**Mathematics 1332 –T: An Introduction to Contemporary Mathematics**

**Student Learning Outcomes**

1. **The students will demonstrate factual knowledge including the mathematical notation and terminology used in this course.** Students will read, interpret, and use the vocabulary, symbolism, and basic definitions used in a selection from the following topics: basic algebraic techniques, voting theory, apportionment, the mathematics of money, probability, statistics, graph theory, and geometry.
2. **The students will be able to describe generalizations of mathematics to real-world situations.** Students will be able to describe, for example, the role played by mathematics in the theory of voting. The students will be able to describe connections between mathematical concepts and natural and societal phenomena.
3. **The students will apply the course material along with techniques and procedures covered in this course to solve various problems and improve decision making.** The students will apply such topics related to statistics and probability to improve decision making through a broader understanding of mathematics. They will learn to analyze problems using mathematical ideas and symbolism and learn to obtain the appropriate resources required to better deal with such problems.
4. **The students will develop specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields.** Students will develop new approaches and algorithms for solving problems related to networking, scheduling and paths. Students will develop basic algebraic skills necessary for the support of their academic careers.

**Course Content**

**Textbook:** *Excursions in Modern Mathematics 9th ed.* by Peter Tannenbaum, Prentice Hall

1. **Mathematics of Voting:** Preference Ballots, Plurality, Borda, Runoff Voting, Pairwise Comparison, Rankings
2. **Weighted Voting:** The Banzhaf Power Index, The Shapley-Shubik Power Index
3. **Apportionment and Sharing:** Fair-Division Games, The Divider-Chooser Method, The Lone-Divider Method, The Lone Chooser Method, The Last Diminisher Method, Sealed Bids, Markers
4. **Apportionment:** Various methods including Hamilton’s, Jefferson’s, Adam’s, and Webster’s; The Alabama Paradox
5. **Euler Paths and Circuits:** Euler Circuit Problems, Graphs, Euler’s Theorems, Fleury’s Algorithm, Eulerizing Graphs
6. **The Traveling Salesman Problem:** Hamilton Paths and Circuits, Complete Graphs, Greedy and Nearest Neighbor Algorithms
7. **Networks:** Trees, Spanning Trees, Kruskal’s Algorithm, Shortest Networks for Three or more points
8. **Scheduling:** Directed Graphs, Priority Lists, The Decreasing Time Algorithm, Critical Paths, Independent Tasks
9. **Fibonacci Numbers and the Golden Ratio:** Fibonacci Numbers, The Golden Ratio, Gnomons, Spiral Growth
10. **Math of Finance:** Percentages, Simple Interest, Compound Interest, Annuities
11. **Mathematics of Symmetry:** Rigid Motions, Reflections, Rotations Translations, Glide Reflections, Patterns
12. **Fractals:** The Koch Snowflake, The Sierpinski Gasket, Chaos, The Mandelbrot Set
13. **Collecting Data:** Sampling, Random Sampling, The Capture-Recapture Method, Clinical Studies
14. **Descriptive Statistics:** Graphical Methods, Variables, Data Summaries, Spread
15. **Probability:** Random Experiments, Sample Spaces, Permutations, Combinations, Equiprobable Spaces, Odds
16. **Normal Distributions:** Approximately Normal Distributions, Normal Curves, Distributions of Random Events, Statistical Inference.

**Additional Algebraic Techniques:**

* Order of Operations- numeric applications for PEMDAS with no variables.
* The Distributive Law
* Absolute Value- evaluating the absolute value of numbers as a distance from 0
* Exponent Rules- basic integer exponents (both positive and negative), along with the product rule, quotient rule, and power rule
* Simplifying Radicals- simplifying square roots and cube roots with simple variables under the radicals; will include both perfect squares/cubes and others that have to be factored out
* Polynomial Addition & Subtraction
* Polynomial Multiplication- both distributive property and FOIL are introduced
* Factoring by GCF- factoring polynomials strictly by greatest common factor
* Factoring Basic Trinomials- factoring trinomials with a leading coefficient of 1, or a GCF that lends a leading coefficient of 1
* Solving Linear Equations- determine if a number is a solution to an equation; then solving basic linear equations; no rational equations are covered.

**Core Curriculum Student Learning Objectives**

* **Core Objective (Critical Thinking):** Gather, analyze, evaluate, and synthesize information relevant to a question or issue. (CT1)
  + **Course Student Learning Objective:** Students will evaluate graphs to determine the presence of an Euler circuit or a spanning tree, and identify node degrees.
  + **Assessment:** Assessment exam that demonstrates CT1.
* **Core Objective (Communication):** Develop, interpret, and express ideas through effective visual communication. (CS3)
  + **Course Student Learning Objective:** Students will perform various rigid motion transformations on plane shapes.
  + **Assessment:** Assessment exam that demonstrates CS3.
* **Core Objective (Empirical and Qualitative Skills):** Manipulate and analyze numerical data and arrive at an informed conclusion. (EQS1)
  + **Course Student Learning Objective:** Students will use the facts, formulas, and techniques to compute various data measures and draw conclusions regarding data sets.
  + **Assessment:** Assessment exam that demonstrates EQS1.