DEREE COLLEGE SYLLABUS FOR: MA 2026 DISCRETE MATHEMATICS 3/0/3

(FALL 2024)

PREREQUISITES:	None
CATALOG DESCRIPTION:	An introductory course in discrete mathematics which concerns the study of discrete structures. The course covers topics such as logic, number theory, induction, set theory, combinatorics, probability theory, and graph theory.
RATIONALE:	The course aims to develop students' ability to reason mathematically and to write mathematical proofs. It provides fundamental knowledge on discrete objects, such as integers, graphs, and statements in logic that are necessary for the study of algorithms, networks, programming languages, and other related applications in computer science and technology.
LEARNING OUTCOMES:	*As a result of taking this course, the student should be able to:* 1. Demonstrate understanding and execute a variety of proof techniques and write clear mathematical statements. 2. Demonstrate understanding of basic number theory concepts and develop numerical representations. 3. Apply appropriate counting techniques to application problems and calculate probabilities. 4. Apply inductive/deductive reasoning to solve a variety of problems.
METHOD OF TEACHING AND LEARNING:	In congruence with the teaching and learning strategy of the college, the following tools are used: • Lectures and class discussions. • Homework assignments. • Office hours held by the instructor to provide further assistance to students. • Use of library facilities for further study and preparation for the exams. • Use of the Blackboard course management platform to further support communication, by posting lecture notes, assignment instruction, timely announcements, formative quizzes and online submission of assignments.
ASSESSMENT:	**Summative:** 1st assessment: Midterm examination (written, 1 hour) — **30%** 2nd assessment: Portfolio of student work — **10%** Final assessment: Final examination (written, 2 hours) — **60%** ▪ The first assessment tests Learning Outcomes 1, 2. ▪ The second assessment tests Learning Outcomes 1, 2, 3, 4. ▪ The final assessment tests Learning Outcomes 1, 2, 3, 4. The final grade for this module will be determined by averaging all summative assessment grades, based on the predetermined weights for each assessment. Students are not required to resit failed assessments in this module. Failure to pass the module results in module repeat.
INDICATIVE READING:	**REQUIRED READING:** • Susanna S. Epp, *Discrete Mathematics with Applications,* 5th Ed. (Metric Version), 2019, Cengage **RECOMMENDED READING:** • H. Lewis, R. Zax, *Essential Discrete Mathematics for Computer Science*, 2019, Princeton University Press • P. Grossman, *Discrete Mathematics for Computing*, 3rd Ed., 2017, Red Globe Press

INDICATIVE MATERIAL:	**REQUIRED MATERIAL:** N/A **RECOMMENDED MATERIAL:** • College Mathematics • Mathematics Magazine • American Mathematical Monthly
COMMUNICATION REQUIREMENTS:	Oral and written communication skills using academic / professional English.
SOFTWARE REQUIREMENTS:	MS Office and Blackboard CMS.
WWW RESOURCES:	http://mathworld.wolfram.com http://mathacademy.com https://www.khanacademy.org/math
INDICATIVE CONTENT:	**1. Introduction to Logic** 1.1 Mathematical statements, sets, and relations 1.2 Propositional equivalences 1.3 Predicates and quantifiers 1.4 Proof techniques and strategies **2. Number Theory** 2.1 Divisibility 2.2 Prime factorization 2.3 Integer representations 2.4 Division algorithms and GCD 2.5 Big-O notation and algorithm efficiency **3. Sequences** 3.1 Sequences and recursive formulas 3.2 Partial sums and products 3.3 Divide and conquer algorithms, master theorem **4. Induction** 4.1 Induction proofs 4.2 Strong induction 4.3 Structural induction **5. Set Theory** 5.1 Sets and their properties 5.2 Sets and proofs 5.3 Cardinality of sets 5.4 Boolean Algebra expressions **6. Counting and Probability** 6.1 Events and probability 6.2 The pigeonhole principle and applications 6.3 Counting techniques: Multiplication rule, Combinations, Permutations 6.4 Basic Probability rules and Expected Value 6.5 Conditional Probability – Bayes formula 6.6 Independence **7. Graphs*** 7.1 Types of graphs and basic concepts 7.2 Eulerian and Hamiltonian circuits *If time permits