SUFFOLK COUNTY COMMUNITY COLLEGE
COLLEGE-WIDE COURSE SYLLABUS
MAT101 (formerly MA21)

I.   COURSE TITLE:
Survey of Mathematical Reasoning

II.   CATALOG DESCRIPTION:
Liberal arts mathematics course which provides insight into the nature of mathematical reasoning by examining basic structures such as logic, sets, real numbers, numeration systems and inductive reasoning. Prerequisite: MAT007 or equivalent. Note: *Credit given for MAT101 or MAT107, but not both.*

A-E-G / 3 cr. hrs.

III.   COURSE GOALS:
A.   Expose students to the foundations of mathematical methods
B.   Introduce inductive and deductive reasoning.

IV.   COURSE OBJECTIVES:
Upon successful completion of this course, students will be able to:
A.   distinguish between deductive and inductive reasoning and be able to apply each in problem solving;
B.   make connections between mathematical discoveries and the history of human thought;
C.   perform the basic operations of set theory including: intersection, union and complement;
D.   analyze basic data-type questions (survey results) using subsets and Venn diagrams;
E.   translate verbal statements into symbolic forms of implication, conjunction, disjunction and biconditional;
F.   test for the validity of arguments using various methods, indirect as well as direct;
G.   define logical connectives using truth tables and be able to discover tautologies and prove theorems using truth tables;
H.   convert to any base using expanded numeral concept as well as the division algorithm.

Depending on the instructor's choice of optional topics, students should also be able to:
I.   distinguish between rational and irrational numbers using the infinite decimal concept;
J.   solve problems on a calculator or computer involving loans, interest, mortgages, annuities and life insurance;
K.   analyze switching circuits using logical equivalences;

L.   write programs in basic which utilize a loop, using proper structured programming techniques;

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M.   diagram the logical design of a computer or calculator.

V.   Topics Outline with Timeline

Topics	Approximate Time (Including Examinations)

A. Logic (Mathematical Thinking)
   1.   deductive thought
   2.   inductive thought
   3.   conjecture, proof
   4.   history of logic
   5.   definitions: disjunction, conjunction, conditional, bi-conditional, negation
   6.   truth tables
   7.   arguments, theorems, proof (direct and indirect)
   8.   validity
	3-5 weeks

B. Sets
   1.   history
   2.   definition
   3.   operations with sets
   4.   Venn diagrams, survey problems
   5.   arguments, theorems, proof, conjecture (optional)
   6.   finite sets
   7.   equivalent sets
   8.   1-1 correspondence
   9.   cardinal numbers (optional)
   10. infinite sets (optional)
   11. Cantor's theorems (optional)
	2-3 weeks

Additional Topics: at least 3	

D. Real numbers
   1.   natural numbers
   2.   integers
   3.   rational numbers
   4.   irrational numbers
   5.   properties of the systems (closure, etc.)
   6.   calculators
      a.   history
      b.   algorithms
      c.   order of operations
	2-3 weeks

E. Switching Circuits
   1.   definitions
   2.   problems
   3.   theorems
	1 week

F. <u>Boolean algebra</u>
  1. definitions
  2. theorems
  3. proofs
	1-2 weeks

G. <u>Numeration system</u>
  1. historical
  2. positional
	2-3 weeks

H. <u>Number Bases</u>
  1. unique representation
  2. other bases
  3. connecting to other bases
  4. application - to computer
	2-3 weeks

I. <u>Inductive Reasoning</u>
  1. find the nth term of a sequence
  2. prove sum of arithmetic and geometric series
	2-3 weeks

J. <u>Computers</u>
  1. history
  2. processing
  3. flow chart
  4. programming
	2-3 weeks

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

VII.   **Programs that require this course:**
Communication and Media Arts: Journalism/AA (recommended)

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).