

Math 220: Discrete Mathematics

Master Course Syllabus

Description:	<i>An introduction to mathematical reasoning, algorithm analysis, and the concepts that provide a mathematical foundation for computer science. Topics include a review of sets, relations, functions and matrices; logic, proof techniques, including mathematical induction; counting techniques; difference equations; applications and elementary analysis of iterative and recursive algorithms, graph theory.</i>
Credit Hours:	3
Audience:	Required for Computer Science and Computer Engineering majors. Mathematics/Science elective for Electrical Engineering majors. Prerequisite for CS 372. Required as a bridge for Cyber Security students.
Corequisite:	Math 131
Format:	Online or in lecture format
Textbook:	<i>An Introduction to Discrete Mathematics (Second edition)</i> by Steven Roman (ISBN 0-15-541730-4)
Technology:	You may find a scientific calculator useful for this course, but it is not required.
Internet:	Course material and grades are often maintained in Blackboard, at the discretion of the instructor.
Access & Accommodations:	The Access & Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.

Course Goals:

- A. Students will improve mathematical problem-solving skills.
- B. Students will use mathematical ideas to solve computer science and engineering problems.
- C. Students will improve mathematical proof writing skills

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Topical Objectives (with goals addressed).

Preface: *Students will be able to...*

1. Define the basic terminology of propositional logic and predicate calculus. (A)
2. Understand the use of truth tables in analyzing compound statements. (A)
3. Describe the connection between propositional logic and digital logic circuits. (B)
4. Identify and name logical equivalences and valid argument techniques and use them in proofs. (C)
5. Perform different proof techniques, such as induction, direct proofs, etc. (C)
6. Solve linear homogeneous recurrence relations with constant coefficients. (A)
7. Given integers a , b , and m , determine if a is congruent to b modulo m . (A)
8. Use the Euclidean algorithm to find the greatest common divisor of two integers. (A)
9. Describe how number theory is used in cryptology. (B)
10. Solve problems involving construction and analysis of trees and graphs. (A,B)
11. Understand and perform simple graph algorithms, such as search algorithms, greedy algorithms, Dijkstra's algorithm. (A,B)

General Objectives (with goals addressed).

Preface: *Students will be able to ...*

12. Identify when certain theorems apply, and if not, identify what hypothesis is violated. (A,C)
13. Recognize alternate forms of a correct result. (A,C)
14. Use proper mathematical notation and vocabulary. (C)
15. Write clear and detailed solutions to assigned exercises. (A,B,C)
16. Describe the underlying mathematical ideas for foundational computer science and engineering applications. (B)