Las Positas College
3000 Campus Hill Drive
Livermore, CA 94551-7650
(925) 424-1000
(925) 443-0742 (Fax)

Course Outline for MATH 39

TRIGONOMETRY

Effective: Fall 2019

I. CATALOG DESCRIPTION:
MATH 39 — TRIGONOMETRY — 4.00 units

Trigonometry includes definitions of the trigonometric functions and their inverses, graphs of the trigonometric functions and their inverses, trigonometric equations, trigonometric expressions and identities, including proofs, an introduction to vectors, polar coordinates and complex numbers. Applications include solving right triangles and solving triangles using the law of sines and the law of cosines.

4.00 Units Lecture

Prerequisite
MATH 55 - Intermediate Algebra for BSTEM
with a minimum grade of C
or

MATH 55B - Intermediate Algebra for STEM B
with a minimum grade of C
or

NMAT 255 - Intermediate Algebra for BSTEM
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:
- Mathematics

	MIN
Lecture Hours:	72.00
Expected Outside of Class Hours:	144.00
No Unit Value Lab	18.00
Total Hours:	234.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. MATH55
1. Recognize and determine the distinctions between relations and functions, numerically, graphically, symbolically, and verbally;
2. Given a function, determine the domain and range and express them in interval notation;
3. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
4. Apply basic operations on functions, including composition of functions and finding inverse functions;
5. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
6. Use the properties of radicals, complex numbers, exponents and logarithms;
7. Sketch the graphs of nonlinear relations, including parabolas and circles, and identify key components of the graphs;

B. MATH55B
1. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
2. Apply basic operations on functions, including composition of functions and finding inverse functions;
3. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
4. Use the properties of radicals, complex numbers, exponents and logarithms;

5. Sketch the graphs of nonlinear relations, including parabolas and circles, and identify key components of the graphs.

C. NMAT255
1. Recognize and determine the distinctions between relations and functions, numerically, graphically, symbolically, and verbally;
2. Given a function, determine the domain and range and express them in interval notation;
3. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
4. Apply basic operations on functions, including composition of functions and finding inverse functions;
5. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
6. Use the properties of radicals, complex numbers, exponents and logarithms;
7. Sketch the graphs of nonlinear relations, including parabolas and circles, and identify key components of the graphs;

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Define trigonometric functions in terms of the right triangle, using coordinates of a point and distance from the origin, and using the unit circle;
B. State from memory the values for sine, cosine and tangent functions of common angles given in either degrees or radians;
C. Identify special triangles and their related angle and side measures;
D. State from memory the Pythagorean identities, reciprocal identities, quotient identities, double angle identities, and sum and difference identities for sine and cosine ;
E. Evaluate the trigonometric function of an angle in degree and radian measure;
F. Manipulate and simplify a trigonometric expression;
G. Solve trigonometric equations, including equations with multiple angles over different intervals, and solve triangles and applied problems;
H. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs;
I. Evaluate and graph inverse trigonometric functions;
J. Prove trigonometric identities;
K. Develop and use trigonometric ratios or other trigonometric formulas to solve problems;
L. Develop and use the law of sines and law of cosines to completely solve an oblique triangle;
M. Convert between polar and rectangular coordinates and equations;
N. Graph polar coordinate equations.
O. Calculate powers and roots of complex numbers using DeMoivre's Theorem;
P. Represent a vector (a quantity with magnitude and direction) in the form <a,b> and ai+bj.

V. CONTENT:

A. Definitions and evaluation of the six trigonometric functions
1. Coordinate definitions
2. Right triangle definitions
3. Unit circle definitions
4. Reference angles and quadrant rules of sign

B. Radian measure of an angle
1. Definition and radian/degree conversion
2. Arc length
3. Angular and linear speed

C. Identities
1. Prove trigonometric identities
2. Use identities to evaluate trigonometric functions
3. Use identities to simplify or manipulate trigonometric expressions

D. Graphs of trigonometric functions
1. Period, amplitude, vertical translation and phase shift, asymptotes
2. Graphing with calculator

E. Inverse trigonometric functions
1. Definitions
a. domain
b. range
c. graph
2. Evaluation by hand or with calculator

F. Trigonometric equations
1. Solutions over an interval
2. General solutions
3. Solutions of equations with a multiple angle
4. Solutions involving inverse trigonometric functions

G. Applications of Trigonometric Functions
1. Solving triangles
2. Right triangle applications
3. Law of sines
4. Law of cosines

H. Polar coordinates and complex numbers
1. Polar coordinates and polar/rectangular conversion
2. Polar equations
3. Polar form of complex numbers
4. DeMoivre's Theorem
5. Root Theorem

I. Vectors in the plane

VI. METHODS OF INSTRUCTION:

A. **Lecture** -
B. Assigned readings in the text
C. Web-based tutorials
D. Group and individual activities in class
E. **Lab** - assignments
F. Homework

VII. TYPICAL ASSIGNMENTS:

A. Homework
1. Problems from the text should be assigned for each section covered. The number of problems assigned may vary from section to section and from instructor to instructor, but the homework assignments should include a sufficient number and

variety of problems to develop both skill and conceptual understanding. A typical assignment should take an average student 1 to 2 hours for each hour in class.
2. The majority of the problems assigned should be those for which answers are readily available (e.g., from the answer appendix in the text), so that students may obtain immediate feedback on their work. 3. Homework assignments may include reading the text. Students may be asked to read sections in advance of the lecture and then to re-read them after the lecture, to reinforce important concepts and skills. An instructor may require written work in conjunction with the reading assignments (e.g., have students complete a Q & A sheet related to the assigned reading).

B. Laboratory
1. Lab assignments can be used to reinforce fundamental concepts and skills or to explore certain concepts in more depth than is possible in-class. They may be designated for individual or group work. Lab assignments are completed in the Open Math Lab where students have access to assistance with the assignments.
2. Sample lab assignment: students develop and use trigonometric function models to solve applied problems.

C. In-Class
1. Collaborative learning, done in small groups of 2-4 students, can be used to introduce new concepts, build skills, or teach problem solving. Students may be asked to present their results on the board.
2. Sample collaborative learning assignment: Each student given a piece of paper of with a trigonometric identity printed on it. They must find the other members of the class that have the same identity. Working with those students, the group proves the identity and then presents their solution to the class via the document camera.

VIII. EVALUATION:
Methods/Frequency

A. Exams/Tests
minimum of four exams plus the final
B. Quizzes
at the discretion of the instructor
C. Projects
at the discretion of the instructor
D. Class Work
at the discretion of the instructor
E. Home Work
assigned for each section covered
F. Lab Activities
minimum of eight

IX. TYPICAL TEXTS:
1. Lial, Margaret, John Hornsby, Davd Schneider, and Callie Daniels. *Trigonometry.* 11th ed., Pearson, 2017.
2. Sullivan, Michael. *Trigonometry: A Unit Circle Approach.* 10th ed., Pearson, 2015.
3. McKeague, Charles, and Mark Turner. *Trigonometry.* 8th ed., Cengage, 2017.

X. OTHER MATERIALS REQUIRED OF STUDENTS:
A. Graphing or scientific calculator