

**MAT 225 – DISCRETE MATHEMATICS**

4 hrs./wk. – 4 cr.

8/2020

BEGINNING FALL 2020

Catalog 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.

Prerequisite: MAT 131 (grade of a “C” or better) or equivalent

Text: Irani, *Discrete Mathematics*, zyBook

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Syllabus

Period	Topics
1 – 4	Logic – Propositions, logical operations, compound propositions, conditional statements, logical equivalence, laws of propositional logic, quantified statements, logical reasoning, rules of inference
5 – 8	Proofs – Direct proofs, proof by contrapositive, proof by contradiction, proof by cases
9 – 12	Integer Properties – Division algorithm, modular arithmetic, prime factorization, GCD and Euclid’s algorithm, number representations, Intro to Cryptography (ciphers)
13 – 15	Set Theory – sets, subsets, power sets, set operations, set identities, Cartesian Product and partitions
16 – 17	Functions – Definition, properties, inverse, types of functions
18 – 22	Relations and Digraphs – binary relations, properties of relations, digraphs, partial orders, equivalence relations,
23	Review for exam
24	<b>Midterm</b>
25 – 30	Graphs and Trees – Graph representations and isomorphisms, Euler and Hamiltonian path and circuits, planar graphs and graph coloring, tree traversals, minimum spanning trees
31 – 35	Induction and Recursion – sequences, recurrence relations, mathematical induction, proof by induction, recursive algorithms
36 – 39	Counting – Sum and product rules, combinations and permutations, pigeonhole principle
40 – 41	Discrete Probability – probability of an event, unions and complements of events, conditional probability
42 – 43	Boolean Algebra – Boolean operations, Boolean functions, circuits
44	Review for exam
45	<b>Final Exam</b>

Students are expected to adhere to the policies of the County College of Morris. These can be accessed at [www.ccm.edu/academics/academic-policies/](http://www.ccm.edu/academics/academic-policies/).

## Statement of Course **LEARNING OUTCOMES**

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