Time (may be changed for some weeks). Detailed schedules can be found on the Zoom section of NYU Brightspace. These sessions would be also recorded. Attendance to all webinars are mandatory via either attending during the live session or watching the recorded sessions.

- You will also be asked to read some topics covered in the lectures/webinars in order to get a deeper and more detailed understanding of them.
- In addition to active learning modules and virtual meetings, participation will play a ~~key~~ **key** role in this course. Students are expected to participate in weekly discussion forums and webinar sessions.
- You will have 4 exams during this period. The exams are taken online and will be proctored by ‘ProctorU’ – an online proctoring service.

The dates and topics are given below. **Make all required arrangements to be available to take the exams at the specified times.**

## **Grade Breakdown (%)**

- Weekly Homework Assignments: %8
- Exam 1: %23
- Exam 2: %23
- Exam 3: %23
- Exam 4: %23

## **Certificates**

Certificates are issued to individuals who receive a grade of C, C+, B-, B, B+, A-, A, A+. For those who receive a B+ or higher, the Certificate will say "with Distinction." The Bridge to Tandon course is a non-credit course. Linked here is a [Certificate Example](#).

## **Interaction Policy**

You are required to be an active online learner in this program and expected to participate in the Active Learning Modules, weekly discussion boards, weekly virtual meetings, etc.

## **Program Communication**

**Announcements** - Announcements will be posted on NYU LMS (Brightspace) on a regular basis. You can locate all class announcements under the *Announcements* tab of our class. Be sure to check the class announcements regularly as they will contain important information about class assignments and other class matters.

**Discussion Forums** – We will use Edstem as our discussion forums platform. This is an excellent way for you to engage with the course material and with your peers. You are expected to read the discussion boards and engage in thoughtful discussions. We will read all discussion posts and provide content clarification and feedback when necessary.

**Email** – You are encouraged to post your questions about the course in the Forums discussions on Piazza. This is an open forum in which you and your classmates are encouraged to answer each other's questions. But, if you need to contact us directly, you may email.

**Weekly Virtual Meetings** – Once a week, we will hold a webinar. You would be able to access these virtual class meeting through the *Zoom* tool on NYU LMS (Brightspace). In this weekly meeting, we will teach some new topics, and offer extra practice on the topics that were introduced on the videos. This meeting is also an opportunity for you to ask questions and gain clarification about the content from us and your peers. You are highly encouraged to attend these meetings. We understand that not all students will be available to attend these virtual meetings. Due to this fact, the meetings will be recorded so you can watch them when you are available. Attendance is **MANDATORY** via either live or recorded session.

**Netiquette** – When participating in an online class it is important to interact with your peers in an appropriate manner. Always use professional language (no netspeak) in your discussion board posts and emails. Please be respectful of your classmates at all times even if you disagree with their ideas.

## **Readings**

The required texts for the course are:

1. Problem Solving with C++, Ninth Edition, Walter Savitch, University of California, ISBN-10: 0133591743 • ISBN-13: 9780133591743
2. Discrete Math book from zyBooks.com. To access the book:
  - a) Sign in or create an account at learn.zybooks.com
  - b) Enter zyBook code: NYUCSBRWinter2023
  - c) Subscribe
3. Data structures and Algorithms in C++, Fourth edition, Mark Allen Weiss, Pearson, ISBN-13: 978-0132847377, ISBN-10: 013284737X
4. Modern Operating System, Fourth edition, Andrew S. Tanenbaum, Pearson Prentice Hall, ISBN-13: 978-0133591620, ISBN-10: 013359162X

Recommended books:

1. Introduction to Algorithms, 3rd Edition, Cormen, Leiserson, Rivest, and Stein, MIT Press, 2009; ISBN-13: 9780262033848; ISBN: 0262033844.
2. Computer Networking: A Top-Down Approach, 7<sup>th</sup> Edition, James Kurose, Keith Ross, Pearson.
3. Discrete Mathematics and its Applications, 7<sup>th</sup> Edition, Kenneth H. Rosen, The McGraw Hill Companies, 2012; ISBN: 978-0-07-338309-5.

You can access NYU's central library here: <http://library.nyu.edu/>

You can access NYU Tandon's Bern Dibner Library here: <http://library.poly.edu/>

## **Program requirements**

Participation is paramount to your success in the CS Bridge Program. You must attend or watch all virtual meetings in the week in which we cover it. Be sure to log into NYU LMS (Brightspace) multiple times a week, read all announcements, complete all Active Learning Modules and assignments on time, and participate in Discussion Forums.

First Exam, given on **Thursday Feb 09<sup>th</sup>–6pm Eastern Time** (during ‘week 6’), 23%

Topics covered: Number systems, Data types, Expressions, Branching statements, Iterative statements, Logics, Proofs, Sets, Mathematical functions (weeks 1-4)

Second Exam, given on **Thursday Mar 02<sup>nd</sup>–6pm Eastern Time** (during ‘Catch-up week’), 23%

Topics covered: All from Exam 1 and, Algorithm Analysis, Functions, Arrays, Strings, Pointers, Dynamic storage, Recursion, Induction, Basic counting and combinatorics, Probability (weeks 1-8)

Third Exam, given on **Thursday Mar 30<sup>th</sup>–6pm Eastern Time** (during ‘week 12’), 23% Topics

covered: All from Exam 2 and, Object oriented, File processing, Searching and Sorting, Linked lists, Stacks and Queues, Trees and Binary search trees (weeks 1-11)

Forth Exam, given on **Thursday April 27<sup>th</sup> 6pm Eastern Time** (during ‘Exam week’), 23%

Topics covered: All

#### **Tentative List of Topics Covered in the Program:**

- Fundamentals of system hardware
- Number Systems
- Compilation and Execution process
- Data types and Expressions
- Branching statements
- Iterative Statements
- Intro to algorithm analysis and Order of growth
- Coding functions, Abstraction and Runtime stack
- Arrays
- Strings
- Pointers and Dynamic allocation
- Logic
- Proofs
- Sets
- Mathematical Functions
- Introduction to Counting
- Discrete Probability
- Induction
- Recursion
- Searching and Sorting
- Object Oriented Programming concepts
- File Processing
- Linked Lists
- Stacks and Queues
- Trees and Binary Search trees
- Intro to OS Concepts
- Processes & Threads
- Thread concurrency and deadlocks
- Memory Management
- Introduction to Networking
- Overview of OSI/RM

- Physical layout of networks
- Application Layer, Network Layer and Transport Layer

### **Moses Center Statement of Disability**

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or [mosescsd@nyu.edu](mailto:mosescsd@nyu.edu). You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at [www.nyu.edu/csd](http://www.nyu.edu/csd). The Moses Center is located at 726 Broadway on the 2nd floor.

### **NYU School of Engineering Policies and Procedures on Academic Misconduct**

*(from the School of Engineering Student Code of Conduct)*

A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

Access the entire School of Engineering Student Code of Conduct here:

[engineering.nyu.edu/academics/code-of-conduct](http://engineering.nyu.edu/academics/code-of-conduct)