1 Course Link

You can access this course at [this link](#) if it is available and you are enrolled in it.

2 Catalog Description

What this course is about: *Mathematics for computer science.*

This course introduces the mathematical topics needed to provide a solid theoretical foundation for computer science. The following topics will be covered:

- Logic and Proof
  - Propositional logic
  - Logical connectives
  - Truth tables
  - Validity
  - Predicate logic
  - Universal and existential quantification
  - Rules of Inference (e.g., modus ponens and modus tollens)
  - Proof Strategy and Techniques
- Sets, Functions, Sequences and Summations
  - Sets and Set Operations (Venn diagrams, complements, Cartesian product, power sets)
  - Functions (surjections, injections, bijections, inverses, composition)
  - Sequences and Summations
  - Cardinality, Countability and Uncountability
- Integers, Algorithms and Number Theory
  - Divisibility
  - GCD, LCM
  - Congruence
  - Prime numbers
  - Cryptography
• Mathematical Induction and Recursion
  – Mathematical Induction
  – Recursive Definitions
  – Structural Induction
  – Recursive Algorithms
• Basics of Counting
  – Counting arguments
  – The Pigeonhole Principle
  – Permutations and Combinations
  – Binomial Coefficients
• Graphs
  – Graph Models and Terminology
  – Representing Graphs and Graph Isomorphism
  – Connectivity
  – Euler and Hamilton Paths
  – Shortest-Path Problems
  – Planar Graphs and Graph Coloring

3 Objectives

• Master the basic terminology and operations of logic, sets, functions, and graphs.
• Demonstrate logical reasoning through solving problems.
• Recognize important proof techniques: proof by contradiction and mathematical induction, at least.
• Relate induction to recursion and recursively defined structures.
• Solve problems in elementary number theory and basic combinatorics.
• Interpret the meaning of mathematical statements in the context of real-world applications.
• Think like a mathematician by making sense out of ambiguous, paradoxical or contradictory messages.

4 Course Materials

Required Text:

*Discrete Mathematics and its Applications*

Kenneth H. Rosen

5 Prerequisites

- CS 165 Object-Oriented Software Development
- Math 112 Calculus

6 Requirements

You are required to...

- attend class, as attendance and participation factor into your grade.
- read assigned portions of the course materials before the class meeting when they will be discussed.
- take quizzes to make sure your reading is effective.
- take tests to reinforce the concepts you have learned.
- do homework assignments to enhance your understanding of selected topics.
- take a comprehensive two-part final exam, or
- write a final paper on an assigned discrete-mathematical topic.

7 Assignments

Homework assignments are of two types: Exercises and Explorations.

7.1 Exercises

Exercises are of two types: book and non-book. Book exercises are assigned for each section of the book (at a rate of about one per class meeting). They are found at the end of the section, and the odd numbered ones have the answers in the back of the book. These exercises will be graded by you after a grading key is made available.

Non-book exercises are individual and group learning activities that will require either a small amount of preparation before class, or participation during class, or both. These will be self-and/or-peer-graded.

7.2 Explorations

Explorations are programming assignments that allow you to explore certain topics in discrete mathematics, as well as increase your C++ programming prowess. There are also a couple of non-programming (writing) assignments. There will be five explorations, about one every two weeks.
7.3 Late Policy

Explorations are due on the day at the time indicated in the schedule. Unless the reasons are extraordinary, late work will not be accepted—but the lowest score will be dropped[1](except for the last exploration).

The same applies to exercises, except that the lowest five scores will be dropped.

8 Assessments

Assessments come in two flavors: Quizzes and Tests.

There will be frequent preparation-assessment (take-before-class mostly, but some take-during-class) quizzes. These consist of multiple choice, multiple answer, true/false, fill in the blank or matching type questions for the online quizzes, and write-on for the in-class quizzes. These quizzes are open book, open notes, but you should try to take them without using book or notes (or google, etc.)

Five tests will be given during this course, one after each chapter covered (except Chapters 4 and 9). These are like the quizzes, except they are longer (in fact, they are cumulative), and are time-limited to 120 minutes each. The tests will be closed book, closed notes, (closed google, closed wikipedia, etc.) and will be proctored by the Online Testing Center.

Lastly, a comprehensive two-part final exam will be given on the last day of class and at the university-scheduled testing time. These exams will be administered in the classroom or the Linux lab, NOT in the testing center.

If you opt for it, writing a significant paper will substitute for taking the final exam.

9 Grading

- Assignments: 50%
  - Exercises: 15%
  - Explorations: 35%
- Assessments: 50%
  - Quizzes: 10%
  - Tests: 20%
  - Final Exam: 20%

Your weighted final percentage will determine your final grade as follows:

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[1] A zero score is usually as low as it can go, but you typically only get that by doing nothing, or else failing to turn anything in. Try very hard to avoid getting any such scores!
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<th>Grade</th>
<th>Percentage Range</th>
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<tr>
<td>A</td>
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