SUFFOLK COUNTY COMMUNITY COLLEGE
COLLEGE-WIDE COURSE SYLLABUS
MAT205 (formerly MA92)

I. COURSE TITLE:
Discrete Mathematics

II. CATALOG DESCRIPTION:
Of special interest to students majoring in computer science and engineering as well as mathematics. Topics chosen from mathematical logic, set theory – an introduction to combinatorics, Boolean algebras with applications to circuit minimization, graph theory, differential equations, and algebraic structures with applications to coding theory. Prerequisite: C or better in MAT141.

A-E-G / 4 cr. hrs.

III. COURSE GOALS:

A. Provide a rigorous mathematical foundation for computer science by introducing the main concepts of set theory, logic and combinatorics.
B. This course satisfies the SUNY general education requirement for mathematics.

IV. COURSE OBJECTIVES:

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

A. use propositional and predicate logic in mathematical arguments;
B. apply set notation and use set-builder notation for inductive (recursive) definitions of sets, recognize finite and infinite sets, and perform operations on sets;
C. recognize relations and binary relations on a set, determine if a relation is reflexive, symmetric, antisymmetric or transitive;
D. identify equivalence relations and understand the relationship between equivalence relations and partitions;
E. apply the definitions of function, domain, image, into, surjection, injection, and bijection;
F. construct recursive algorithms;
G. apply the division algorithm and divisibility, find the prime factorization of a number, construct proofs of results from elementary number theory and write a numeral in base 10 as a numeral in base 2;
H. construct direct and indirect proofs, understand the use of counterexamples and use the principle of mathematical induction;
I. apply the basic permutation and combination formulas, the binomial theorem, the inclusion-exclusion principle, the Pigeonhole principle and solve a difference equation;
J. apply the definition and properties of a Boolean Algebra and use Karnaugh maps for minimization of circuits;
K. use graph terminology, be able to write the matrix representation of a graph and solve path problems;

L. apply Kuratowski's theorem to decide whether a graph is planar and solve problems in planar graph theory.

V. Topics Outline with Timeline

Topics	Approximate Time (Including Examinations)
A. Mathematical Preliminaries 1. number systems a. natural numbers, integers, rationals, real numbers b. primes c. natural numbers in bases other than base l0 d. real numbers in base 2 2. sets a. set notation, subsets b. operations on sets c. power set d. Venn diagrams e. Cartesian product f. binary operations 3. relations and functions a. properties of order relations b. equivalence relations and partitions c. functions - discrete domain/range d. 1-to-l and onto functions 4. matrices a. matrix arithmetic b. matrix powers c. transpose of a matrix	3 ½ weeks
B. Algorithms 1. top-down methodology 2. recursion and recursive algorithms	3 weeks
C. Mathematical Logic 1. propositional logic 2. predicate logic 3. proofs 4. mathematical induction	2 ½ weeks
D. Elementary Combinatorics 1. counting techniques 2. combinations and permutations	1 ½ weeks
E. Boolean Algebras 1. definition and properties of a Boolean Algebra	1 ½ weeks

2. motivational examples: logic and set theory 3. circuits 4. Boolean functions 5. minimization of circuits	
F. Graphs 1. planar graphs 2. Euler's formula 3. directed graphs 4. paths and path problems	2 ½ weeks
Optional Topics:	
G. Sequences and Series	
H. Generating Functions	
I. Difference Equations	
J. Introduction to Coding Theory	
K. Introduction to Trees	
L. Discrete Probability	
M. Finite State Machines	
N. Color and Covering Problems in Graph Theory	

VI. Evaluation of Student Performance:
To be determined by the instructor

VII. Programs that require this course:
Computer Science/AS

VIII. Courses that require this course as a prerequisite:
None

IX. Supporting Information:
Mathematics tutoring services, as well as video and computer aids, are provided for all students through the Math Learning Center (Ammerman Campus, Riverhead 235), the Center for Academic Excellence (Grant Campus, Health, Sports and Education Center 129), and the Academic Skills Center (Eastern Campus, Orient 213).