

BRONX COMMUNITY COLLEGE
Of the City University of New York
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

SYLLABUS: CSI30 DISCRETE MATHEMATICS 1 **3 credits / 3 hours**
PREREQUISITE: MTH 06
COREQUISITES: ENG 02 and RDL 02, if required
TEXT: CSI 30: Discrete Mathematics I (zyBooks),
learn.zybooks.com, zyBook code: CUNYCSI30Fall2021
ISBN: 978-1-394-11035-3

Goals of the course:

CSI 30 is an introduction to mathematical methods in computer science. It begins with basic concepts of mathematical logic, continues with an introduction to algorithms and programming, and concludes with an introduction to counting techniques and probability. The emphasis is on computational, hands-on experience. The material on set theory reinforces and complements parallel topics covered in Precalculus (MTH 30). It is highly recommended that MTH 30, if required, and CSI 30 are taken in the same semester.

Objectives: A successful student in this course will learn to:

1. Understand the idea of an algorithm and computer program;
2. Write and analyze simple programs;
3. Understand the use of formal logic in mathematics and programming;
4. Understand basic concepts of set theory, particularly those of a function;
5. Use basic combinatorial counting techniques, particularly permutations and combinations;
6. Understand basic concepts of probability theory, and the way counting techniques are used there.

Chapters and sections:

1. Logic

- 1.1 Propositions and logical operations
- 1.2 Evaluating compound propositions
- 1.3 Conditional statements
- 1.4 Logical equivalence
- 1.5 Laws of propositional logic
- 1.6 Predicates and quantifiers
- 1.7 Quantified statements
- 1.8 De Morgan's law for quantified statements
- 1.9 Nested quantifiers
- 1.10 More nested quantified statements
- 1.11 Logical reasoning
- 1.12 Rules of inference with propositions
- 1.13 Rules of inference with quantifiers

2. Sets

- 2.1 Sets and subsets
- 2.2 Set of sets
- 2.3 Union and intersection
- 2.4 More set operations
- 2.5 Set identities
- 2.6 Cartesian products
- 2.7 Partitions

3. Functions
 - 3.1 Definition of functions
 - 3.2 Floor and ceiling functions
 - 3.3 Properties of functions
 - 3.4 The inverse of a function
 - 3.5 Composition of functions
4. Computation
 - 4.1 An introduction to algorithms
 - 4.2 Finite state machines
 - 4.3 Turing machines
5. Searching and Sorting Algorithms
 - 5.1 Searching and algorithms (C++)
 - 5.2 Binary search (C++)
 - 5.3 Sorting: Introduction
 - 5.4 Selection sort (C++)
 - 5.5 Insertion sort (C++)
6. Integer Properties
 - 6.1 The Division Algorithm
 - 6.2 Modular arithmetic
 - 6.3 Prime factorizations
 - 6.4 Factoring and primality testing
 - 6.5 Greatest common divisor and Euclid's algorithm
 - 6.6 Number representation
 - 6.7 Fast exponentiation
 - 6.8 Introduction to cryptography
 - 6.9 The RSA cryptosystem
7. Intro to Counting
 - 7.1 Sum and product rules
 - 7.2 The bijection rule
 - 7.3 The generalized product rule
 - 7.4 Counting permutations
 - 7.5 Counting subsets
 - 7.6 Subset and permutation examples
 - 7.7 Counting by complement
 - 7.8 Permutations with repetitions
 - 7.9 Counting multisets
 - 7.10 Assignment problems: Balls in bins
 - 7.11 Inclusion-exclusion principle
 - 7.12 Counting problem examples
8. Advanced Counting
 - 8.1 Generating permutations and combinations
 - 8.2 Binomial coefficients and combinatorial identities
 - 8.3 The pigeonhole principle
 - 8.4 Generating functions

9. Discrete Probability

- 9.1 Probability of an event
- 9.2 Unions and complements of events
- 9.3 Conditional probability and independence
- 9.4 Bayes' Theorem
- 9.5 Random variables
- 9.6 Expectation of a random variable
- 9.7 Linearity of expectations
- 9.8 Bernoulli trials and the binomial distribution

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.

RK/2003; Revised Nov 2006/JP/SP Fall 2007, CO'S Fall 2008, NN 2012

Last updated 01/14/2019, 07/17/2019 for typo

Updated for zyBooks NN 08/23/2021