I. **OVERVIEW**
The following information will appear in the 2009 - 2010 catalog

**MATH 130**  
*Finite Mathematics*  
3 Units

Set theory, probability and counting techniques, Markov chains, matrices and linear systems, linear programming (Simplex Method), applications to business and behavioral and social sciences.  
**Prerequisite:** Satisfactory completion of MATH 90. or equivalent placement by MJC assessment process

Field trips are not required. **Units/Hours:** 3.00 Units: Lecture - 54.00 hours  
**Grading:** A-F or P/NP - Student choice  
**Transfer:** CSU, UC  
**General Education:** D.2 ) (CSU-GE: B4 ) (IGETC: Mathematics )

II. **LEARNING CONTEXT**
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. **COURSE CONTENT**

1. **Required Content:**

   a. Matrices  
      i. Gaussian elimination  
      ii. Arithmetic  
      iii. Multiplicative inverse  
      iv. Applications

   b. Linear Programming  
      i. Algebraic form  
      ii. Geometric solution  
      iii. Simplex method  
      iv. Dual method  
      v. Applications

   c. Sets  
      i. Operations  
      ii. Subsets  
      iii. Venn Diagrams  
      iv. Applications
d. Probability
   i. Fundamental Counting Principle, permutations, combinations
   ii. Probability trees
   iii. Independence
   iv. Conditional probability
   v. Formulas using union, intersection, and complement
   vi. Bayes's Theorem
   vii. Binomial trials
   viii. Expected value
   ix. Application

e. Markov Processes
   i. Distribution matrix
   ii. Transition matrix
   iii. Stable distribution matrix
   iv. Applications

B. ENROLLMENT RESTRICTIONS

1. Prerequisites
   Satisfactory completion of MATH 90 or equivalent placement by MJC assessment process.

2. Requisite Skills
   *Before entering the course, the student will be able to:*
   a. Graph lines and find the equation of a line, given sufficient information.
   b. Effectively use function notation to describe mathematical relationships.
   c. Determine the domain and range of a given function.
   d. Given a relation between two variables, determine if the relation is a function.
   e. Solve systems of linear equations in two or three variables by choosing the most effective method for the given problem.
   f. Solve linear, quadratic, absolute value, and rational inequalities.
   g. Solve problems involving permutations, combinations, and probability.
   h. Given an applied problem, analyze the problem, select an appropriate mathematical model, and use that model to solve the problem. Models used include: linear, quadratic, exponential, logarithmic, systems, and conic sections.
C. **HOURS AND UNITS**

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<th>UNITS</th>
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D. **METHODS OF INSTRUCTION (TYPICAL)**

*Instructors of the course might conduct the course using the following method:*

1. Lectures which develop theoretical material
2. Demonstrations of mathematical techniques, applications, and problem-solving strategies by both instructor and students
3. Applications of material to specific problems
4. Homework assignments and/or in-class exercises require students to analyze a given problem, select an appropriate procedure to solve the problem, apply the procedure, and evaluate the adequacy of both the result of the procedure and the procedure itself.

E. **ASSIGNMENTS (TYPICAL)**

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**

   *Time spent on coursework in addition to hours of instruction (lecture hours)*

   1. Daily homework assignments requiring at least two hours per class hour.
   2. Daily review of class notes and readings from the text.
   3. Review and preparation for examinations, including the final exam.

2. **EVIDENCE OF CRITICAL THINKING**

   *Assignments require the appropriate level of critical thinking*

   1. A manufacturer produces two different sizes of woven baskets. Each small basket costs $20 for materials, requires four hours of labor to produce, and sells for $300. Each of the large baskets costs $40 for materials, requires five hours of labor and sells for $400. The manufacturer has a budget of $6020 for materials, has at most 1000 hours of labor available and wants to know how many of each type of basket should be produced to maximize revenue. Write out the system of inequalities, state the objective function, and solve the problem.

   2. In a survey of 275 community college students 120 were females, 160 were transfer students, and 187 were under 25 years of age. Furthermore, 100 were female transfer students, 120 were transfer students under 25, 77 were females under 25, and 70 were female transfer students who were under 25 years of age. How many students were male transfer students? How many were transfer students who were at least 25 year old? How many were male non-transfer students who are at least 25 years old? How many were females or transfer students?

   3. A stereo system contains 50 transistors. The probability that a given transistor will fail in 100,000 hours of use is 0.0005. Assume the failures of the various transistors are independent of one another. What is the probability that no transistors will fail in the first 100,000 hours of use?

F. **TEXTS AND OTHER READINGS (TYPICAL)**

III. DESIRED LEARNING

A. COURSE GOAL
   As a result of satisfactory completion of this course, the student should be prepared to:

   analyze and solve problems in the following areas: probability, matrices, linear programming (Simplex Method), Markov chains, and applications from business, behavioral and social sciences, and select appropriate problem-solving strategies and use these strategies to solve problems.

B. STUDENT LEARNING GOALS
   Mastery of the following learning goals will enable the student to achieve the overall course goal.

1. Required Learning Goals
   Upon satisfactory completion of this course, the student will be able to:

   a. Perform matrix operations including addition, subtraction, scalar multiplication, transpose, and matrix multiplication.
   b. Find the multiplicative inverse of a square matrix by using Gaussian Elimination.
   c. Solve a system of linear equations by using the inverse of the coefficient matrix.
   d. Write a linear programming problem in algebraic form (define the variables, write the constraints and objective function).
   e. Solve a linear programming problem by graphing (graph, determine the vertex locations, and determine the maximum and minimum values of an objective function).
   f. Solve a maximum linear programming problem by using the Simplex Method.
   g. Convert minimum or mixed constraint linear programming problems to standard maximum form and solve by the Simplex Method.
   h. Write the dual of a linear programming problem and solve the dual by the Simplex Method.
   i. Solve the primal system by using the dual.
   j. Use sensitivity analysis to analyze the benefits of changing available resources.
   k. Perform set operations including union, intersection, and complement.
   l. Graph sets and set operations on Venn Diagrams.
   m. Apply the Fundamental Counting Principle, permutations, and combinations to various combinatorics problems.
   n. Use the Binomial Theorem in counting problems (optional).
   o. Calculate the probabilities of events using various combinatorics methods.
   p. Find the probabilities of events using unions, intersections, complements, and conditional probabilities.
   q. Determine if events are independent.
   r. Represent events and their associated probabilities using tree diagrams.
   s. Apply Baye’s Theorem to solving probability problems.
   t. Calculate probabilities using binominal trials.
   u. Find the expected value of a probability distribution.
   v. Write the distribution matrix and the transition matrix for a Markov Process problem.
w. Calculate stable distribution matrix (optional).

x. Use linear regression to determine the best fit line to data points (optional).

y. Solve applications problems specific to each method in a-x above.

a`. Perform matrix arithmetic operations, including inverse of a 3x3 matrix.

aa. Solve a linear programming problem using the graphing/geometric method.

IV. METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT

1. Tests and quizzes at regular intervals throughout the semester

2. Assigned homework

3. Class participation

B. SUMMATIVE ASSESSMENT

1. Comprehensive 2 to 3 hour Final Exam (excluding the following formats: multiple choice, open book, take home, group exam)