AROR UNIVERSITY OF ART, ARCHITECTURE, DESIGN & HERITAGE, SUKKUR

MAT-000 (PRE CALCULUS) Syllabus
Fall 2025

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Learning Outcomes	
	Students will learn to:
	Perform common operations on polynomials
	Find zeros of polynomials and factor polynomials
	Solving the quadratic inequalities and equations
	Manipulate functions algebraically
	Graph common functions
	Perform common calculations with complex numbers
	Use the logarithm and exponential functions and their real life applications
	Use the laws for exponentials and logarithms of real numbers
	Find values of trigonometric functions
	Relate basic trigonometric functions to the unit circle
	Manipulate trigonometric identities
	Solve problems involving right-angle triangles
	Apply the Laws of Sines and Cosines
	Real-life applications of the trigonometric and pre-calculus

COURSE OVERVIEW			
Weeks(s)	Chapters/Topics	Recommended Readings*	Objectives/ Application
1-2	**Chapter#01 Fundamentals:** Integers, Rational and Irrational, Real, and Complex numbers. Absolute value, exponent and radicals. Algebraic expressions, equation and straight lines.	1.1-1.6, 1.8-1.11	Understanding of the real line and absolute value function. Expressing the relationship between quantities through numbers. Identify and use properties of exponents. Solving the linear equation (straight line),
3-4	**Chapter#02 Functions:** Introduction to functions and their graphs. Graph transformations, Properties of functions, Combining Functions, One-to-One Functions and Their Inverses.	2.1-2.2, 2.6-2.8	Learn the basic concept of function. Learn to draw/sketch graph functions and use the tests of symmetry about the x-axis, y-axis and the origin. Learn properties of functions.
5-6	**Chapter#03 Polynomial and Rational Functions:** Linear and Quadratic Functions: Linear functions and their properties, quadratic functions and their properties.	3.1-3.7	Determining the key feature of the Linear and quadratic functions. Graph Linear Functions, Use Average Rate of Change to Identify Linear Functions, Determine Whether a Linear Function Is Increasing, Decreasing, or Constant, learn to solve inequalities involving quadratic functions.
	Polynomial Functions, Dividing Polynomials, Rational functions, Real and complex Zeros of Polynomials, Fundamental Theorem of Algebra, remainder theorem, factor theorem, Polynomial and rational inequalities.		Modeling the polynomial functions to find of the extrema of the functions. Understand the concept of rational functions. Finding the characteristics such as asymptotes of the rational function and their graphs. Learn to use remainder theorem, factor theorem, fundamental theorem of algebra and the conjugate roots theorem.
7-8	**Chapter#04 Exponential and Logarithmic Functions:** Exponential functions, the natural exponential function, logarithmic functions and their properties, laws of logarithms, Composition, inverse functions, logarithmic and exponential equations.	4.1-4.5	Defining the exponential functions and their application of growth and decay. Understand the laws of logarithmic function with change of base. Contemplate problems involving application of logarithmic functions.
9-12	**Trigonometric Functions:** i. **Chapter#05 Trigonometric functions via the unit circle;** right triangle trigonometry; basic properties and graphs of trigonometric functions.	5.1-5.5	Finding the relationship between degree and radian measure Linkage of sin, cosine, and tangent through the unit circle. And finding their values of reference angles $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$ and their multiples. Graph the trigonometric functions and identify their key features such as period, amplitude, domain, range and zeros.
	ii. **Chapter#06 Trigonometric functions via Right angle approach;** trigonometric functions of angles, inverse trigonometric functions and right triangles, , law of sine, law of cosine.	6.2-6.6	
	Chapter#07 Analytic Trigonometry: trigonometric identities; sum and difference formulas; double-angle and half-angle, formulas: product-to-sum and sum-to- product formulas, basic trigonometric equations **Chapter#09 System of Equations and Inequalities:** system of equations; system of equations in two variables; partial variables; system of inequalities	7.1-7.5.	Learn the basic trigonometric identities. Use sum, difference, half angle and double angle identities. Define and graph trigonometric functions and their inverses. Learning right. angled and non-right angled geometry Using laws of sine and cosine.

12-13	**Chapter#11** Sequences and Series: Sequences and Summation Notation, Arithmetic Sequences, Geometric Sequences, Mathematical Induction, The Binomial Theorem.	11.1-11.5	Learn to write the First Several Terms of a Sequence, Write the Terms of a Sequence Defined by a Recursive Formula, Find the Sum of a Sequence. Find a Formula for an Arithmetic and Geometric Sequences. Application of binomial theorem and mathematical induction
14-15	**Chapter#10** Conic Sections: Parabola, ellipse, Hyperbola, Shifted Conics	10.1-10.4	
16	**Presentation**		

Textbook(s)/Supplementary Readings

Textbook:
  * Precalculus, Mathematics for Calculus by James Stewart, Lothar Redlin, Saleem Watson. (8th edition)

Supplementary Readings:
  • Precalculus: Enhanced Graphing Utilities, 9th edition. By M. Sullivan & M. Sullivan, III.
  • Precalculus with unit-circle trigonometry by David Cohen.

Supplemental Websites:
  • Khan Academy is a free resource. It may require you to set up an account.
  • Purple Math has many lessons for free. However, Purple Math Plus requires you to enroll in monthly or yearly plan.
  • S.O.S. Mathematics is a free resource.
  • West Texas A & M University Virtual Math Lab is a free online tutorial.