COURSE SYLLABUS

Course Title: **Computational Discrete Mathematics**

Abbreviated Title As Appears on Transcript: `Comp Discrete Math`

Course Number: DMAT 225

Credit Hours: 4 credits [semester credit hours]

Course Description: A single course on discrete mathematics with emphasis on the connections to computer science. Topics include sets, functions, mathematical induction, sequences, recurrence relations, logic, proofs, and introductions to combinatorics and number theory.

Prerequisite: Successful completion (C- or higher) of Precalculus with Trigonometry or equivalent, or consent of instructor.

Course Workload: 4 semester credit hours • 3 student work hours per credit hour • 14 week Carnegie semester = 168 hours student course workload average

Examination Requirements: Proctored written final examination must be passed at 60% or higher to earn passing grade in course. "B" and "A" grade paths have additional examinations.
See https://www.distancecalculus.com/grades/ for more information.

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Accredited by New England Commission of Higher Education (NECHE).
See https://www.rwu.edu/academics/accreditation/ for more information.

E-Textbook: *Computational Discrete Mathematics* by Skiena/Pemmaraju
Discrete Mathematics and Its Applications by Kenneth Rosen, 7th

Mathematical Software: *Mathematica*™ Computer Algebra & Graphing System

ADA ACCOMMODATIONS

Roger Williams University has a continuing commitment to providing reasonable accommodations for students with documented disabilities. Students with disabilities who need accommodations in order to fully participate in this class are urged to contact Student Accessibility Services, as soon as possible, to explore the arrangements needed to be made to assure access. Student Accessibility Services is open Monday

through Friday from 8:00AM to 5:00PM Eastern Time; Email: sas@rwu.edu or Voice: 401-254-3841. For more information about SAS, visit https://www.rwu.edu/undergraduate/academics/student-academic-success/student-accessibility-services-sas

Learning Outcomes for DMAT 225 - Computational Discrete Mathematics

1. To develop understanding and ability in symbolic logic
2. To understand and formulate basic mathematical proofs
3. To understand and formulate mathematical conjecture and algorithmic experimentation
4. To understand and compute the core concepts of Set Theory
5. To develop understanding of introductory Number Theory and Cryptography
6. To understand and formulate induction and recursion proofs and computations
7. To understand and compute with the Principals of Counting and Recurrence Relations
8. To develop understanding of introductory Graph and Tree Theory

Syllabus Topics Outline for DMAT 225 - Computational Discrete Mathematics

1. Getting Started
   - 1.1. Email and Chat
   - 1.2. Learning About the Course
   - 1.3 Required Hardware
   - 1.4. Software Fundamentals

2. Logical Reasoning
   - 2.1. Propositional Logic
   - 2.2. Equivalences
   - 2.3. Inference
   - 2.4. Introduction to Proofs
   - 2.5. Proof Methods and Strategies
   - 2.6. Conjecture and Experimentation

3. Set Theory
   - 3.1. Sets and Set Operations
   - 3.2. Functions
   - 3.3. Sequences and Summations
   - 3.4. Matrices

4. Algorithms
   - 4.1. Introduction
   - 4.2. Growth of Functions
   - 4.3. Complexity of Algorithms

5. Number Theory
   - 5.1. Modular Arithmetic

- 5.2. Divisibility
- 5.3. Primes
- 5.4. Greatest Common Divisors
- 5.5. Congruences
- 5.6. Cryptography

6. Recursion
   - 6.1. Danger in Recursion in Programming
   - 6.2. Induction
   - 6.3. Recursion and Algorithms

7. Counting
   - 7.1. Basics of Counting
   - 7.2. Pigeonhole Principle
   - 7.3. Permutations
   - 7.4. Combinations
   - 7.5. Recurrence Relations
   - 7.6. Divide-and-Conquer Algorithms

8. Relations
   - 8.1. Properties of Relations
   - 8.2. Closure
   - 8.3. Equivalence

9. Graph Theory
   - 9.1. Graphs and Graph Models
   - 9.2. Generating Graphs
   - 9.3. Representing Graphs and Graph Isomorphism
   - 9.4. Connectivity
   - 9.5. Euler and Hamilton Paths
   - 9.6. Graph Coloring
   - 9.7. Trees