I. **CATALOG DESCRIPTION**
    Mathematics; Math 115:Ideas of Mathematics
    Lecture: 3 hours per week = 3 units
    Designed for liberal arts majors. This transfer-level course includes sets, propositional logic, inductive reasoning and applications, such mathematical patterns, counting methods, and finite probability spaces.
    Prerequisite: Math 095: Intermediate Algebra with a grade of C or better or eligibility for MATH 102 as determined by the SBVC assessment process.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS

    Upon completion of the course, the student should be able to:
    A. explain the difference between inductive and deductive reasoning.
    B. determine if a sentence is a logical statement.
    C. use Euler diagrams to determine the validity of syllogisms.
    D. recognize the logical connectors and either symbolize written statements or convert symbolic statements into verbal ones.
    E. write truth tables for simple and compound statements and use them to determine the validity of arguments.
    F. will know and be able to apply DeMorgan's rules in both the logic and set theory settings.
    G. recognize whether or not a set is well defined.
    H. know and apply the definitions of set operations, set notations, subsets, elements and cardinality.
    I. use Venn diagrams to analyze two and three set situations and apply this knowledge to the analysis of surveys.
    J. understand counting methods such as the multiplication principle, permutations and combinations in order to determine the number of possibilities in various selection processes.
    K. understand the principles of probability theory and using the set and counting theories be able to calculate the probability of various events.
    L. The student will be able to determine conditional probability and dependence.

IV. CONTENT

    A. Unit 1: Logic
        1. Simple statements
        2. Compound statements and connectives
        3. The conditional statement
        4. Truth tables
        5. Syllogisms and Euler diagrams
        6. DeMorgan's rules
        7. Equivalency of statement
        8. Validity of arguments

    B. Unit 2: Sets
        1. Operations on sets: union, intersection, complement
        2. Subsets and cardinality
        3. Set notation

        4. DeMorgan's rules
        5. Relationship between sets and compound statements
        6. Equivalent sets
        7. Use of Venn diagrams to analyze two and three sets

C. Unit 3: Counting
        1. Multiplication principle and trees
        2. Pascal's triangle
        3. Permutations and Combinations

D. Unit 4: Probability
        1. Basic definitions and notation.
        2. And/or probabilities
        3. Independence
        4. Conditional probability and probability trees
        5. Combinatorics and probability

E. Unit 5: Introduction to Statistics
        1. Mean and average
        2. Visual representation of statistical data and effect
          of scaling on emotional impact

V.   METHODS OF INSTRUCTION:

A. Lecture discussion
B. Group work to facilitate learning.
   example: applied problems in logic, sets/surveys or
  probability are given to the students and instructor circulates
  among groups facilitating the student's progress solving the
  problems.

VI.   TYPICAL ASSIGNMENTS:

A. Given a verbal argument – symbolize it, then construct a
  truth table and determine its validity.
B. Given a syllogism-symbolize it, then use an Euler diagram to
  determine its validity
C. Given raw survey data in three parameters-model it with a
  Venn diagram, place correct numbers in the eight regions of
  the diagram. Analyze the data as modeled in the Venn
  diagram.
D. Calculate the likelihood of winning the Super Lotto (picking the
  correct 6 of 51 numbers.

VII.   EVALUATION(S)
A. Homework
B. 4 hour exams and a comprehensive final exam.
C. May also include quizzes, papers and/or projects.
D. Typical Exam Questions:
    1. Determine the validity of the following argument
      using truth tables.
      h1 If there is an atmosphere, then there is gravity.
      h2 If an object has weight, then there is gravity.
      c   If there is an atmosphere, then an object has weight

2. A librarian is looking over a list of books that was compiled
   by her staff for possible removal from the shelves. Of the
   700 books on the list, here is the summary information she
   has been provided.
   > 310 are hardback books
   > 365 are fiction
   > 400 are out of print
   > 220 are hardback books and are out of print
   > 130 are hardback books and are fiction
   > 165 are out of print and are fiction
   > 100 are hardback books that are fiction and out of
   > of print
   a. Construct a Venn diagram that uses the sets H(hardback),
      F(fiction, and O(out of print) to model this situation. Fill
      each region of the Venn diagram with the number of books
      that belong in that region.
   b. Using this Venn diagram, determine:
      i. How many of the books are not out of print.
      ii. How many of the books are fiction or paperback.
      iii. How many of the books are fiction and still in print.
      iv. How many of the books are hardback, but are not fiction.

3. A Math 115 class has 30 students enrolled – 18 women and 12 men.
   If the teacher sends five students to the board and they all work the
   same problem at the same time, in how many ways can she select the
   students so that
   (a) they are all women   a._____

   (b) 3 are men   b._____

   (c) there are more men than women at
       the blackboard   c._____

   (d) at least one is a man
                                            d._____

4. An organization has 12 men and 18 women as members.
   a. How many different 5 person committees can be
      picked from this membership?
   b. Calculate p(all women)
   c. Calculate p(at least one man)

VIII.   TYPICAL TEXT(S): McCowan and Sequeria, <u>Patterns in Mathematics,</u> PWS 1994

IX.   OTHER SUPPLIES REQUIRED OF STUDENTS: None