COURSE NUMBER: MATH 2305

COURSE TITLE: Discrete Mathematics I

CREDIT HOURS: 3  LECTURE HOURS: 3  LAB HOURS: 0

ASSESSMENTS: None

PREREQUISITE: MATH 2413

COREQUISITE: None

COURSE DESCRIPTION: A course designed to prepare math, computer science, and engineering majors for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science. Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory, graph theory, and mathematical proof techniques.


SUPPLIES: Graphing calculator required

STUDENT LEARNING OUTCOMES:

Upon completion of this course the students should be able to do the following:

1. Construct mathematical arguments using logical connectives and quantifiers. (Communication)
2. Verify the correctness of an argument using propositional and predicate logic and truth tables. (Critical Thinking)
3. Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability. (Empirical and Quantitative)
4. Solve problems involving recurrence relations and generating functions. (Empirical and Quantitative)
5. Use graphs and trees as tools to visualize and simplify situations.
6. Perform operations on discrete structures such as sets, functions, relations, and sequences.
7. Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction. (Communication)
8. Apply algorithms and use definitions to solve problems to prove statements in elementary number theory. (Critical Thinking)

COURSE REQUIREMENTS: Completion of required exams and assignments.
COURSE FORMAT: Lecture and guided practice.

METHOD OF EVALUATION: A minimum of four proctored exams and a proctored comprehensive final exam will be given. Homework and/or quizzes may be used in place of one exam or in addition to exams. The weight of each of these components of evaluation will be specified in the individual instructor’s addendum to this syllabus. All out-of-class course credit, including home assignments, service-learning, etc. may not exceed 25% of the total course grade; thus, at least 75% of a student’s grade must consist of proctored exams, and no student may retake any of these exams.

ATTENDANCE POLICY: Attendance is expected of all students. If a student is unable to attend, it is his/her responsibility to contact the instructor to obtain assignments. Please see the schedule of classes for the last day to withdraw from the course with a grade of W.

RELIGIOUS HOLY DAYS: In accordance with section 51.911 of the Texas Education Code, the college will allow a student who is absent from class for the observance of a religious holy day to take an examination or complete an assignment scheduled for that day within a reasonable time. A copy of the state rules and procedures regarding holy days and the form for notification of absence from each class under this provision are available from the Admissions and Records Office. Please refer to the current Collin Student Handbook.

ADA STATEMENT: Collin College will adhere to all applicable federal, state and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student's responsibility to contact the ACCESS Office, SCC-D140 or 972.881.5898, (V/TDD 972.881.5950) to arrange for appropriate accommodations. See the current Collin student Handbook for additional information.

ACADEMIC ETHICS: Please see section 7-2.2 of the Collin Student Handbook. Contact the Dean of Students at 972.881.5771 for the student disciplinary process and procedures.

COURSE CONTENT: Proofs and derivations will be assigned at the discretion of the instructor. The student will be responsible for knowing all definition and statements of theorems for each section outlined in the following modules.

MODULE 1: The Foundations: Logic and Proofs

The students will learn about:

1. Propositional Logic
2. Propositional Equivalences
3. Predicates and Quantifiers
4. Nested Quantifiers
5. Rules of Inference
6. Introduction to Proofs

MODULE 2: Basic Structure: Sets, Functions, Sequences, and Sums
The students will learn about:

1. Sets
2. Set Operations
3. Functions
4. Sequences and Summations

MODULE 3: The Fundamentals: Algorithms, the Integers, and Matrices

The students will learn about:

1. Algorithms
2. The Growth of Functions
3. Complexity of Algorithms
4. The Integers and Division
5. Primes and Greatest Common Divisors
6. Integers and Algorithms
7. Applications of Number Theory
8. Matrices

MODULE 4: Induction and Recursion

The students will learn about:

1. Mathematical Induction
2. Strong Induction and Well-Ordering
3. Recursive Definitions and Structural Induction
4. Recursive Algorithms

MODULE 5: Counting

The students will learn about:

1. The Basics of Counting
2. The Pigeonhole Principle
3. Permutations and Combinations
4. Binomial Coefficients
5. Generalized Permutations and Combinations

MODULE 6: Discrete Probability

The students will learn about:
1. An Introduction to Discrete Probability

**MODULE 7: Relations**

The students will learn about:

1. Relations and Their Properties

**MODULE 8: Graphs and Trees**

The students will learn about:

1. Graphs and Graph Models
2. Graph Terminology and Special Types of Graphs
3. Introduction to Trees