COURSE SYLLABUS

Tunxis Community College

Education That Works For a Lifetime

Course Title:	Discrete Mathematics	**Date submitted:**	May 2020 (AAC: 20-26)
Department:	STEAM		
Curriculum:	Mathematics		

Course Descriptors:

Course Code: (eg. ACC 101)	**MAT*210**
Course Type:	**L/D**

A: Clinical B: Lab D: Distance Learning
I: Individual/Independent L: Lecture N: Internship
M: Seminar P: Practicum U: Studio
X: Combined Lecture/Lab Y: Combined Lecture/ Clinical/Lab Z: Combined Lecture/Studio

Elective Type:	**G/LAS/ M**

AH: Art History E: English FA: Fine Arts FL: Foreign Language G: General HI: History HU: Humanities LAS: Liberal Arts & Sciences M: Math S: Science SS: Social Science

Credit Hours:	3
Developmental: (yes/no)	N
Contact Hours: Lecture:	3
Clinical:	0
Lab:	0
Studio	0
Other:	0
TOTAL:	3
Class Maximum:	30
Semesters Offered:	F/Sp

Prerequisites:

C- or better in MAT*254 Calculus I

Corequisites:

None

Other Requirements:

None

Catalog Course Description:

This course is designed to provide students with an introduction to mathematical concepts, problem-solving skills, and methods of thinking that are fundamental in computer science, engineering, and mathematics. Topics include logic, set theory, relations, functions, number theory, combinatorics, and induction. The course emphasizes the writing of mathematical proofs, abstract reasoning, language precision, and effective communication and serves as a transition to higher mathematics.

Topical Outline:

Topics with an asterisk (*) are optional and will be covered if time permits.

1. Logic and Proofs
   - Compound statements
   - Proofs in Mathematics: Direct, indirect, cases, if and only if, existence, and uniqueness
   - Truth tables
   - The algebra of propositions
   - Logical arguments

Topics with an asterisk (*) are optional and will be covered if time permits.

2. Sets and Relations
    - Sets
    - Operations on sets
    - Binary relations
    - Equivalence relations
    - Cardinality
    - Partial orders (*)

3. Functions
    - Terminology
    - Inverses and composition
    - One-to-one and onto

4. Number Theory
    - Division algorithm
    - Divisibility and the Euclidean Algorithm
    - Prime numbers
    - Congruence
    - Applications of congruence

5. Induction and Recursion
    - Mathematical Induction
    - Recursively defined sequences (*)

6. Combinatorics
    - The addition and multiplication rules
    - The principle of inclusion-exclusion (*)
    - The pigeonhole principle (*)
    - Permutations and combinations
    - The Binomial Theorem
    - Repetitions
    - Derangements (*)

Outcomes:	**COURSE: Upon successful completion of this course, the student will be able to:** • Convert statements from common language to formal logic using predicates, quantifiers, and logical connectives. • Apply truth tables, rules of inferences, and the laws of propositional and predicate calculus to simplify and evaluate logic statements—including compound statements, implications, inverses, converses, and contrapositives. • Understand what it means to prove a mathematical statement correctly and conclusively. • Write proofs using the following methods: direct proof, indirect proof (contradiction and contraposition), case analysis, and mathematical induction. • Prove existential and uniqueness statements. • Use set operations and logic to solve problems. • Apply properties of one-to-one, onto, composition, and inverse functions. • Use divisibility properties and Euclidean Algorithm to determine greatest common divisors, prime numbers, composite numbers, and least common multiples. • Give integer representation in various bases. • Perform modulo arithmetic. • Determine the domain and range of discrete or non-discrete functions. • Solve counting problems using techniques such as addition and multiplication rules, permutations, and combinations. • Determine if a binary relation is reflexive, symmetric, transitive, or equivalence. **PROGRAM:** N/A **GENERAL EDUCATION/TAP OUTCOMES:** Quantitative Reasoning→Students will learn to recognize, understand, and use the quantitative elements they encounter in various aspects of their lives. Students will develop a habit of mind that uses quantitative skills to solve problems and make informed decisions. Demonstrates: Interprets numerical information and applies sufficient laws of logic and mathematics to solve problems using numbers, symbols, graphs and/or descriptions. Does Not Demonstrate: Misinterprets numerical information or insufficiently applies laws of logic and mathematics to solve problems using numbers, symbols, graphs and/or descriptions.
Evaluation:	**Assessment will be based on the following criteria:** Quizzes; homework; exams

Instructional Resources:	**Required: None** **Desired: None**
Textbook(s)	• Discrete Mathematics with Graph Theory, 3rd edition. Authors: Edgar G. Goodaire and Michael M. Parmenter Publisher: Pearson Or • Discrete Mathematics and Its Applications, 8th edition Author: Kenneth Rosen Publisher: McGraw-Hill Or • Instructor's choice