Las Positas College
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Course Outline for MATH 38

TRIGONOMETRY WITH GEOMETRY

Effective: Fall 2018

I. CATALOG DESCRIPTION:
MATH 38 — TRIGONOMETRY WITH GEOMETRY — 5.00 units

Plane trigonometry with topics from plane geometry. Geometry includes properties of polygons, parallel and perpendicular lines, congruence and similarity, area, volumes and surface area. Trigonometry includes definitions of the trigonometric functions, graphs of the trigonometric functions, trigonometric equations and inverse trigonometric functions, identities, polar coordinates and complex numbers. Applications involving right triangles, law of sines and law of cosines.

5.00 Units Lecture

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

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

Grading Methods:
Letter Grade

Discipline:
- Mathematics

	MIN
Lecture Hours:	90.00
No Unit Value Lab	18.00
Total Hours:	108.00

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. Solve systems of linear equations in three variables;
6. 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.
7. Solve compound inequalities, sketch the graph of the solution and use appropriate set and interval notation to express the solution;
8. Solve absolute value equations and inequalities and, where appropriate, sketch the graph of the solution and use set or interval notation to express the solution;
9. Factor polynomials, including using the sum and difference of cubes;
10. Use the properties of radicals, complex numbers, exponents and logarithms;
11. Sketch the graphs of nonlinear relations, including parabolas and circles, and identify key components of the graphs;

B. MATH55B

IV. MEASURABLE OBJECTIVES:

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

A. Solve problems using definitions, postulates, and theorems concerning:
1. Straight lines, rays, line segments;
2. Midpoints of line segments and bisectors of angles;
3. Perpendicular and parallel lines;

4. Congruent and similar triangles;
5. Perimeters, circumferences, and areas of 2-dimensional geometric figures;
6. Volumes and surface areas of 3-dimensional geometric figures.

B. Identify and use trigonometric ratios in problem solving;
C. Define trigonometric functions in terms of the right triangle and the unit circle;
D. Memorize the values for sine, cosine and tangent functions for common angles, both in degrees and radians;
E. Memorize the Pythagorean identities, reciprocal identities, double angle and half-angle formulas for sine and cosine and sum and difference formulas for sine and cosine;
F. Prove trigonometric identities;
G. Develop and use trigonometric formulas to solve problems;
H. Solve trigonometric equations including equations with multiple angles over different intervals;
I. Graph trigonometric and inverse trigonometric functions;
J. Develop and use the law of sines and law of cosines to completely solve an oblique triangle;
K. Convert between polar coordinate system and rectangular coordinate system;
L. Graph basic polar coordinate equations.

V. CONTENT:

A. Introduction to an axiomatic system
B. Points, lines, planes, segments, rays, angles
   1. Congruence
   2. Bisectors
   3. Angle relationships
C. Parallel and perpendicular lines; transversals
D. Triangles
   1. Classification
   2. Angles
   3. Right Triangles: the Pythagorean Theorem
   4. Congruence and similarity
   5. Area and perimeter
E. Polygons
   1. Classification
   2. Angles
   3. Diagonals
   4. Area and perimeter
F. Circles
   1. Radius and diameter
   2. Angles, sectors and arc length
   3. Area and circumference
G. Volumes and surface areas of polyhedra, cylinders, spheres and cones
H. Definitions of the six trigonometric functions
   1. Coordinate definitions
   2. Right triangle definitions
   3. Unit circle definitions
I. Reference angles and quadrant rules of sign
J. Radian measure of an angle
K. Identities
   1. Prove identities
   2. Use identities to evaluate trigonometric functions
L. Graphs of trigonometric functions
   1. Period, amplitude and translations
   2. Graphing with calculator
M. Inverse trigonometric functions
   1. Graphs
   2. Evaluation by hand or with calculator
N. Trigonometric equations
   1. Solutions over an interval
   2. General solutions
   3. Solutions of equations with a multiple angle
   4. Solutions involving inverse trigonometric functions
O. Applications of Trigonometric Functions
   1. Right triangle applications
   2. Law of sines
   3. Law of cosines
P. Polar coordinates and complex numbers
   1. Polar form of complex numbers
   2. DeMoivre's Theorem
   3. Root Theorem
Q. 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: Working in groups, students use angle, sector, and arc length relationships for circles and congruent triangles to find the values of marked angles and line segments in a geometric figure.

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Projects
4. Group Projects
5. Home Work
6. Lab Activities
7. Other:
   a. Collaborative group activities

B. **Frequency**

1. Recommend minimum of four exams plus the final
2. Homework should be assigned for each section covered
3. Recommend minimum of eight laboratory assignments over the semester
4. Number of quizzes, collaborative activities and quizzes are at the discretion of the instructor

IX. TYPICAL TEXTS:

1. Lial, Margaret, John Hornsby, David Schneider, and Callie Daniels. *Trigonometry.* 11th ed., Pearson, 2017.
2. Bass, Alan *Geometry: Fundamental Concepts and Applications.* 1st ed., Pearson/Addison Wesley, 2008.
3. *Basic Geometry for College Students: An Overview of the Fundamental Concepts of Geometry.* 2nd ed., Cengage, 2010.
4. , Michael. *Trigonometry: A Unit Circle Approach.* 10th ed., Pearson, 2015.
5. McKeague, Charles, and Mark Turner. *Trigonometry.* 8th ed., Cengage, 2017.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. Graphing calculator