I.  INTRODUCTION

A. Math 1414, College Algebra, is a four semester-hour course. This course includes an in-depth study and application of polynomial, rational, radical, exponential and logarithmic functions, and systems of equations using matrices. Additional topics include matrix operations, sequences, series, binomial theorem, and probability.

B. This course satisfies the mathematics requirement in most curricula. Please, check your degree plan to determine the status of this course in your program of study. This course is occupationally related and serves as preparation for careers in sciences, social sciences, and business.

C. In support of the objectives of the Texas core curriculum, the course provides significant exercise of students’ critical thinking, communication skills, empirical and quantitative skills, and teamwork. These objectives form a foundation of intellectual and practical skills that are essential for all learning.
   1. Critical thinking skills include creative thinking, innovation inquiry, and analysis, evaluation and synthesis of information
   2. Communication skills include effective development, interpretation and expression of ideas through written, oral and visual media.
   3. Empirical and quantitative skills include the ability to manipulate and analyze numerical data or observable facts to reach informed conclusions.

D. Prerequisites: DSMA 0303 or equivalent placement test score.

II. LEARNING OUTCOMES

Upon successful completion of this course, College Algebra, the student will be able to

A. Define relation and function. (F1, F2, F5, F6)
B. Demonstrate and apply knowledge of properties of functions, including domain and range, operations, compositions, and inverses. (F1, F8, F9)
C. Evaluate functions. (F3, F8, F9)
D. Construct and analyze graphs of functions using transformations. (F2, F10)
E. Recognize and apply polynomial, rational, radical, exponential and logarithmic functions and solve related equations and application problems. (F8, F10)
F. Evaluate all roots of higher degree polynomial and rational functions.
G. Recognize, solve and apply systems of linear equations using matrices. (F3, F4, F8, F9)
H. Use matrix operations. (F3, F4)
I. Evaluate determinants. (F3, F4, F9)
J. Identify types of sequences and series. (F1, F8)
K. Use sequences and series to solve problems. (F3, F4, F9)
L. Apply the Binomial Theorem. (F3, F4)
M. Use the Fundamental Counting Principal.
N. Distinguish between and apply the permutation formula and the combination formula. (F1, F3, F4, F8)
O. Compute theoretical and empirical probability. (F8, F9)
P. Use electronic and other media, such as the computer and DVD, to reinforce and supplement the learning process. (F1, F2, F3, F6)
Q. Demonstrate critical thinking, communication, and empirical and quantitative skills. (F1, F3, F4, F9)

Some learning outcomes are followed by letters and numbers; i.e., C9 or F11. These refer to SCANS foundations skills (F) and workplace competencies (C). View a chart showing these skills at http://www.ctcd.edu/scans. For more on the (Labor) Secretary's Commission on Achieving Necessary Skills, or SCANS, go to the U.S. Department of Labor site at http://wdr.doleta.gov/SCANS/.

III. INSTRUCTIONAL MATERIALS

The Instructional materials identified for this course are viewable through www.ctcd.edu/books

IV. COURSE REQUIREMENTS

A. Assignments are given in MyMathLab (MML) and are due as scheduled by your instructor. The instructor will monitor students’ progress in completing the assignments.

B. Students are expected to attend every class, to arrive at each class on time, and remain in class for the entire period. Students who are absent from class 12.5% of the number of class meetings for any reason will be dropped from the class with a grade of "F". Instructors may choose to lower a student's grade because of tardiness.

V. EXAMINATIONS

A. Examinations will be given at appropriate points during the semester. Each examination will be announced in class in advance. There will be three examinations (including the final).

B. Students who miss an exam should discuss with the instructor the circumstances surrounding the absence. The instructor will determine whether a make-up exam is to be given. It is necessary to make an appointment with the instructor for a make-up exam.

VI. SEMESTER GRADE COMPUTATIONS

A. The semester average is derived from the periodic unit examinations, the
homework in MML, and the comprehensive final exam. The instructor may also use quizzes or posttests to determine your grade.

Final grades will follow the grade designation below:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Class Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>“A”</td>
<td>90 to 100</td>
</tr>
<tr>
<td>“B”</td>
<td>80 to 89</td>
</tr>
<tr>
<td>“C”</td>
<td>70 to 79</td>
</tr>
<tr>
<td>“D”</td>
<td>60 to 69</td>
</tr>
<tr>
<td>“F”</td>
<td>0 to 59</td>
</tr>
</tbody>
</table>

VII. NOTES AND ADDITIONAL INSTRUCTIONS

A. Withdrawal from Course: It is the student's responsibility to officially drop a class if circumstances prevent attendance. Any student who desires to, or must, officially withdraw from a course after the first scheduled class meeting must file an Application for Withdrawal or an Application for Refund. The withdrawal form must be signed by the student.

An Application for withdrawal will be accepted at any time prior to Friday of the 12th week of classes during the 16-week fall and spring semesters. The deadline for sessions of other lengths is as follows.

<table>
<thead>
<tr>
<th>Session</th>
<th>Deadline for Withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-week session</td>
<td>Friday of the 9th week</td>
</tr>
<tr>
<td>10-week session</td>
<td>Friday of the 7th week</td>
</tr>
<tr>
<td>8-week session</td>
<td>Friday of the 6th week</td>
</tr>
<tr>
<td>6-week session</td>
<td>Friday of the 4th week</td>
</tr>
<tr>
<td>5-week session</td>
<td>Friday of the 3rd week</td>
</tr>
</tbody>
</table>

The equivalent date (75% of the semester) will be used for sessions of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.

Students who officially withdraw will be awarded the grade of "W" provided the student's attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the college before they may be considered for withdrawal.

A student may not withdraw from a class for which the instructor has previously issued the student a grade of "F" or "FN" for nonattendance.

B. An Administrative Withdrawal: An administrative withdrawal may be initiated
when the student fails to meet College attendance requirements. The instructor will assign the appropriate grade on the Administrative Withdrawal Form for submission to the registrar.

C. **An Incomplete Grade:** The College catalog states, "An incomplete grade may be given in those cases where the student has completed the majority of the course work but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course..." Prior approval from the instructor is required before the grade of "I" is recorded. A student who merely fails to show for the final examination will receive a zero for the final and an "F" for the course.

D. **Cellular Phones and Beepers:** Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

E. **Americans With Disabilities Act (ADA):** Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Review the website at www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

F. **Civility:** Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.

G. **Math Lab:** The Math Department operates an Advanced Mathematics Lab in Building 152, Room 145. All courses offered by the Math Department are supported in the lab with appropriate tutorial software. Calculators and Graphlink are available for student use in the lab. Students are encouraged to take advantage of these opportunities. See posted hours for the Math Lab.

H. **Office Hours:** Full-time instructors post office hours in Blackboard. Part-time instructors may be available by appointment. If you have difficulty with the course work, please consult your instructor.

**VIII. COURSE OUTLINE**

A. **Unit One:** Functions and Graphs (Chapter 2)

1. **Learning Outcomes:** Upon successful completion of this unit, the student will be able to:

   a. Define a relation.
b. Define a function.
c. Evaluate functions.
d. Determine domain and range.
e. Use the vertical line test.
f. Graph functions and relations.
g. Identify increasing or decreasing functions.
h. Graph transformations of functions.
i. Form combinations of functions.
j. Form the composition of functions.
k. Find and give definition of the inverse of functions.

2. **Learning Activities:**

   a. Listen to classroom lecture and discuss exercises. (F5, F6, F7, F8)
   b. Read pages of assigned chapter. (F1)
   c. Work problems as assigned by the instructor. (F2, F7, F8, F9, F10, F11, F12)

3. **Unit Outline:**

   a. Section 2.1 (Basics of Functions and Their Graphs)
   b. Section 2.2 (More on Functions and Their Graphs)
   c. Section 2.5 (Transformations of Functions)
   d. Section 2.6 (Combinations of Functions; Composite Functions)
   e. Section 2.7 (Inverse Functions)

B. **Unit Two: Polynomial and Rational Functions (Chapter 3)**

1. **Unit Objectives:** Upon successful completion of this unit, the student will be able to:

   a. Analyze graphs of polynomials using end-behavior, leading coefficient test.
   b. Perform synthetic division.
   c. State and use the Remainder Theorem.
   d. State and use the Factor Theorem.
   e. State and use the Rational Zero Theorem.
   f. State and use Descartes Rule of Signs.
   g. State and use the Intermediate value theorem.
   h. Solve Polynomial Equations.
   i. Graph rational functions.

2. **Learning Activities:**
a. Listen to classroom lecture and discuss exercises. (F5, F6, F7, F8)
b. Read pages of assigned chapter. (F1)
c. Work problems as assigned by the instructor. (F2, F7, F8, F9, F10, F11, F12)

3. Unit Outline:
   a. Section 3.2 (Polynomial Functions and Their graphs)
   b. Section 3.3 (Dividing Polynomials: Remainder and Factor Theorems)
   c. Section 3.4 (Zeros of Polynomial Functions)
   d. Section 3.5 (Rational Functions and Their Graphs)
   e. Section 3.6 (Polynomial and Rational Inequalities)

C. Unit Three: Exponential and Logarithmic Functions (Chapter 4)

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
   a. Define the exponential function
   b. Graph exponential functions.
   c. Use exponential models to solve problems.
   d. Define the logarithmic function.
   e. Identify properties of the logarithmic function.
   f. Graph the logarithmic function.
   g. Use logarithmic models to solve problems.
   h. Solve logarithmic or exponential equations.

2. Learning Activities:
   a. Listen to classroom lecture and discuss exercises. (F5, F6, F7, F8)
   b. Read pages of assigned chapter. (F1)
   c. Work problems as assigned by the instructor. (F2, F7, F8, F9, F10, F11, F12)

3. Unit Outline:
   a. Section 4.1 (Exponential Functions)
   b. Section 4.2 (Logarithmic Functions)
   c. Section 4.3 (Properties of Logarithms)
   d. Section 4.4 (Exponential and Logarithmic Equations)
   e. Section 4.5 (Exponential Growth and Decay; Modeling Data)

D. Unit Four: Matrices and Linear Systems (Chapter 6)

7/7/14
1. **Unit Objectives:** Upon successful completion of this unit, the student will be able to:

   a. Define a matrix.
   b. Solve a linear system using the Gauss-Jordan Method.
   c. Model stated problems using matrices.
   d. Find solutions to dependent systems.
   e. Perform operations on matrices.
   f. Find the inverse of a matrix.
   g. Solve a linear system using the inverse.
   h. Evaluate determinants.

2. **Learning Activities:**

   a. Listen to classroom lecture and discuss exercises. (F5, F6, F7, F8)
   b. Read pages of assigned chapter. (F1)
   c. Work problems as assigned by the instructor. (F2, F7, F8, F9, F10, F11, F12)

3. **Unit Outline:**

   a. Section 6.1 (Matrix Solutions to Linear systems)
   b. Section 6.2 (Inconsistent and Dependent Systems and their Applications)
   c. Section 6.3 (Matrix Operation and their Applications)
   d. Section 6.4 (Multiplicative Inverses of Matrices and Matrix Equations)
   e. Section 6.5 (Determinants and Cramer’s Rule)

E. **Unit Five:** Sequences and Series (Chapter 8)

1. **Unit Objectives:** Upon successful completion of this unit, the student will be able to:

   a. Define a sequence.
   b. Define an arithmetic sequence.
   c. Find the $n^{th}$ term and the $n^{th}$ partial sum of an arithmetic sequence.
   d. Model problems using arithmetic sequences.
   e. Define a geometric sequence.
   f. Find the $n^{th}$ term and the $n^{th}$ partial sum of a geometric sequence.
   g. Find the sum of certain infinite geometric series.
   h. Find the binomial coefficient.
   i. State and use the Binomial Theorem.
   j. Find a particular term in a binomial expansion.
   k. State and use the Fundamental Counting Principle.

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1. State and use the formula for permutations.
2. State and use the formula for combinations.
3. Define and compute empirical probability.
4. Define and compute theoretical probability.

2. Learning Activities:
   a. Listen to classroom lecture and discuss exercises. (F5, F6, F7, F8)
   b. Read pages of assigned chapter. (F1)
   c. Work problems as assigned by the instructor. (F2, F7, F8, F9, F10, F11, F12)

3. Unit Outline:
   a. Section 8.1 (Sequences and Summation Notation)
   b. Section 8.2 (Arithmetic Sequences)
   c. Section 8.3 (Geometric Sequences and Series)
   d. Section 8.5 (The Binomial Theorem)
   e. Section 8.6 (Counting Principles, Permutations, and Combinations)
   f. Section 8.7 (Probability)
h. State and use the principle of mathematical induction.

i. Perform proof by mathematical induction.

j. State and use the Binomial Theorem.

2. Learning Activities.

   a. Listen to classroom lecture and discuss exercises.  (F5, F6, F7, F8)
   b. Read pages of assigned chapter.  (F1)
   c. Work problems as assigned by instructor.  (F2, F7, F8, F9, F10, F11, F12)

3. Unit Outline:

   a. Section 8.1 (Sequences and Summation Notation)
   b. Section 8.2 (Arithmetic sequences)
   c. Section 8.3 (Geometric sequences)
   d. Section 8.4 (Mathematical Induction)
   e. Section 8.5 (Binomial Theorem)