Math 1139: Mathematics for Liberal Arts Students

Credit hours: **3 credits**
Prerequisites: **Placement in ACCUPLACER Grid 3 or MATH 0100 with a grade of C or better or MATH 1025 with a grade of C or better.**

Course Description

This course deals with the fundamentals of logic, set theory, probability and statistics.

Course Objectives

1. Identify methods to represent, organize, and distinguish sets
2. Apply rules of logic to evaluate claims
3. Compute probabilities of an event
4. Distinguish between methods for collecting, presenting, and interpreting data

Learning Outcomes

1. Understand set theory terminology, perform set operations, construct Venn diagrams with two and three sets, and solve application problems
2. Use connectives and negations to convert between symbolic statements and English
3. Construct truth tables for negation, conjunction, disjunction, conditional, and biconditional statements
4. Write equivalent and negated statements using DeMorgan's Laws and other equivalent forms
5. Determine the validity of symbolic arguments
6. Solve probability problems involving the fundamental counting principle, permutations, and combinations
7. Calculate odds and convert between probability and odds
8. Solve compound probability problems involving unions (or) and intersections (and)
9. Construct frequency distributions, histograms, and frequency polygons
10. Calculate statistical measures including mean, median, mode, midrange, range, and standard deviation
11. Solve problems involving the normal distribution

Course Topics

I. SETS
- A. Methods of specifying sets
  1. Descriptive notation
  2. Roster notation
- B. Set membership and notation
- C. Special sets
  1. Universal set
  2. Empty set
- D. Cardinality of a set
  1. One -to -one correspondence
  2. Finite
  3. Infinite
- E. Subsets
  1. Definition and notation
  2. Types
     a. Proper

        b. Improper
    F. Operations on sets
        1. Union
        2. Intersection
        3. Complement
        4. Difference*
    G. Venn diagrams
    H. Cartesian product*
    I. Applications: voting coalitions

II. LOGIC
    A. Statements
        1. Definition
        2. Examples
    B. Quantifiers*
        1. Universal
        2. Existential
        3. Truth value of quantified statements
    C. Basic connectives
        1. Four types
            a. Conjunction
            b. Disjunction
            c. Conditional
            d. Biconditional
        2. Examples
        3. Combining connectives
        4. Truth tables
    D. Variants of the conditional
        1. Converse
        2. Inverse
        3. Contrapositive
    E. Additional connectives*
    F. Uses of truth tables
        1. Identification of tautologies, contradictions, contingencies
        2. Determination of the validity of an argument
        3. Truth tables and Venn diagrams*
    G. Syllogisms using Venn diagrams

III. COUNTING TECHNIQUES
    A. Multiplicative counting principle
    B. Permutations
        1. Permutation of n objects taken n at a time
        2. Permutations of n objects taken r at a time
        3. Permutations of objects some of which are alike
        4. Circular permutations*
    C. Combinations

IV. PROBABILIY
    A. Elementary experiments
    B. Definitions
        1. Sample space
        2. Random variable
        3. Event
        4. Probability of an event

C. Simple examples and examples involving permutations and combinations
D. Additive principle of probability
E. Multiplicative principle of probability
F. Mathematical expectation*

V. STATISTICS

A. Three measures of central tendency (grouped & ungrouped)
    1. Mean
    2. Median
    3. Mode
B. Measures of dispersion
    1. Range
    2. Variance
    3. Standard deviation
C. Frequency distribution and frequency polygons
D. Percentiles
E. Normal curve
F. Z scores

VI. NATURE OF COMPUTERS*

A. History of computers
B. Uses of computers
C. Flow charts (incorporate with simple programming)
D. Programming languages: introduction of programming language (e.g. Basic)
E. Mathematical applications of a programming language (e.g. Basic)

*Optional