**MAT 140**
**SURVEY OF MATHEMATICS**

## COURSE DESCRIPTION:

Prerequisites: MAT 070 or satisfactory score on placement test
Corequisites: MAT 140A

This course provides an introduction in a non-technical setting to selected topics in mathematics. Topics include, but are not limited to, sets, logic, probability, statistics, matrices, mathematical systems, geometry, topology, mathematics of finance, and modeling. Upon completion, students should be able to understand a variety of mathematical applications, think logically, and be able to work collaboratively and independently. *This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences/mathematics. Course* Hours Per Week: Class, 3. Semester Hours Credit, 3.

## LEARNING OUTCOMES:

1. Students will be able to perform conversions between different systems of numeration. Students will display proficiency by demonstrating the following competencies:

    a. Count and manipulate numbers among different systems of numeration.
    b. Make conversions among the decimal, binary, octal and hexadecimal number systems.

2. Students will be able to use logical operators to perform operations on sets and to evaluate logical expressions and arguments. Students will display proficiency by demonstrating the following competencies:

    a. Determine if an element is a member of a given set.
    b. Determine subsets of various sets.
    c. Find the complements, unions, and intersections of given sets.
    d. Draw Venn diagrams to illustrate various sets.
    e. Solve appropriate problems using set theory.
    f. Determine whether a sentence is a logical statement, and whether a given statement is simple or compound.
    g. Symbolize statements and compound statements and the appropriate negations.
    h. Construct truth tables for statements and compound statements.
    i. Write the converse, inverse, and contrapositive of conditional statements.
    j. Identify the components of a valid argument.
    k. Determine if a given argument is valid or fallacious.
    l. Use truth tables to determine the validity of a symbolized argument.

3. Students will be able to define and perform operations with matrices and use them to solve systems of linear equations. Students will display proficiency by demonstrating the following competencies:

    a. Determine the dimension of a given matrix.
    b. Add and multiply matrices.
    c. Use matrix theory and row operations to solve systems of linear equations.

4. Students will be able to apply concepts of probability and statistics to solve practical problems. Students will display proficiency by demonstrating the following competencies:

    a. Use the fundamental counting principle to solve counting problems.
    b. Use tree diagrams to solve counting problems.
    c. Evaluate permutations and combinations.
    d. Solve probability and conditional probability problems.
    e. Calculate the odds for an event.
    f. Solve expected outcome problems.
    g. Use the Binomial Probability Formula to find probabilities.
    h. Construct appropriate graphs to display descriptive data.
    i. Solve problems involving accurate interpretation of such graphs.
    j. Find the mean, median, and mode of a given set of quantitative data.
    k. Find the range, variance, and standard deviation of a given set of quantitative data.
    l. Convert raw scores to z-scores.
    m. Solve practical problems requiring information derived from the use of the normal curve.

**OUTLINE OF INSTRUCTION**

I. Other number systems
    A. Binary systems
    B. Octal systems
    C. Hexadecimal systems

II. Sets
    A. Set concepts
    B. Subsets
    C. Venn diagrams and set operations
    D. Venn diagrams with three sets and verification of equality of sets
    E. Applications of sets

III. Logic
    A. Statements and logical connectives
    B. Truth tables for negation, conjunction, and disjunction
    C. Truth tables for the conditional and biconditional
    D. Equivalent statements
    E. Symbolic arguments

IV. Matrices and their applications
   A. Basic operations with matrices
   B. Multiplication of matrices
   C. Solving systems of linear equations by using matrices

V. Probability
   A. The nature of probability
   B. Theoretical probability
   C. Odds
   D. Expected value
   E. Tree diagrams
   F. "Or" and "and" problems
   G. Conditional probability
   H. The Fundamental Counting Principle
   I. Permutations
   J. Combinations
   K. Solving probability problems by using combinations
   L. Binomial probability formula

VI. Statistics
   A. Sampling techniques and the misuses of statistics
   B. Frequency distributions
   C. Statistical graphs
   D. Measures of central tendency
   E. Measures of dispersion
   F. The normal curve

**REQUIRED TEXTBOOK AND MATERIALS:**

Angel, Allen R., Christine D. Abbott, and Dennis C. Runde. A Survey of Mathematics with Applications. 8th Ed. Pearson Education, 2009.

Number Bases Module

Scientific calculator

**STATEMENT FOR STUDENTS WITH DISABILITIES:**

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by

calling 536-7207, ext. 1413 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.