Syllabus

MAT 160 - Introduction to Discrete Mathematics

General Information

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Department Mathematics

Course Prefix MAT

Course Number 160

Course Title Introduction to Discrete Mathematics

Course Information

Catalog Description An introduction to many of the principal topics of discrete mathematics, including number systems, sets, logic, relations, combinatorial methods, graph theory, regular sets, vectors and matrices,

Credit Hours 4

Lecture Contact Hours 4

Lab Contact Hours 0

Other Contact Hours 0

Grading Scheme Letter

Prerequisites

MAT 152

Co-requisites

None

First Year Experience/Capstone Designation

This course DOES NOT satisfy the outcomes applicable for status as a FYE or Capstone.

SUNY General Education

This course is designated as satisfying a requirement in the following SUNY Gen Ed category
Mathematics (and Quantitative Reasoning)

FLCC Values

Institutional Learning Outcomes Addressed by the Course
Inquiry and Perseverance

Course Learning Outcomes

Course Learning Outcomes

1. Apply precise mathematical reasoning in the use and analysis of course content.
2. Justify conclusions supported by appropriate evidence, presented with proper terminology and notation.
3. Articulate clear solutions to problems by applying definitions, properties, techniques and logical structure included within course concepts.

Outline of Topics Covered

I. **Number systems**
   I. **Binary, octal and hexadecimal systems**
   II. **Properties of the integers**
   III. **Modular arithmetic**

II. **Sets**
   I. **Sets, subsets, and powersets**
   II. **Set representations and Venn diagrams**
   III. **Set operations: Intersection, union, and complement**
   IV. **Cartesian product**

III. **Logic**
   I. **Logical operators: Conjunction, disjunction, negation, and implication**
   II. **Tautologies and contradictions**
   III. **Truth tables and logical equivalence**
   IV. **Valid and invalid arguments**
   V. **Decision tables**
   VI. **Quantifiers: Universal, existential, and uniqueness**

IV. **Proof techniques**

I. The rationale of mathematical proof
II. Understanding the reasoning behind and evaluating the validity of proposed direct proofs
III. Understanding the reasoning behind and evaluating the validity of proposed proofs by contradiction
IV. Understanding the reasoning behind and producing basic proofs by mathematical induction

V. Functions
I. Relations as subsets of the Cartesian product
II. Partial orders and equivalence relations
III. Functions: One-to-one, onto, and inverses
IV. Recursively defined functions

VI. Combinatorics
I. Permutations and combinations
II. The Binomial Theorem
III. The Pigeonhole Principle

VII. Graph Theory
I. Types of graphs, including K[n], C[n], trees, digraphs, and weighted graphs
II. Isomorphics graphs
III. The Traveling Salesperson Problem and other graph traversal problems
IV. Shortest paths and Dijkstra's algorithm

VIII. Arrays
I. Vectors and matrices
II. Matrices associated with graphs
III. Matrix operations
IV. Bit clearing and bit masking

IX. Regular sets
I. Regular expressions
II. Linear grammars
III. Finite state automata
IV. Equivalence of regular expressions, linear grammars and finite state automata.