SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: MATH 122 Department: Mathematics

Course Title: Applied Mathematics 1 Semester: Spring Year: 1997

Objectives/Competencies

Course Objective	Competencies
1. Understand and apply the concepts of linear functions to elementary mathematical models.	1. Identify the points in the Cartesian plane as ordered pairs of numbers. 2. Determine the slope of a line passing through two points as the difference in the two y coordinates divided by the difference in the two x coordinates. 3. Write the equation of a line in slope-intercept form, $y = mx + b$. 4. Use the slope-intercept form to write an equation of a line when two points are known, or when the slope and one point are known.
2. Solve systems of linear equation in two and three variables.	1. Graph the equations of two lines in two variables: a. identify the solution as the point of intersection. b. identify that there are no solutions because the lines do not intersect. c. identify that there are infinite solutions because the two lines graph as one line.

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	2. Use the elimination method to reduce two equations in two unknowns to one equation in one unknown and use back substitution to solve for the second variable. 3. Use substitution to solve a system of two equations in two unknowns. Use back substitution to solve for the other variable. 4. Work applied problems modeled by two equations in two unknowns. 5. Solve three equations in three unknowns by: a. solving for one equation in terms of the other two variables and transforming the problem into two equations in two unknowns. b. eliminating the same variable in equations one and two, and equations one and three (or some other pair of equations) to generate a two-variable problem in two unknowns.
3. Solve simultaneous linear equations using matrices.	1. Write an adjoint matrix of coefficients that corresponds to a pair of linear equations in two unknowns. 2. Use Gauss-Jordan Elimination to solve the system. 3. Write an adjoint matrix for a system of three equations in three unknowns. 4. Solve a system of three equations in three unknowns using Gauss-Jordan Elimination.
4. Find the product of 2x2 and 3x3 matrices.	1. Write a matrix of coefficients that corresponds to two polynomials of the form ax + by.

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	2. Find the sum or difference of two matrices. 3. Multiply a matrix by a constant. 4. Factor a constant from a matrix. 5. Define compatible matrices. 6. Find the produce of two compatible matrices. 7. Extend the work with 2x2 matrices to 3x3 matrices. 8. Define the identify matrices for all square matrices. 9. Show that the identity matrix is commutative.
5. Find the inverse of a 2x2 matrix by formula.	1. Define the identity matrix for 2x2 matrices. 2. Write matrix of coefficients in adjoint form with the corresponding identity matrix. 3. Use Gauss-Jordan elimination to transform the left side to the identity matrix and the right side into the inverse matrix. 4. Students follow the procedure of finding the inverse when the 2x2 matrix has variables instead of constants.
6. Find the inverse of a 3x3 matrix by row reduction.	1. Write the 3x3 matrix of coefficients in adjoint form with the identity matrix. 2. Use Gauss-Jordan elimination to reduce the left side to the identity matrix. 3. Identify the right side of the adjoint matrix as the inverse of the original matrix.
7. Solve linear programming problems geometrically.	1. Sketch a linear inequality in two variables. 2. Graph two or more 2-variable inequalities and shade in

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	the bounded region they define. 3. Identify the corner points of a bounded region with constraints that keep the region in Quadrant I. 4. Identify constraints as a system of inequalities. 5. Identify objective function as the equation that is to be maximized or minimized. 6. Work maximization problems where the objective function and the constraints are given. 7. Work applied problems where the constraints and the objective function must be determined from the problem.
8. Solve linear programming problems using the simplex method.	1. Define slack variable. 2. Rewrite inequalities with slack variables. 3. Write a simplex tableau for minimization problems where all constraints and the objective function are given. 4. Apply the standard techniques to reduce the tableau. 5. Identify: a. unique solutions. b. problems with infinite solutions. 6. Use the simplex method to solve applied problems were all information is given in statement form.
9. Use union, intersection, and complement to define new sets.	1. Define sets. 2. Define union of sets with: a. roster notation. b. set-builder notation. c. Venn diagrams.

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	3. Define intersection of sets with: a. roster notation. b. set-builder notation. c. Venn diagrams. 4. Define universe and universe of discourse. 5. Define complement of a set. 6. Depict the complement of a set with: a. roster notation. b. set-builder notation. c. Venn diagrams.
10. Understand the relations of set equality, proper subset and subset.	1. Define set equality. 2. Define proper subset. 3. Define subset. 4. Identify subsets from: a. a collection of sets in roster notation. b. a collection of sets in set-builder notation. c. a Venn diagram.
11. Understand and illustrate DeMorgan’s Laws.	1. Define Demorgan’s Laws using sets and set operators. 2. Establish the veracity of DeMorgan’s Laws using Venn diagrams. 3. Verify the truth of Demorgan’s Laws using sets in roster notation.
12. Understand and use the multiplication principle of solve counting problems.	1. Find n(A) for finite sets. 2. Work simple counting problems on an intuitive level.

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	3. State the multiplication principle for a finite number of events.
13. Understand the meaning of n!.	1. Compute simple factorials less than 8. 2. Use a calculator to compute larger factorials. 3. Recognize scientific notation as used in calculators.
14. Work basic problems using permutations and combinations.	1. Define permutation using factorials. 2. Define combination using factorials. 3. Discriminate between problems with are instances of permutations and those which are instances of combinations.
15. Understand and use the concepts of experiment, events, and sample space.	1. Define experiment, event, and sample space. 2. Apply experiment, event, and sample space to problems.
16. Use counting techniques in determining probability.	1. Find the cardinality of a sample space and of events within a sample space. 2. Define probability. 3. Find the probability for a variety of experiments.
17. Understand and use tree diagrams to illustrate conditional probability.	1. Define conditional probability. 2. Recognize the notation for conditional probability. 3. Use the notation for conditional probability. 4. Depict conditional events with tree diagrams. 5. Compute the probability of conditional events from a tree diagram.

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18. Understand and identify events that are independent.	1. Define independent events. 2. Test events using counting techniques to see whether or not they are independent.
19. Apply Baye's Theorem to solve problems.	1. Use modified Venn diagrams to illustrate data that are related. 2. Define Baye's Theorem based upon the diagrams from part A. 3. Calculate probabilities where Baye's Theorem is appropriate.