CIC Approval:
BOT APPROVAL:
STATE APPROVAL:
EFFECTIVE TERM:

SAN DIEGO COMMUNITY COLLEGE DISTRICT
CITY COLLEGE
ASSOCIATE DEGREE COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER: Mathematics 098

COURSE TITLE: Technical Intermediate Algebra and Geometry **Units:** 4
Letter Grade or Credit/No Credit Option

CATALOG COURSE DESCRIPTION:

This course introduces an applied technology approach to problem solving in Intermediate Algebra and Geometry, and it is intended to support the curriculum required in the Engineering and applied technologies majors. Students are expected to apply problem solving techniques to technology-based situations in their technical physics and applied technology courses. Topics include scientific notation, algebra of functions, linear systems of equations, graphing using log and semi-log paper, technology applications of quadratic, exponential and logarithmic functions, right triangle trigonometry, applications in electronics of vectors and phasors. Special emphasis will be placed on the use of the graphing calculator and mathematical software packages to solve application problems.

REQUISITES:

Prerequisite:
MATH 095 with a grade of "C" or better, or equivalent or Assessment Skill Level M40

Advisory:

ENGL 051 with a grade of "C" or better, or equivalent or Assessment Skill Level W5
ENGL 056 with a grade of "C" or better, or equivalent or Assessment Skill Level R5

FIELD TRIP REQUIREMENTS: May be required

TRANSFER APPLICABILITY: Associate Degree Credit only and not Transferable

CAN DATA:

LECTURE HOURS PER WEEK: 4

ADJU/FIPT TOTAL LECTURE HOURS: 4.00

LAB HOURS PER WEEK: -

STUDENT LEARNING OBJECTIVES:
Upon successful completion of the course the student will be able to:

1. Apply exponents to problems involving scientific notation and unit conversions in the metric system.
2. Determine domains and ranges of functions from their graphs and use elementary graphing techniques to graph functions.
3. Identify one-to-one functions and formulate their inverses.
4. Formulate and solve quadratic equations that arise in engineering technology fields, by using various techniques.

5. Analyze the graph of a quadratic function, including its roots and its maximum or minimum values, and apply these geometric properties in solving applications in various technology fields.
6. Construct systems of linear equations for problems in engineering technology and apply various techniques to solve such systems.
7. Compute the determinant of a square matrix, and apply Cramer's Rule to solve low order systems of equations.
8. Define and graph exponential and logarithmic functions, including graphing logarithmic functions using log and semi-log paper.
9. Solve equations and technical applications involving exponential and/or logarithmic functions.
10. Perform basic geometric calculations for geometric shapes found in fields of engineering technology, including calculation of dimensions, tolerances, surface area and volume.
11. Apply right angle trigonometry in technical calculations including computation of inverse trigonometric function values.
12. Perform operations including geometric and trigonometric properties to two-dimensional vectors and relate these to phasors.
13. Apply complex numbers in phasor and vector representations to electronics and engineering technology.

SECTION II

1. COURSE OUTLINE AND SCOPE:

A. **Outline Of Topics:**
The following topics are included in the framework of the course but are not intended as limits on content. The order of presentation and relative emphasis will vary with each instructor.

1. Scientific Notation in Engineering and Engineering Technology
    a. Scientific and Engineering Notations
    b. Metric System
    c. Conversion of Units
    d. Applications in Technology

2. Functions
    a. Domain and Range
    b. Graphs
    c. Techniques of Graphing
    d. Algebraic Operations
    e. One-to-One Property
    f. Inverses

3. Quadratic Equations and Functions
    a. Solving Equations
        i. Completing the Square
        ii. Quadratic Formula
    b. Graphing
        i. Vertex
        ii. Roots
    c. Applications problems in the applied technologies

4. Systems of Equations
    a. Substitution
    b. Matrices
        i. Row-Echelon Form
        ii. Inverse Matrices
    c. Cramer's Rule Using Determinants
    d. Applications problems in applied technologies

5. Exponential and Logarithmic functions

a. Definitions
b. Geometric and Algebraic Properties
c. Change of Base Theorem
d. Graphing using log and semi-log paper
e. Equations with exponential and logarithmic functions
f. Applications problems in applied technologies

6. Geometric Concepts Encountered in Fields of Technology
   a. Basic Geometric Shapes
   b. Volumes and Surface Areas
   c. Dimensions
   d. Tolerances
   e. Applications problems in applied technologies

7. Right Angle Trigonometry
   a. Definitions of Ratios of Sides
   b. Sine
   c. Cosine
   d. Tangent
   e. Inverse Trigonometric Functions
   f. Computations involving two-dimensional vectors

8. Vectors
   a. Geometric and Algebraic Representations
   b. Arithmetic Operations
   c. Applications problems in applied technologies

9. Complex Numbers in Applied Technologies
   a. Operations
   b. Rationalization of Complex Numbers
   c. Phasor and Vector Representations of Complex Numbers
   d. Applications problems in applied technologies

B. **Appropriate Outside Assignments:**
Outside assignments may include, but are not limited to, the following:
Students are expected to spend a minimum of 2 hours outside of class in practice and preparation for each hour of lecture. Outside assignments will apply the principles of technical mathematics to problems presented in the applied technology programs. Implementing a variety of software applications such as Microsoft Excel or Computer Algebraic Systems is encouraged.

I. Reading and writing assignments as specified in the course syllabus,
II. Reading and reviewing lecture notes,
III. Library, electronic and other archival research,
IV. Viewing of assigned/recommended media materials,
V. Observations, e.g. field trips to attend pertinent lectures/conferences,
VI. Various analytical and technical projects presented in the form of modules,
VII. Developing problem solving techniques and analytical skills by solving problems from various texts, such as Technical Mathematics by Peterson or Technical Mathematics by Calter & Calter,
VIII. Preparing collaborative projects focusing on expanding mathematical concepts presented in class.

C. **Appropriate Assignments that Demonstrate Critical Thinking:**
Critical thinking assignments are required and may include, but are not limited to, the following:

I. Applying algebraic and geometric techniques to analyze technical problems.
II. Analyzing appropriate functions that model dynamic and/or static phenomena.
III. Applying appropriate algebraic principles to solve a variety of equations.
IV. Analyzing and solving problems that are broader in scope than those presented in class, or those introduced in the text.
V. Reviewing and implementing past Mecomtronics Computer Technology modules from NJCATE.

D. **Reading Assignments:**
Reading assignments are required and may include but, are not limited to, the following:

I. Assigned Textbook.
II. Related Instructional Modules by the New Jersey Center for Advanced Technological Education, NJCATE.
III. Related sections in College Algebra, by Sullivan, 8th edition, 2008
IV. Related chapters in Elementary Technical Mathematics by Ewen and Nelson, 7th edition, 1998.
V. Related chapters in Technical Mathematics by Peterson, 2nd edition, 1997.
VI. Related sections in Electronics and Computer Mathematics by Deen and Zannini, 8th edition, 2006.
VII. Related sections in Technical Mathematics by Calter & Calter, 4th edition, 2000.
VIII. Applications in Technical Mathematics and Fields of Technology found on the Internet.

E. **Writing Assignments:**
Writing assignments are required and may include, but are not limited to, the following:
Writing assignments are required, and the written work will involve application of critical thinking and analytical skills. A substantial portion of this course is dedicated to applying mathematics in fields of technology.

I. Written solutions to problems using proper mathematical terminology involving but not limited to
A. Organizing and processing data,
B. Calculating properties of two dimensional geometric figures and solids,
C. Relating functions to their graphs, including those of the log and exponential functions,
D. Solving systems of equations that arise in technical situations and applying determinants to such problems
II. Report writing with a focus on applying technical mathematics to fields of technology.
III. Essay homework or test questions may include but are not limited to describing in complete sentences and using proper mathematical terminology the applications of mathematics to problems encountered to fields of technology.
IV. Writing a formal report analyzing some applied topic related to mathematics in engineering technology.

2. METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

I. In-class objective quizzes, examinations, and a comprehensive final examination that test for definitions, major mathematical concepts such as graphing functions, solving equations, applying trigonometry to applied technical problems, processing data and formalizing conclusions based on elementary statistics principles. Exams can consist of free response items, multiple choice items, or a combination.
II. Out-of-class projects that develop critical thinking and problem solving techniques such as:
A. Exploratory activities involving a graphing calculator or computers.
B. Analytical semester projects.
C. Written reports on related subjects.
III. Class participation, including:
A. Participation in classroom discussion.
B. Participation in collaborative assignments.
C. Oral presentations on a variety of mathematical applications.
D. Group projects.
E. Field trips.
F. Classroom experiments and simulations.
IV. Supplementary activities, including:
A. Library and on-line Internet research

3. METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

* Collaborative Learning
* Shadowing
* Lecture
* Laboratory
* Lecture-Lab Combination
* Computer Assisted Instruction
* Lecture Discussion
* Discussion Seminar
* Learning Modules
* Audio-Visual
* Other (Specify)
* Field observation and field trips,
* Guest speakers.
* Internet related research.

4. REQUIRED TEXTS AND SUPPLIES:
Textbooks may include, but are not limited to:

TEXTBOOKS:
1. Deem and Zannini. Electronics and Computer Math, 8/E ed. Prentice Hall, 2006, ISBN: 0131711377
2. Ewen, Gary & Trefzger. Technical Mathematics, 2/E ed. Prentice Hall, 2005, ISBN: 0130488100
3. Peterson. Technical Mathematics, 3/E ed. Thomson Delmar Learning, 2004, ISBN: 0766861899

MANUALS:
1. Beyer, Gao, Misuraca, O'Rourke, Pearce, Schatz, Tyrrell. Instructional Modules in Technology, Middlesex County College, 01-01-1999

PERIODICALS:

SOFTWARE:
1. MATLAB. MATLAB, Current ed.
Mathematics Simulation Software

SUPPLIES:
1. Calculator, graphing preferred.
2. Digital storage media.
3. Graph paper, various types.
4. Journal or lab book.

PROPOSAL ORIGINATOR: Carlos DeLaLama
PROPOSAL DATE: 01/23/2007