



Math 133 – Plane Trigonometry Course Syllabus

Course description: Trigonometric functions of angles, radian measure, fundamental identities; addition, product, and half angle formulas, solution of triangles; polar coordinates; inverse trigonometric functions, complex numbers.

Credit hours: 3

Course Prerequisites and Corequisites: See general course prerequisites.

Course outline:

	<u>Approximate time spent</u>
<ul style="list-style-type: none">● Angles and definitions of trigonometric functions	15%
<ul style="list-style-type: none">○ Angles<ul style="list-style-type: none">▪ Degree measure of angles▪ Reference angles▪ Radian measure of angles▪ Arc length, angular velocity, linear velocity○ Trigonometric functions<ul style="list-style-type: none">▪ Definition using the unit circle▪ Reciprocal, ratio, and Pythagorean identities▪ Definition using ratios of sides of right triangles▪ Evaluating exact values for special angles	
<ul style="list-style-type: none">● Graphs of trigonometric functions	15%
<ul style="list-style-type: none">○ Basic graphs of the trigonometric functions○ Modified graphs of the trigonometric functions<ul style="list-style-type: none">▪ Amplitude▪ Period▪ Vertical translation▪ Phase shift	
<ul style="list-style-type: none">● Inverse Trigonometric Functions and Solving Equations	15%
<ul style="list-style-type: none">○ Definitions and graphs of inverse trigonometric functions○ Calculations with inverse trigonometric functions○ Solving trigonometric equations<ul style="list-style-type: none">▪ Using factoring, identities, and quadratic formula▪ Arguments with multiple angles▪ Using inverse functions to approximate solutions	
<ul style="list-style-type: none">● Identities	20%
<ul style="list-style-type: none">○ Logic and techniques for proving identities○ Calculations with identities○ Sum and difference identities○ Even, odd, and cofunction identities○ Double and half-angle identities○ Product-to-sum and sum-to-product identities	

Approximate time spent

- **Solving Triangles** 15%
 - Accuracy and significant digits
 - Solving right triangles
 - Law of Cosines
 - Law of Sines
 - Ambiguous case (SSA)
 - Applications
 - Navigation
 - Surveying
 - Angles of depression/elevation
 - Areas of triangles
- **Vectors, Complex Numbers, and Polar Coordinates** 20%
 - Vectors
 - Definitions
 - Algebraic representations and resolving vectors
 - Resultant vector
 - Angle between vectors
 - Dot product and orthogonality
 - Applications
 - Forces
 - Air speed/ground speed
 - Work
 - Complex number system
 - Definitions
 - Arithmetic and simplification of complex numbers
 - Trigonometric form
 - Products and quotients in trigonometric form
 - De Moivre's Theorem
 - nth root theorem
 - Polar coordinate system
 - Definitions
 - Various representations for points using polar
 - Conversion between polar and rectangular coordinates
 - Graphs of polar equations
 - Conversion between polar and rectangular
 - Special polar graphs

Student Learning Outcomes (SLO): At the end of MTH 133, a student who has studied and learned the material should be able to:

1. State and use the unit circle and ratio definitions of the six trigonometric functions. [EEO: 2, 5]
2. Recall and use exact values of the trigonometric functions at integer multiples of $\pi/4$ and $\pi/6$ in various contexts, especially in graphing trigonometric functions. [EEO: 2, 5]
3. Graph the trigonometric functions, and graph transformations of trigonometric functions by recognizing amplitude, changes in period, vertical translations, and phase shifts. [EEO: 1, 2, 5, 6]
4. Use appropriate trigonometric identities in solving equations involving trigonometric functions and in calculating trigonometric function values. [EEO: 2, 3, 4, 5]
5. Use logical reasoning and known trigonometric identities to verify that an equation is a trigonometric identity. [EEO: 3]
6. Use inverse trigonometric functions in applications and in solving equations. [EEO: 1, 4, 6, 7]
7. Determine unknown measures of sides and/or angles of triangles for which some specific measures are given. [EEO: 1, 4, 6, 7]

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8. Solve application problems using tools such as vectors, right triangle trigonometry, the Law of Sines, and the Law of Cosines. [EEO: 1, 4, 6, 7]
9. Perform arithmetical operations with complex numbers and find powers and roots of complex numbers in trigonometric form. [EEO: 2, 4, 7]
10. Use the polar coordinate system, relate it to the rectangular coordinate system, and graph equations using polar coordinates. [EEO: 1, 2, 5, 7]

There are no specific program learning outcomes for this major addressed in this course. It is a general education core curriculum course and/or a service course.

Exemplary Educational Objectives (EEO):

1. To apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations.
2. To represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.
3. To expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments.
4. To use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.
5. To interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them.
6. To recognize the limitations of mathematical and statistical models.
7. To develop the view that mathematics is an evolving discipline, interrelated with human culture, and understand its connections to other disciplines.

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