I. OVERVIEW

The following information will appear in the 2009 - 2010 catalog

MATH-111 Applied College Algebra 3 Units

Prerequisite: Satisfactory completion of MATH 90 or equivalent placement by MJC assessment process.

A College Algebra course that presents each topic to answer the question, "What is this used for?"

Instruction begins with a real-world problem and develops the mathematical models and methods to solve it. Topics include: polynomial, rational, exponential, and logarithmic functions; theory of equations; systems of equations; matrix algebra; and analytic geometry. Designed specifically for students needing only a one-semester, non-precalculus College Algebra course for transfer to a university. Not open to students who have received credit in Math 121. Will not serve as a prerequisite to Math 122 or Math 171. STUDENTS PREPARING TO TAKE CALCULUS MUST TAKE MATH 121 AND MATH 122. Field trips are not required. Course is applicable to the associate degree. General Education:

CSU-GE - B4
IGETC Category: IGETC - 2M

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. Review of Linear and Quadratic Functions

      i. Functions

      ii. Linear Functions

      iii. Linear Curve Fitting

      iv. Parabolas and Quadratic Functions

   b. Polynomial Functions and Equations

      i. Graphing Polynomial Functions

      ii. The Fundamental Theorem of Algebra

      iii. Finding Roots of Polynomials

      iv. Polynomial Equations

   c. Rational Functions
i. Graphing Rational Functions
ii. Finding Asymptotes
iii. Long-term Behavior

d. Operations on Functions
   i. Composition of Functions
   ii. Inverse Functions

e. Exponential Functions
   i. Review: Graphing Exponential Functions
   ii. Exponential Curve Fitting
   iii. Exponential Population Growth
   iv. Logistic Population Growth

f. Logarithmic Functions
   i. Review: Graphing Logarithmic Functions
   ii. Logarithmic Curve Fitting
   iii. Logarithmic Scales and Their Uses
      a. Earthquake Intensity
      b. Magnitude of Sound

h. Analytic Geometry
   i. Review: Standard Form of Conic Sections
   ii. Focus-Directrix-Eccentricity Approach
   iii. Parabolic Reflectors
   iv. Elliptical Reflectors
v. Planetary Orbits

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. Graph linear, quadratic, absolute value, and simple cubic functions using transformations.

   f. Solve systems of linear equations in two or three variables by choosing the most effective method for the given problem.

   g. Solve linear, quadratic, absolute value, and rational inequalities.

   h. Solve quadratic equations with real and complex solutions by completing the square and using the quadratic formula.

   i. Graph quadratic functions by determining and using the vertex and stretching constant.

   j. Add, subtract, multiply, and divide complex numbers.

   k. Convert radicals to rational exponents and vice versa.

   l. Add, subtract, multiply, divide, or compose two given functions.

   m. Find the inverse of a given function.

   n. Graph exponential and logarithmic functions using transformations.

   o. Solve exponential and logarithmic equations.

   p. Simplify expressions using the properties of logarithms.

   q. Identify the equations for and sketch the graphs of conic sections.

   r. List a requisite number of terms of a given arithmetic, geometric, or recursive sequence.

   s. Determine the general term of a given arithmetic or geometric sequence.

   t. Determine the sum of a fixed number of terms of an arithmetic or geometric series, and determine the sum of an infinite geometric series when it exists.

   u. Solve problems involving permutations, combinations, and probability.

   v. 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**

<table>
<thead>
<tr>
<th>INST METHOD</th>
<th>TERM HOURS</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lect</td>
<td>54.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disc</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

3 Units

D. **METHODS OF INSTRUCTION (TYPICAL)**

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

1. Lectures, discussions, or other presentations that 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 in-class exercises that 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)

   Homework assignments should be assigned on a daily or weekly basis. Exercises from the textbook can be used for these assignments, to be supplemented as desired. Each hour of class time should produce almost 2 hours of homework.

   Several exams should occur during the semester, apportioned as appropriate. Each exam should require several hours of preparation from the student.

   A comprehensive final exam should be held during the scheduled time. This exam should require several hours of preparation from the student.

2. **EVIDENCE OF CRITICAL THINKING**

   Assignments require the appropriate level of critical thinking

   Homework is expected to help foster a student's understanding of the material, and give them an understanding of the level of performance that will be expected of them. The textbook itself has many fine examples of such problems.

   Quizzes and exams should challenge a student to perform at a high level. Free-response questions are expected to be the norm, such as the following:

   1) Graph \( g(x) = \frac{(x^2-4)}{(6x^2+5x-4)} \). Be sure to label all intercepts and asymptotes accurately.

   2) Use mathematical induction to prove that this formula is true for all positive integers \( n \): \( 1+3+5+\ldots+(2n-1) = n^2 \)

   3) The population of Nowheresville was 15,300 in the year 1995. In the year 2002, the population was 20,800. What will the population be in 2010, if we assume exponential growth? (round to the nearest whole number)
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:

Demonstrate a mastery of advanced algebraic skills, including rational, exponential, and logarithmic functions, operation with matrices, techniques for working with high degree polynomials, and analytic geometry.

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. graph linear and quadratic functions, given their algebraic representation.

b. determine the line or parabola of best fit from given data.

c. graph polynomial functions, noting intercepts, turning points, and long-term behavior.

d. graph linear and quadratic functions, given their algebraic representation.

e. determine the line or parabola of best fit from given data.

f. graph polynomial functions, noting intercepts, turning points, and long-term behavior.

g. state the Fundamental Theorem of Algebra.

h. solve polynomial equations by factoring, synthetic division, and using the POLY function of the graphing calculator.

i. graph rational functions, noting intercepts, vertical asymptotes, and horizontal or slant asymptotes.

j. find the inverse of a given function.

k. compose given functions.

l. graph exponential and logarithmic functions.

m. choose an appropriate exponential or logarithmic model for a given situation, fit it to given data, and use the model to make predictions.

n. add, subtract, multiply, and invert matrices (where possible).

o. solve systems of linear equations using matrices and determinants.

p. use appropriate matrix methods to model multivariate behavior.

q. graph parabolas, ellipses, and hyperbolas, noting their foci, directrices, and vertices.

r. identify and both qualitatively and quantitatively discuss real-world incidences of conic sections, such as satellite dishes, dentist’s spotlight, planetary orbits, and the Global Positioning System.
IV. **METHODS OF ASSESSMENT (TYPICAL)**

A. **FORMATIVE ASSESSMENT**
   1. Homework

B. **SUMMATIVE ASSESSMENT**
   1. Tests given at regular intervals throughout the semester