STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MATH 351 - DISCRETE MATHEMATICS

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Canino School of Engineering Technology

Department: MATHEMATICS DEPARTMENT

Semester/Year: Fall/2018

A. **TITLE**: DISCRETE MATHEMATICS

B. **COURSE NUMBER:** MATH 351

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 3 **per week**
 # Lab Hours: 0 **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☐ **Yes:** GER
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☐ **Spring** ☐ **Fall & Spring** ☒

G. **COURSE DESCRIPTION:**

This course studies the basic tools and techniques of discrete mathematics and their applications. The topics include sets, logic, proofs, functions and relations, algorithms, elementary number theory, counting methods, discrete probability, pigeonhole principle, recurrence relations, introduction to graph theory and Boolean algebras. Three hour lecture per week.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

College Algebra (MATH 121) or Precalculus Algebra and Trigonometry (MATH 123), with a grade of C or better or permission of instructor.

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
Use basic logic and set theory for reasoning		GER 1	3-Found Skills ISLO ISLO	QTR Subsets Subsets Subsets
Construct abstract proofs or give counterexamples		GER 1	3-Found Skills ISLO ISLO	QTR Subsets Subsets Subsets
Understand the discrete structure in number system and probability		GER 1	3-Found Skills ISLO ISLO	QTR Subsets Subsets Subsets
Use counting principles to solve real life problems, analyze algorithms, construct and solve recurrence relations		GER 1	3-Found Skills ISLO ISLO	QTR Subsets Subsets Subsets
Understand fundamentals of graph theory		GER 1	3-Found Skills ISLO ISLO	QTR Subsets Subsets Subsets
Use Boolean algebra in combinatorial circuits		GER 1	3-Found Skills ISLO ISLO	QTR Subsets Subsets Subsets
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KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator

J. APPLIED LEARNING COMPONENT: Yes ☐ No ☒

If YES, select one or more of the following categories:

- ☐ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. TEXTS:

Members of the Mathematics Department who will be teaching the course will select the appropriate text. Audio-visual aids and computer software will be used when appropriate and available.

L. REFERENCES:

Many materials in the Math Lab and online will aid the students with mastery of this subject

M. EQUIPMENT: None ☒ Needed:

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Homework**
- **Quizzes**
- **Exams**
- **Projects**

P. DETAILED COURSE OUTLINE:

I. Sets and Logic
A. Sets
B. Propositions and Logical Equivalence
C. Arguments and Rules of Inference
D. Quantifiers and Nested Quantifiers

II. Methods of Proof
A. Mathematical Systems, Direct Proofs, and Counterexamples
B. More Proofs (contradiction, cases etc) and Problem-solving
C. Resolution Proofs (optional)
D. Mathematical Induction
E. Strong Form of Mathematical Induction and the Well-Ordering Property

III. Functions, Sequences, and Relations
A. Functions
B. Sequences and Strings
C. Relations and Equivalence Relations
D. Matrices of Relations
E. Relational Databases (optional)

IV. Algorithms
A. Introduction to Algorithms
B. Examples of Algorithms
C. Analysis of Algorithms
D. Recursive Algorithms

V. Introduction to Number Theory
A. Divisors
B. Representations of Integers and Integer Algorithms
C. Euclidean Algorithm
D. RSA Public-Key Cryptosystem

VI. Counting Methods and the Pigeonhole Principle
A. Basic Counting Principles
B. Permutations and Combinations
C. Generalized Permutations and Combinations
D. Algorithms for Generating Permutations and Combinations
E. Discrete Probability Theory
F. Binomial Coefficients and Combinatorial Identities
G. The Pigeonhole Principle

VII. Recurrence Relations
A. Introduction to Recurrence Relations
B. Solving Recurrence Relations
C. Applications to the Analysis of Algorithms

VIII. Graph Theory
A. Introduction to Graph Theory
B. Paths and Cycles
C. Hamiltonian Cycles and the Traveling Salesperson Problem
D. A Shortest-Path Algorithm
E. Representations of Graphs
F. Isomorphism of Graphs
G. Planar Graphs

IX. Boolean Algebras and Combinatorial Circuits
A. Combinatorial Circuits
B. Properties of Combinatorial Circuits
C. Boolean Algebras
D. Boolean Functions and Synthesis of Circuits

E. Applications

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐