

Department of Mathematics, Computer & Information Science

## DISCRETE MATHEMATICS - MA3030

### Departmental Syllabus

**TEXTBOOK:** Discrete Mathematics with Applications, Third Edition, Susanna Epp, Brooks/Cole

**Prerequisite:** Grade of C or higher in Mathematical Logic & Set Theory-MA2030.

**COURSE DESCRIPTION:** Topics include combinatorics, functions and relations on discrete structures, recursion, efficiency of algorithms, graphs and trees.

**COURSE OBJECTIVES:** This course is designed to build necessary mathematical foundations for students majoring in computer science and to introduce a variety of topics in finite mathematics to students majoring mathematics. This course assumes that you already have some familiarity with the following topics: basic set theory, propositional logic, a variety of standard proof techniques including mathematical induction.

**COURSE EVALUATION & GRADING:** Your grade will be based on exams, quizzes, and homework.

There will be in class cumulative final exam. The grading scale is as follows:

<b>A</b> = [93, 100]	<b>B<sup>+</sup></b> = [87, 89]	<b>C<sup>+</sup></b> = [77, 79]	<b>D<sup>+</sup></b> = [67, 69]	<b>F</b> = [0, 59]
<b>A<sup>-</sup></b> = [90, 92]	<b>B</b> = [83, 86]	<b>C</b> = [73, 76]	<b>D</b> = [63, 66]	
	<b>B<sup>-</sup></b> = [80, 83]	<b>C<sup>-</sup></b> = [70, 72]	<b>D<sup>-</sup></b> = [60, 62]	

**TUTORIAL:** Drop-in tutorial is available in the mathematics learning center, Room **A118**.

**WITDRAWALS:** If you decide to withdraw from this course, you must complete an official withdrawal form at the office of the registrar to receive a **W** in this course.

**ACCOMMODATIONS FOR STUDENTS WITH SPECIAL NEEDS:** If you have or suspect you may have a physical, psychological, medical or learning disability that may impact your course work, please contact The Office of Services for Students with Disabilities (OSSD), Phone: 516-876-3009, Fax: 516-876-3005, TTD: 516-876-3083. All support services are free and all contacts with the OSSD are strictly confidential.

## TOPICS TO BE COVERED

*Textbook* Discrete Mathematics with Applications, Third Edition, Susanna Epp, Brooks/Cole

### 1 – 5 REVIEW OF LOGIC AND SET THEORY – (1to 2 Weeks)

#### 6. COUNTING AND PROBABILITY

- 6.1 Introduction
- 6.2 Possibility Trees and the Multiplication Rule
- 6.3 Counting Elements of Disjoint Sets: The Addition Rule
- 6.4 Counting Subsets of a Set: Combinations
- 6.5 Combinations with Repetition Allowed
- 6.6 The Algebra of Combinations
- 6.7 The Binomial Theorem
- 6.8 Probability Axioms and Expected Value
- 7.3 The Pigeonhole Principle

#### 8. RECURSION

- 8.1 Recursively Defined Sequences
- 8.2 Solving Recurrence Relations by Iteration
- 8.3 Second-Order Linear Homogeneous Recurrence Relations with Constant Coefficients
- 8.4 General Recursive Definitions

#### 9. THE EFFICIENCY OF ALGORITHMS

- 9.1 Real -Valued Functions of a Real Variable and Their Graphs
- 9.2 O, Omega, and Theta Notations
- 9.3 Application: Efficiency of Algorithms I
- 9.4 Exponential and Logarithmic Functions: Graphs and Orders
- 9.5 Application: Efficiency of Algorithms II

#### 10. RELATIONS

- 10.1 Relations on Sets
- 10.2 Reflexivity, Symmetry, and Transitivity.
- 10.3 Equivalence Relations.
- 10.4 Modular Arithmetic with Applications to Cryptography.
- 10.5 Partial Order Relations

#### 11. GRAPHS AND TREES

- 11.1 Graphs: An Introduction.
- 11.2 Paths and Circuits
- 11.3 Matrix Representations of Graphs
- 11.4 Isomorphism of Graphs
- 11.5 Trees