**BRONX COMMUNITY COLLEGE**

**Of the City University of New York**

**DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE**

**SYLLABUS: CSI 11 Computer Science for Everyone 3 credits / 4 hours**

**PREREQUISITE: MTH 5 or CUNY Elementary Algebra Proficiency, and ENG 2 and RDL 2, if required**

**TEXT: How to think like a computer scientist (Python 3) (free online textbook)**

<http://interactivepython.org/runestone/static/thinkcspy/index.html>

**ZyBooks: Computer Science for Everyone (online book)**

<https://learn.zybooks.com/>

**Course Description**:This course presents an introduction to computer science (CS) with an emphasis on problem-solving and computational and algorithmic thinking through “coding”. It aims to present computers as a tool for modeling and solving real-world problems. It will offer an introduction to programming, and students will be exposed to more advanced topics selected from the following partial list: artificial intelligence, robotics, cybersecurity, data science, networking, and neuroscience, conferring an advantage for students considering a CS major. Students majoring in any other discipline will learn how computers can be used to help solve problems in one’s area of expertise.

**Course Goals/Objectives**:

CSI 11 helps to answer questions like “What computer science is?”, “What is computational thinking?”, and “How they can be used to help solve problems?” by introducing students to basic principles of computational thinking.

In this course students will see the basic design of a computer system, how the information is represented and processed. Students will learn to analyze a given problem, design clear, step-by-step solution to the problem; translate this solution into a program; then test and debug it. By the end of the course students will understand the difference between an algorithm and a computer program, and will be able to use, where appropriate, functions; data structures; file and user input/output; decision structures; and loops.

**Student Learning Outcomes (SLO’s):**

* Students will be required to gather information from a variety of sources: the textbook, the internet, and discussion group. Through class discussions students will learn to interpret the collected data as it pertains to presented topic and will be guided to assess the applicability and quality of the data being acquired.
* Students will analyze problems, design an algorithmic solution, and implement that solution into a functioning program via the assigned coding exercises. Throughout the process, students will need to analyze and critique different proposed solutions to the given problems, and they will analyze anomalies (“bugs”) in the process of generating correct code.
* Students will be required to design algorithms and write the programs that implement them. A well written program contains detailed comments to document and justify the choices that students made in their algorithm. In addition, group projects are structured specifically so that students state and justify why a chosen algorithm solves the stated problem via a report or an in-class discussion.
* Students will explore and apply the fundamental concepts in computer science (principles of coding, information theory, artificial intelligence, robotics, data science, and cybersecurity), via coding exercises, group projects, and class discussions. Students will gather information, represent it meaningfully, and use it to solve a posed problem.
* Students will complete weekly group projects in which they will model and solve real-world problems from a variety of fields. They will analyze them using mathematical and formal techniques in order to find an algorithmic solution that can be implemented into a program.
* Students will participate in class discussions on topics from cybersecurity and cryptography, including the impact of digital technologies in issues of privacy, security, and the nature of social structures.

**Grading Policy and Assessment:**

Students will be given in-class quizzes or will be asked to submit in-class work (once a week); homework assignments and group project assignments will be given once a week each. All group projects are programming assignments with grading rubric provided for each of them and will be submitted as a program along with the accompanying documentation answering the posed question. All homeworks and group projects have a due date and must be submitted by the due date. In addition, there will be a Midterm Exam and a Final Exam.

Grading for the course will be based on:

* In-class work or in-class quizzes: 10%
* Homeworks: 20%
* Group projects: 20%
* Midterm Exam: 25%
* Final Exam: 25%

**Attendance Policy**: Attendance in class is essential to success in this course. If a student misses a class, it is the student’s responsibility to get the material covered in class and all the assignments. There are no make-ups for in-class work nor for in-class quizzes. A student may receive a failing grade for the course if absent more than 6 times (6 times are equivalent to 12 hours).

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| Week | Topic | Reading |
| 1 | History and Basics | *ZyBooks: Computer Science for Everyone*Chapter 1 *History and Basics*1.1 Brief history1.2 Historical figures in computing1.3 Computer programs1.4 Computers all around us1.5 Computing and careers |
| Hardware and Software | *ZyBooks: Computer Science for Everyone*Chapter 2 *Hardware and Software*2.1 Basic hardware2.2 Cache, memory, drive2.3 Types of computers2.4 Common input devices2.5 Common output devices |
| Operating Systems | ZyBooks: *Computer Science for Everyone*Chapter 3 *Operating Systems*3.1 OS basics3.2 Common operating systems |
| 2 | Programming languages | *ZyBooks: Computer Science for Everyone*Chapter 2 *Hardware and Software*2.8 Programming: Machine language2.9 Programming: Assembly language2.10 Programming: High-level language |
| Basic Input and Output | ZyBooks: *Computer Science for Everyone*Chapter 4 *Introduction to Python 3*4.1 Programming introduction4.2 Computational thinking4.3 The Python interactive interpreter4.4 Programming in Python4.5 Basic output4.6 Basic input4.7 Errors4.8 Additional practice: Output art4.9 Development environment |
| 3 | Variables and Expressions in Python | ZyBooks: *Computer Science for Everyone*Chapter 5 *Variables and Expressions*5.1 Objects and variables5.2 Assignments5.3 More on objects5.4 Names5.5 Numeric types: Floating-point5.6 Expressions5.7 Module basics5.8 Math module5.9 Additional practice: Number games5.10 Representing text |
| 4 | Number RepresentationTypes | ZyBooks: *Computer Science for Everyone*Chapter 6 *Integer Properties*6.1 Representing information as bits6.2 Number representationZyBooks: *Computer Science for Everyone*Chapter 7 *Types*7.1 String basics7.2 Lists basics7.3 Dictionary basics7.4 Common data types summary7.5 Additional practice: Grade calculation7.6 Type conversions7.7 String formatting7.8 Numbers in binary7.9 Additional practice: Health data |
| 5 | Propositional Logic | ZyBooks: *Computer Science for Everyone*Chapter 8 *Logic*8.1 Propositions and logical operations8.2 Evaluating compound propositions8.3 Conditional statements8.4 Logical equivalence8.5 Laws of propositional logicLogical Puzzles (Rosen, Discrete Mathematics) |
| Branching | ZyBooks: *Computer Science for Everyone*Chapter 9 *Branching*9.1 If-else statement9.2 Relational and equality operators9.3 Multiple if-else9.4 Boolean operators and expressions |
| 6 | Branching | Book: *How To Think Like a Computer Scientist*7.1. Boolean Values and Boolean Expressions7.2. Logical operators7.3. Precedence of Operators7.4. Conditional Execution: Binary Selection7.5. Omitting the else Clause: Unary Selection7.6. Nested conditionals7.7. Chained conditionals7.8. Boolean FunctionsZyBooks: *Computer Science for Everyone*Chapter 9 *Branching*9.5 Membership operators9.6 Code blocks and indentation9.7 Conditional expressions9.8 Additional practice: Tweet decoderet decoder |
| 7 | Loops | ZyBooks: *Computer Science for Everyone*Chapter 10 *Loops*10.1 Loops10.2 While loops10.3 More while examples10.4 Counting10.5 For loops10.6 Counting using the range() function10.7 While vs. for loops10.8 Nested loops |
| 8 | Loops*Midterm Exam* | ZyBooks: *Computer Science for Everyone*Chapter 10 *Loops*10.9 Developing programs incrementally10.10 Break and continue10.11 Loop else10.12 Getting both index and value when looping: enumerate()10.13 Additional practice: Dice statistics |
| 9 | Functions | ZyBooks: *Computer Science for Everyone*Chapter 11 *Functions*11.1 User-defined function basics11.2 Function parameters11.3 Returning values from functions11.4 Dynamic typing11.5 Reasons for defining functions11.6 Function with branches/loops11.7 Function stubs11.8 Functions are objects11.9 Functions: Common errors11.10 Scope of variables and functions |
| 10 | Functions | ZyBooks: *Computer Science for Everyone*Chapter 11 *Functions*11.11 Namespaces and scope resolution11.12 Function arguments11.13 Keyword arguments and default parameter values11.14 Arbitrary argument lists11.15 Multiple function outputs11.16 Help! Using docstrings to document functions11.17 Engineering examples |
| 11 | Strings | ZyBooks: *Computer Science for Everyone*20.1 String slicing20.2 Advanced string formatting20.3 String methods20.4 Splitting and joining strings20.5 The string format method |
| 12 | Lists and Dictionaries | ZyBooks: *Computer Science for Everyone*Chapter 12 *Lists and Dictionaries*12.1 Lists12.2 List methods12.3 Iterating over a list12.4 List games12.5 List nesting12.6 List slicing12.7 Loops modifying lists12.8 List comprehensions12.9 Sorting lists12.10 Command-line arguments12.11 Additional practice: Engineering examples |
| 13 | Lists and Dictionaries | ZyBooks: *Computer Science for Everyone*Chapter 12 *Lists and Dictionaries*12.12 Dictionaries12.13 Dictionary methods12.14 Iterating over a dictionary |
| Files | ZyBooks: *Computer Science for Everyone*Chapter 13 *Files*13.1 Reading files13.2 Writing files |
| 14 | Plotting | ZyBooks: *Computer Science for Everyone*Chapter 14 *Plotting*14.1 Introduction to plotting and visualizing data14.2 Styling plots14.3 Text and annotations14.4 Numpy14.5 Multiple plots |

**Academic Integrity**

Academic dishonesty (such as plagiarism and cheating) is prohibited at Bronx Community College and is punishable by penalties, including failing grades, dismissal and expulsion. For additional information and the full policy on Academic Integrity, please consult the BCC College Catalog.

**Accommodations/Disabilities**

Bronx Community College respects and welcomes students of all backgrounds and abilities. In the event you encounter any barrier(s) to full participation in this course due to the impact of a disability, please contact the disAbility Services Office as soon as possible this semester.  The disAbility Services specialists will meet with you to discuss the barriers you are experiencing and explain the eligibility process for establishing academic accommodations for this course. You can reach the disAbility Services Office at: disability.services@bcc.cuny.edu, Loew Hall, Room 211, (718) 289-5874.

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