

MIDDLESEX COUNTY COLLEGE
EDISON, NJ
MASTER SYLLABUS

Course ID and Name: MAT 206, Introduction to Discrete Mathematics

Department: Mathematics

Prerequisites: MAT 132 or approval of the mathematics department chairperson.

Course Description: This is a first course in discrete mathematics. Topics include number theory, sets, functions and sequences, relations, recurrence relations, counting techniques, logic and techniques of proof, graphs, and algorithms. This course prepares a student for further study in mathematics and computer science.

General Education Status: GE MST

Credits: 4 **Lecture Hours:** 4 **Lab Hours:** 0

E-book(s) and Other Course Materials:

E-book: Discrete Mathematics with Applications, 4th Ed., Susanna Epp

Policies:

Disability Support

Students with disabilities, whether physical, learning or psychological, who believe that they may need accommodations in this class, are encouraged to contact Disability Services as soon as possible to ensure that the accommodations are implemented. Please meet with the Disability Services staff in Edison Hall, Room 100, (732) 906-2546.

Code of Student Conduct

To foster a productive learning environment, the College requires that all students adhere to the Code of Student Conduct which is published in the college catalog and website.

Core Learning Outcomes*

Upon successful completion of the course, students will be able to:

1. Use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
 - a. Translate quantifiable problems into mathematical terms and solve these problems using mathematical or statistical operations.
 - b. Construct graphs and charts, interpret them, and draw appropriate conclusions.
2. Communicate accurate mathematical terminology and notation to explain strategies to solve problems and interpret solutions.
3. Utilize various reasoning, problem-solving, and critical thinking techniques to solve applications among the laws of probability, the normal curve, and confidence interval inferences.

4. Understand the language and concepts of Mathematical Structures as well as the formal mathematical definitions that accompany them.

*Imported from the NJCCC GE Learning Goals (2011), NJCCC (2011), and AMATYC (2008)

Content Strands and Content Objectives

| Content Strand | Students will be able to... |
|---|---|
| Logic and Proof (CLO 1a, 2, 3, 4) | <ul style="list-style-type: none"> ▪ Determine the truth of statements. ▪ Build truth tables to test the truth of statements. ▪ Rewrite statements in equivalent forms using DeMorgan's Laws and other techniques. ▪ Express statements with quantifiers and write their negations. ▪ Determine the validity of a symbolic argument. ▪ Construct direct and contrapositive proofs for basic number facts. |
| Sequences and recursion (CLO 1a, 2, 3, 4) | <ul style="list-style-type: none"> ▪ Write an explicit formula for a sequence, given its terms. ▪ Find sums and products of terms in a sequence. ▪ Use mathematical induction to prove formulas for summations and products. ▪ Solve first-order recurrence relations by iteration. ▪ Solve second-order linear, homogeneous recurrence relations. |
| Sets and Functions (CLO 1a, 1b, 2, 3, 4) | <ul style="list-style-type: none"> ▪ Find sets defined by set operations. ▪ Find a power set for a given set. ▪ Construct Venn diagrams for sets. ▪ Prove set identities. ▪ Construct a mapping of the domain and codomain of a function. ▪ Differentiate between a codomain and a range. ▪ Classify functions as injective, surjective, bijective, or neither. ▪ Determine whether a function has an inverse function. ▪ Find the cardinality of an infinite set. |
| Relations (CLO 1a, 1b, 2, 3, 4) | <ul style="list-style-type: none"> ▪ Construct a mapping for a relation on a set. ▪ Determine whether a relation is an equivalence relation. ▪ Find a congruence for any integer in modulo n. ▪ Perform arithmetic in modulo n. ▪ Find the inverse of an integer in modulo n. |
| Combinatorics and Probability (CLO 1a, 2, 3, 4) | <ul style="list-style-type: none"> ▪ Count elements based on the addition rule, multiplication rule, permutations, r-combinations, and multisets. ▪ Use the Binomial Theorem to expand binomials. ▪ Relate Pascal's triangle to r-combinations and the Binomial Theorem. ▪ Calculate the probability of simple and compound events. ▪ Compute an expected value for a game of chance. |
| Graph Theory (CLO 1a, 1b, 2, 3, 4) | <ul style="list-style-type: none"> ▪ Construct graphs to given specifications. ▪ Describe the order of a vertex. ▪ Differentiate between a walk, trail, path, closed walk, and circuit on a graph. ▪ Determine whether a graph has an Euler path. ▪ Determine the number of Hamiltonian circuits on a graph. ▪ Construct trees and rooted trees. ▪ Solve problems involving the Traveling Salesman. ▪ Solve problems involving the minimum-spanning tree. |

