COUNTY COLLEGE OF MORRIS
Course Information Outline

Course Title DISCRETE MATHEMATICS **PREFIX&NUMBER** ~~MAT2XX~~ 225

Lecture Hours 60 **Laboratory Hours** 0 **Credit Hours** 4 **Course Fee** None

Department Chairperson Approval Alexis Thurman A. Thurman **Date** 1/28/15

Division Dean Approval Patrick Enright **Date** 1.29.15

General Education Information:

Categories:

☐ Communications ☐ History ☐ Humanities ☐ Mathematics
☐ Science ☐ Social Science ☐ Technological Competency
☐ Diversity *(check if course also meets diversity category)*

Integrated Goals: *(check all that apply)*

☐ Ethical Reasoning and Action ☐ Information Literacy

1. **Catalog Course Description**
   This course is for mathematics and computer science majors. An introduction to discrete mathematics. Topics include logic, Boolean algebra, mathematical proofs, sets, functions, sequences, graphs, number theory, recursion, mathematical induction, introductory combinatorics, and discrete probability. Emphasis on applications to foundations of computer science.

2. **Prerequisite(s)**
   MAT 131 – Calculus I

3. **Co-requisite(s)**
   N/A

4. **Textbooks**
   Discrete Mathematics and Its Applications, Rosen, 7th Ed. McGraw Hill, 2011

5. **Supplementary Books and/or Materials**
   Student's Solution Guide for Discrete Mathematics and Its Applications, Rosen, 7th Ed. McGraw Hill, 2011

6. **Specialized equipment, supplies, facilities, for classes limited by enrollment or restricted by accreditation and/or equipment limitations.** (Information will be used to determine differential funding category.)

7. Course Content (List of Topics)

1) The Foundations: Logic and Proofs
   - Propositional logic
   - Applications of Propositional Logic
   - Propositional Equivalencies
   - Predicates and Quantifiers
   - Nested Quantifiers
   - Rules of Inference
   - Introduction to Proofs
   - Proof Methods and Strategy

2) Basic Structures: Sets, Functions, Sequences, Sums and Matrices
   - Sets
   - Set Operations
   - Functions
   - Sequences and Summations
   - Cardinality of Sets

3) Number Theory and Cryptography
   -Divisibility and Modular Arithmetic
   - Integer Representation and Algorithms
   - Primes and Greatest Common Divisors
   - Solving Congruences
   - Applications to Congruences
   - Cryptography

4) Induction and Recursion
   - Mathematical Induction
   - Strong Induction and Well-Ordering
   - Recursive Definitions and Structural Induction
   - Recursive Algorithms

5) Counting
   -The Basics of Counting
   - The Pigeonhole Principle
   - Permutations and Combinations
   - Binomial Coefficients and Identities

6) Discrete Probability
   - Probability Theory
   - Bayes' Theorem

7) Relations

8) Graphs

9) Trees

8. Statement of Course LEARNING OUTCOMES

Students will

a) Evaluate the truth of mathematical statements using deductive and inductive reasoning.
b) Illustrate functional similarities of set theory, discrete probability, propositional logic, Boolean algebra, and circuits.
c) Use the set of integers to define the concepts of modulo and remainders.
d) Analyze the relationships among counting techniques (combinatorics), discrete probabability, sets, Boolean algebra, propositional logic.
e) Evaluate trees, graphs, networks and determine efficiency, redundancy, and similarity.
f) Evaluate and prove the efficiency of computer algorithms.
g) Apply the principles of mathematical induction, direct and indirect methods of proof to prove results on the integers, rational numbers, and real number.
h) Prove recursive, iterative, and explicit solutions to classic discrete math problems.
i) Apply graph theory and principles of combinatorial analysis to network models.
j) Create and manipulate trees and spanning trees to find minimized forms
k) Create and search Euler graphs and Hamiltonian graphs or circuits
l) Identify and solve discrete probability and combinatorial problems
m) Identify and solve recurrence relations including equivalence relations and partial orderings.

Statement of Relation to Curriculum(s)
This is a one course math elective and/or computer programming elective to complete the Mathematics or Mathematics Education Specialization curriculum.

9. Format for offering the course (check all that apply)
☒ **Traditional** ☐ **On-Line** ☐ **Hybrid**