CHAPTER	LESSON	DESCRIPTION
I. Numbers (1)	**Surds**	At the end of this activity, students should be able to: - understand and use surds. - use basic operations on surds. - simplify expressions with surds. - rationalise a denominator containing surds in fractions.
II. Quadratic Functions	**Quadratic Functions, Graphs**	At the end of this activity, students should be able to sketch the graph of a quadratic function and represent a quadratic function in the general and factorized forms.
	Factoring Quadratic Functions	At the end of this activity, students should be able to write a quadratic function in factor form with integer coefficients and rational x-intercepts, find the vertex of a quadratic function written in factor form, write a quadratic function in vertex form by completing the square and write a quadratic function in vertex form by calculating the determinant of the function
	Quadratic Equations	At the end of this activity, students should be able to solve a quadratic equation using different methods and estimate the roots of a quadratic equation.
	Linear-Quadratic Systems of Equations	At the end of this activity, students should be able to solve one quadratic–one linear systems of equations, find graphical solutions of simultaneous equations and find equations of given graphs.
	Linear-Quadratic Systems of Inequalities	At the end of this activity, students should be able to solve a system of one quadratic–one linear inequality with one unknown, find the union and intersection of sets of numbers satisfying different inequalities, check if the solution of an inequality includes another set of solutions, find the graphic solution of an inequality with two unknowns and find the graphic solution of a system of one quadratic–one linear inequality with two unknowns.
	Quadratic Inequalities	At the end of this activity, students should be able to: solve quadratic inequalities in the vertex form, solve quadratic inequalities by the test-point method, solve quadratic inequalities by the sign graph method, combine inequalities equations.
III. Polynomials	**Writing Polynomials**	At the end of this activity, students should be able to recognize polynomials, determine the degree and coefficients of a polynomial and calculate the value of a polynomial.
	Addition, Subtraction, and Multiplication of Polynomials	At the end of this activity, students should be able to add, subtract and multiply polynomials, find values of the sum, difference and product of polynomials and understand and use the relationship between the degrees of two polynomials and the degrees of their sum, difference and product.
	Division of Polynomials	At the end of this activity, students should be able to perform algebraic operations fluently and add, subtract and multiply polynomials.
	The Factor and Remainder Theorems	At the end of this activity, students should be able to use the factor theorem, use the remainder theorem and do synthetic division of polynomials.
	Factorization of Polynomials	At the end of this activity, students should be able to decompose a simple polynomial into factors with smaller degree, using various methods.
	Factorization and Roots of Polynomials	At the end of this activity, students should be able to find roots of polynomials using factorisation, find rational roots of polynomials with rational coefficients and solve simple polynomial equations and inequalities.

CHAPTER	LESSON	DESCRIPTION
IV. Graphs of Polynomials	**Sketching Graphs**	At the end of this activity, students should be able to estimate the end behavior of a polynomial function, find crucial points for the graph of a polynomial and sketch a rough graph of a polynomial.
	Graphical Solution of Equations (1)	At the end of this activity, students should be able to use graphical methods to solve simple equations and use graphical methods to check algebraic solutions of equations.
	Graphical Solution of Equations (2)	At the end of this activity, students should be able to use graphical methods to solve equations and systems of equations and use graphical methods to check algebraic solutions of equations.
	Graphical Solution of Inequalities (1)	At the end of this activity, students should be able to understand the notion of half-planes, know how to define a half-plane using an inequality and know how to find graphically the solution of an inequality in two variables.
	Graphical Solution of Inequalities (2)	At the end of this activity, students should be able to understand the notion of inequality in two variables as well as find the graphical solution of an inequality in two variables.
	Translations and Graphs	At the end of this activity, students should be able to understand the effect of a translation on a graph of a polynomial as well as understand the effect of a translation on the equation behind the graph.
V. Coordinate Geometry (1)	**Equation of a Straight Line**	At the end of this activity, students should be able to define different positions of a straight line in the coordinate system, read out the gradient and the y-intercept from the formula and the graph, write the equation of a line passing through two points and change one form of the equation of a line to another.
	Parallel and Perpendicular Lines	At the end of this activity, students should be able to recognize parallel lines by comparing their gradients and recognize perpendicular lines by multiplying out their gradients.
	Coordinate Geometry of a Circle	At the end of this activity, students should be able to place the circumference of the circle given by the equation (x − x0)2 + (y − y0)2 = r2 in the coordinate system, place the disc (x − x0)2 + (y − y0)2 ? r2 or (x − x0)2 + (y − y0)2< r2 in the coordinate system, represent the equation of the circle x2 + y2 − 2ax − 2by + c = 0 in the form (x − x0)2 + (y − y0)2= r2 and find the equation of a circle with three points given.
	The Tangent	At the end of this activity, students should be able to understand the notion of a tangent to a circle and a curve and know how to find the equation of the tangent to a given circle at a given point.
	The Normal	At the end of this activity, students should be able to understand the notion of a normal to a curve and know how to find the equation of the normal to a given simple curve at a given point.
	Intersection points (1)	At the end of this activity, students should be able to find the coordinates of intersection points of a straight line and other figures given by equations.
	Intersection points (2)	At the end of this activity, students should be able to find the coordinates of intersection points of two figures given by equations.

CHAPTER	LESSON	DESCRIPTION
VI. Differentiation (1)	**The Derivative**	At the end of this activity, students should be able to understand the notion of tangent and gradient of a curve, understand what the derivative function is, understand differentiation, recognise a non-differentiable function by its graph and visualise the graph of the derivative knowing the function.
	Differentiation of Simple Functions	At the end of this activity, students should be able to find the derivatives of simple functions y = x^n for any natural n, find th e derivative at a given point from the definition using the graph and recognise graphs of derivatives of simple functions.
	Differentiation of Polynomials	At the end of this activity, students should be able to differentiate functions of the form y = xn for n natural, differentiate a sum of monomials, differentiate a polynomial and sketch the graph of the derivative of a polynomial, knowing the function.
	Finding Slopes, Tangents, and Normals	At the end of this activity, students should be able to use differentiation to find gradients of a curve, find the equation of the tangent to the graph of a polynomial at a given point, find the equation of the normal to the graph of a polynomial at a given point and solve problems by using a tangent to a curve.
	Monotonicity	At the end of this activity, students should be able to recognise increasing and decreasing functions, understand the connection between the sign of the derivative and monotonicity of a function, find intervals of monotonicity and relate the graph of the function to the graph of the derivative.
	Local Extrema, Stationary Points, Critical Points	At the end of this activity, students should be able to understand the notion of local maximum and minimum, understand the notion of stationary point and critical point, use the derivative to find stationary points and find the global maximum and minimum of a function.
	Finding Local Extrema	At the end of this activity, students should be able to find local extrema at points of differentiability, find local extrema at points of non-differentiability and find local extrema in some more complex cases.
	Finding Maximum and Minimum Values	At the end of this activity, students should be able to find maximum and minimum values of a function in both closed and open intervals, if it exists.
	Second-Order Derivatives	At the end of this activity, students should be able to find the second-order derivative of a polynomial, use the second-order derivative to find and classify extrema and decide on extrema when the second derivative is zero.
VII. Integration (1)	**The Anti-Derivative**	At the end of this activity, students should be able to understand the notion of anti-derivative, understand the inverse of differentiation and calculate the integral of xn for natural n.
	Integrating	At the end of this activity, students should be able to understand and use simple laws of integration and integrate polynomials.
	The Definite Integral	At the end of this activity, students should be able to understand the definite integral, evaluate the definite integral of a polynomial and use simple laws of definite integration.
	Area Under the Curve	At the end of this activity, students should be able to use the definite integral to calculate areas delimited by function graphs and straight lines.

CHAPTER	LESSON	DESCRIPTION
VIII. Numbers (2)	**Laws of Indices – Rational Exponents**	At the end of this activity, students should be able to understand and use roots of any order, use powers of any rational exponent and apply laws of indices in calculations.
IX. Graph Transformations	**Transformations of Graphs (1)**	At the end of this activity, students should be able to find the graph of the functions y = f(x) + a and y = f(x + a), given the graph of y = f(x) (a – constant).
	Transformations of Graphs (2)	At the end of this activity, students should be able to: find the graphs of the functions y = a f(x) and y = f(ax), if the graph of y = f(x) is given (a – constant) – find the graph of the function y = a f(bx + c), if the graph of y = f(x) is given (a, b, c – constant values).
X. Sequences and Series	**Sequences**	At the end of this activity, students should be able to find the nth term of a sequence, find the formula for the nth term of a sequence in easy cases, understand the definition of terms depending on previous terms in a sequence and recognize increasing and decreasing sequences.
	Arithmetic Sequence	At the end of this activity, students should be able to define, recognise and use arithmetic sequences.
	Arithmetic Series	At the end of this activity, students should be able to: calculate the sum of the first n terms of a given arithmetic sequence, use the rule for the sum to n of positive integers.
	Geometric Sequence	At the end of this activity, students should be able to define, recognise and use geometric sequences as well as calculate the sum of the first n terms of a given geometric sequence.
	Geometric Series	At the end of this activity, students should be able to find the sum of the first n terms of a given geometric sequence and find the sum of an infinite convergent geometric series.
	Infinite Convergent Geometric Series	At the end of this activity, students should be able to recognise convergent geometric series and calculate the sum of a given convergent geometric series.
	The Binomial Expansion	At the end of this activity, students should be able to: formulate the binomial theorem, perform calculations of the form 1.99^n or positive integer n, know some properties of Pascal's Triangle.
	Binomial Series	At the end of this activity, students should be able to expand (1 + x)^n for rational n and |x|< 1 and use the expansion to calculate approximate values of rational powers and roots.
	Expansion of Rational Functions	At the end of this activity, students should be able to expand a rational function into a series in xn for natural n and apply the series expansion of a rational function to find approximations of its value for a given x.
XI. Trigonometry (1)	**General Angles**	At the end of this activity, students should be able to find the distance covered in a given number of revolutions and understand the notion of general angle as rotation.
	General Angles, Angle Measures	At the end of this activity, students should be able to find the distance traveled during a given number of revolutions, understand the notion of general angle as rotation and convert radian measure to degrees and vice versa.

CHAPTER	LESSON	DESCRIPTION
	Basic Trigonometric Functions	At the end of this activity, students should be able to understand and use the trigonometric functions of a general angle, be able to calculate the trigonometric functions of an angle, given the value of one of the functions, understand the basic trigonometric identities, know how to prove simple trigonometric identities and know how to use some reduction formulas.
	Graphs of Trigonometric Functions	At the end of this activity, students should be able to sketch graphs of trigonometric functions, understand the relation between the formula and the transformation of a graph and apply trigonometric functions in real-world situations.
	Simple Trigonometric Equations	At the end of this activity, students should be able to solve trigonometric equations of the form sinx = a, cosx = a and tanx = a, solve equations of the form psinx = qcosx and solve real-world problems involving equations.
	Solving Simple Trigonometric Equations	At the end of this activity, students should be able to solve equations of the form sin(f(x)) = a, where f is a linear function, solve equations of the form cos(f(x)) = a, where f is a linear function, solve equations by introducing a new variable and solve real world problems involving solving equations.
	The Area of a Triangle	At the end of this activity, students should be able to find the area of a triangle using the formula Area = (a*b*sin a)/2, find the area of a polygon and apply the relation between the area of a triangle and the radius of the inscribed circle.
	The Sine Rule	At the end of this activity, students should be able to find the sides of a triangle using the sine rule, find the angles of a triangle using the sine rule, understand the ambiguous case of the sine rule and apply the sine rule in real world problems.
	The Cosine Rule	At the end of this activity, students should be able to find the missing sides of a triangle using the cosine rule, find the angle of a triangle using the cosine rule and apply the cosine rule in real-world problems (bearings).
	Measuring the Circle	At the end of this activity, students should be able to find the length of an arc, find the area of a sector of a circle, find the area of a segment of a circle and apply the formulas for the length of an arc and the area of a sector in more complex problems.
XII. Exponents and Logarithms	**Exponential Functions**	At the end of this activity, students should be able to draw an exponential function, use properties of exponential functions, apply an exponential function in easy examples and match a transformed graph with a formula.
	Logarithms	At the end of this activity, students should be able to understand the notion of logarithms, change exponential form to logarithmic form, evaluate basic logarithms, apply laws of logarithms, change the base of a logarithm and rewrite logarithms as a single logarithm.
	Basic Exponential Equations	At the end of this activity, students should be able to solve basic exponential equations, use logarithms to solve exponential equations and apply appropriate techniques to solve real-world problems modelled by exponential equations.
	Exponential Inequalities	At the end of this activity, students should be able to solve basic exponential inequalities and use logarithms to solve exponential inequalities.
	The Natural Exponential Function	At the end of this activity, students should be able to recognize an exponential function with the base e, apply an exponential function f(x) = e^x in real-world situations and transform and apply an exponential function f(x) = e^x.

CHAPTER	LESSON	DESCRIPTION
	The Natural Logarithmic Function	At the end of this activity, students should be able to recognise the natural logarithmic function, state the domain and asymptote of a logarithmic function, find inverses of exponential and logarithmic functions and use the logarithmic function in solving problems.
	Exponential Growth and Decay	At the end of this activity, students should be able to model exponential growth, understand the logistic curve model of population growth, understand the process of radioactive decay and use the exponential curve in modelling real-world situations.
XIII. Differentiation (2)	**Derivatives of Powers with Rational Exponents**	At the end of this activity, students should be able to find the derivative of a power with a negative integer exponent, find the derivative of a root and find the derivative of a power with a rational exponent.
XIV. Integration (2)	**Integrals of Powers with Rational Exponent**	At the end of this activity, students should be able to understand and be able to use anti-derivatives and integrals, be able to use simple laws of integration and be able to calculate the indefinite integral of a polynomial.
	Approximation of the Area Under a Curve	At the end of this activity, students should be able to approximate a definite integral using the trapezium rule and approximate the area under a function graph using the trapezium rule.
XV. Functions	**Functions – Basic Notions**	At the end of this activity, students should be able to understand functional dependence, model simple phenomena using right functions, identify the domain of a function and understand the range, represent a simple function in various ways and understand and sketch the graph of a function.
	Composition of Functions	At the end of this activity, students should be able to understand composition of functions, calculate the value of a composite function for a given argument, find the formula for a composite function and identify the domain of a composite function.
	Inverse Functions	At the end of this activity, students should be able to state the existence of an inverse function and define it for a given function (simple cases) and sketch the graph of the inverse function, given the graph of the original function.
	The Absolute Value Function	At the end of this activity, students should be able to - understand the various meanings of the absolute value, understand how to use the absolute value in computations .- understand how to solve simple equalities and inequalities involving the absolute value.
	Transformation of Graphs	At the end of this activity, students should be able to fit the graph of a function to given data by altering the scale on the x or y-axis and by translating the graph along the x or y-axis and find an algebraic representation for the function modified to fit the required graph.
XVI. Trigonometry (2)	**Inverse Trigonometric Functions**	At the end of this activity, students should be able to graph inverses of basic trigonometric functions, list the properties of inverse functions and find an angle, given its trigonometric function.
	Other Trigonometric Functions	At the end of this activity, students should be able to sketch the graphs of the reciprocals of basic trigonometric functions, list the properties of reciprocal functions and graph simple transformations of reciprocal functions.
	Identities For Trigonometric Functions	At the end of this activity, students should be able to understand trigonometric identities introduced in the lesson, use the trigonometric identities to find unknown values of trigonometric functions and use trigonometric identities to prove simple new identities.

CHAPTER	LESSON	DESCRIPTION
	Trigonometric Functions of the Sum and Difference of Angles (1)	At the end of this activity, students should be able to understand the proof for the sine and cosine of the sum and difference of angles, prove trigonometric identities involving sum and difference formulas and use sum and difference formulas to find exact values of trigonometric functions.
	Trigonometric Functions of the Sum and Difference of Angles (2)	At the end of this activity, students should be able to understand the proof for the sum and difference of a linear combination of the sine and cosine, factorise the sum and difference of a linear combination of the sine and cosine and use the sum and difference formulas to solve problems.
	Double-Angle Formulas	At the end of this activity, students should be able to understand the proofs for double-angle formulas, use double-angle formulas to solve problems, rewrite sinA, cosA and tanA in terms of tan and use double-angle formulas to prove trigonometric identities.
XVII. Differentiation (3)	**Derivatives of Exponential and Logarithmic Functions**	At the end of this activity, students should be able to: find the derivative of the natural exponential function, find the derivative of the natural logarithmic function, find the derivative of linear combination of these functions.
	Derivatives of Trigonometric Functions	At the end of this activity, students should be able to find the derivatives of the sine and cosine functions, find the derivatives of the tangent and cotangent functions and find the derivative of a linear combination of trigonometric functions.
	Differentiation Rules (1)	At the end of this activity, students should be able to differentiate the sum and difference of two or more functions, differentiate the product of two functions and differentiate the quotient of two functions.
	Differentiation Rules (2)	At the end of this activity, students should be able to differentiate composite functions.
XVIII. Integration (3)	**Integration of Selected Functions**	At the end of this activity, students should be able to integrate the exponential function, integrate the function x^−1 and integrate the sine and cosine functions.
	Integration Methods (1)	At the end of this activity, students should be able to integrate by substitution and integrate by parts.
	Integration Methods (2)	At the end of this activity, students should be able to calculate the definite integral by substitution and calculate the definite integral by parts.
	Volumes of Revolution	At the end of this activity, students should be able to recognise a solid of revolution, find the volume of a solid of revolution and use the formula for the volume of a cone, the frustum of a cone, a sphere and a one-base segment of a sphere.
XIX. Numerical Methods	**Zeros of a Function**	At the end of this activity, students should be able to find the number of zeros of a function, find intervals with zeros of a function and approximate zeros of a function.
	Approximate Solution of Equations	At the end of this activity, students should be able to use the secant method to find an approximate solution of an equation and use Newton's method to find an approximate solution of an equation.
	Numerical Integration – Mid-Ordinate Rule	At the end of this activity, students should be able to approximate the area under a curve using the mid-ordinate method.

CHAPTER	LESSON	DESCRIPTION
	Numerical Integration – Simpson's Rule	At the end of this activity, students should be able to use Simpson's rule to find the definite integral of a given function.
XX. Rational Functions	**Rational Expressions**	At the end of this activity, students should be able to recognize rational expressions and simplify rational expressions.
	Rational Functions	At the end of this activity, students should be able to recognize rational functions, define the domain of a rational function, find asymptotes of a rational function and recognize graphs of simple rational functions.
	Algebraic Division	At the end of this activity, students should be able to divide one polynomial by another, with a remainder and use the algorithm of polynomial division in various situations.
	Partial Fractions	At the end of this activity, students should be able to recognise partial fractions and decompose a rational expression into partial fractions.
XXI. Coordinate Geometry (2)	**Equations of Curves**	At the end of this activity, students should be able to sketch a curve, given its equation, understand the relationship between an equation and a curve in the coordinate system and recognise a basic curve from its equation.
	Parametric Equations of Curves	At the end of this activity, students should be able to understand parametric equations of curves and find parametric equations of simple common curves
XXII. Differentiation and Integration	**Differential Equations**	At the end of this activity, students should be able to understand the notion of a differential equation, understand the notion of the solution of a differential equation, understand the notion of initial conditions, solve simple differential equations by inspection and solve the simplest differential equations.
	Equations with Separable Variables	At the end of this activity, students should be able to solve linear homogeneous differential equations, solve differential equations with separable variables and find particular solutions of simple differential equations.
	Implicit Differentiation	At the end of this activity, students should be able to: understand the notion of an implicit function, understand the notion of the derivative of an implicit function, differentiate implicit functions.
	Parametric Differentiation	At the end of this activity, students should be able to understand the notion of a parametrically defined function, understand the notion of the derivative of a parametrically defined function and differentiate parametrically defined functions
	Tangents and Normals for Implicitly or Parametrically Defined Curves	At the end of this activity, students should be able to understand the notion of a tangent and a normal to a curve, find the equation of the tangent to a given curve at a given point and find the equation of the normal to a given curve at a given point.
	Integration Using Partial Fractions	At the end of this activity, students should be able to integrate rational functions.
XXIII. Vectors	**Vectors**	At the end of this lesson you should be able to recognize quantities that can be represented by vectors, represent a given vector on the plane or in space in the form of a pair or a trio of numbers and find the magnitude of a given vector on the plane or in space.

CHAPTER	LESSON	DESCRIPTION
	Algebraic Operations on Vectors	At the end of this activity, students should be able to perform vector addition, perform multiplication of a vector by a scalar and apply algebraic operations on vectors to geometry.
	Position Vectors	At the end of this activity, students should be able to understand and use the notion of a position vector, describe the location of points, using vectors and use position vectors to express the basic geometric properties of points and segments in the coordinate system.
	Vector Equations of Lines in 2-D	At the end of this activity, students should be able to represent a line on the plane by its vector equation and transform the vector equation of a straight line into Cartesian form and vice versa.
	Vector Equations of Lines in 3-D	At the end of this activity, students should be able to present a line in space in the form of a vector equation, transform the vector equation of a straight line in 3-D to the Cartesian form and find the intersection points of two lines given in the form of vector equations.
	The Scalar Product (1)	At the end of this activity, students should be able to understand the notion of the scalar product of two vectors and find the scalar product of two vectors in 2-D or 3-D.
	The Scalar Product (2)	At the end of this activity, students should be able to use the scalar product to solve geometrical problems.
	Perpendicular Distance from a Point to a Line	At the end of this activity, students should be able to find the perpendicular distance from a point to a line.