Annual Plan for 12th Standard – NIOS Mathematics (2020-21)

The NIOS 12th syllabus is spread over two years: the 11th and 12th grades.

Topic	Objectives	Month
Common Objectives	- Identify common real-world use-cases to understand the application of topics covered - Understand the language of mathematics as a means to succinctly express multiple, often complex, situations - Understand the overlap with various ideas and topics in Physics and effectively apply mathematical methods and ideas in Physics	June - February
Module VI – Algebra - II Chapter 20 : Matrices	- Understand the representation of data in the form of a matrix and identify various types of matrices - Perform simple operations on matrices: addition, subtraction and multiplication - Find the inverse of a matrix using elementary transformations	May
Chapter 21: Determinants	- Calculate the determinant of a given square matrix - Evaluate determinants using their properties - Apply determinants and their properties in solving certain geometrical problems	June
Chapter 22: Inverse of a Matrix & its Applications	- Find the inverse of a matrix using determinants - Solve a system of linear equations using matrices	June
Module VII – Relations and Functions Chapter 23: Relations and Functions - II	- Briefly revisit the definition and properties of relations and functions* - Understand and identify different types of relations - Understand and identify different types of functions - Identify functions from their graphical representation* - Revisit composite functions $fog(x) = f(g(x))$* - Find the inverse of a function $f^{-1}(x)$ * - Understand the definition of a Binary operation and determine if a given operation is binary	June
Chapter 24: Inverse Trigonometric Functions	- Understand the meaning of inverse trigonometric functions and define their domain and range - Learn various properties of inverse trigonometric functions and use these properties to evaluate, simplify and prove equations involving these functions	June
Module VIII – Calculus *Chapter 25: Limits and Continuity Chapter 26: Differentiation	- Briefly review the concepts of: (a) a limiting value of a function at a point and (b) continuity of a function* - Understand the meaning of derivative of a function f(x) at a point x= a, both algebraically and geometrically - Find the derivative of some simple functions from first principle/ab-initio/delta method - Find the derivative of complex functions using the sum, difference, product, quotient and chain rules	July

	• Understand the meaning of a second derivative and compute the second derivative of a given function	
Chapter 27: Differentiation of Trigonometric Functions	• Find the derivative of basic trigonometric and inverse trigonometric functions from first principle/ab-initio/delta method • Find the derivative of complex trigonometric and inverse trigonometric functions using the sum, difference, product, quotient and chain rules • Compute the second derivative of a given trigonometric/inverse trigonometric function	July
Chapter 28: Differentiation of Exponential and Logarithmic Functions	• Find the derivative of basic exponential and logarithmic functions from first principle/ab-initio/delta method • Find the derivative of complex exponential and logarithmic trigonometric functions using the sum, difference, product, quotient and chain rules • Compute the second derivative of a given exponential/logarithmic function • Find the first and second order derivatives of parametric functions	July, August

Chapter 29: Applications of Derivatives	Use derivatives to calculate:
	• The rate of change of various real-life quantities
	• Approximate error margins
	• The slope of a curve at a point; the equation of a tangent and normal to the curve at a given point
	• Maxima/minima for real-life problems (e.g. maximise profit, minimise wastage, etc.)
	    ○ Understand and verify Rolle's and Langrange's Theorems on a given function in the specified interval
	    ○ Use the sign of a derivative to determine the intervals where a function is increasing/decreasing
	    ○ Use first and second derivatives to determine location and value of local maxima/minima of a function
		August

Chapter 30: Integration Chapter 31: Definite Integrals	• Understand that integration is an inverse operation of differentiation • Learn properties and techniques of integration to integrate various expressions • Geometrically understand the concept of a definite integral as a limit of a summation • Learn properties and techniques to evaluate definite integrals • Use definite integrals to find the area bounded by given curves	September
Chapter 32: Differential Equations	• Understand the definition and use of a differential equation • Form a differential equation from a given situation • Solve simple differential equations	September, October
Module IX: Vectors and Three-Dimensional Geometry *Chapter 33: Introduction to Three-Dimensional Geometry	• Extend the idea of coordinates of a point in 2-D space (x,y) to 3-D space (x, y, z) • Find the distance between the given two points in 3-D space • Find the point in 3-D space that divides a given line in a specific ratio (externally or internally)	October

* Chapter 34: Vectors	• Understand the difference between a scalar and vector quantity and represent a vector quantity using appropriate symbols • Define and identify different types of vectors • Find the sum (resultant), difference and product (scalar, scalar triple and vector product) of two vectors • Determine collinearity and coplanarity of given vectors • Resolve a vector into its three components in 3-D space • Extend the section formula to vectors in 3-D space • Understand and calculate the direction cosines and direction ratios of a vector	October
Chapter 35: Plane	• Identify and represent a plane in 3-D space by an equation in different forms • Find the angle between two given planes • Find the distance of a point from a given plane	November
Chapter 36: Straight Lines	• Identify and represent a line in 3-D space by an equation in different forms • Find the distance of a point from a given line • Find the angle between a line and a plane • Determine coplanarity of given lines	December
Module X: Linear Programming & Mathematical Reasoning *Chapter 37: Linear Programming	• Revisit graphing of linear inequalities • Model a given commercial problem as a system of linear inequalities • Graph the linear inequalities to identify a feasible region where all the given constraints are satisfied • Identify the solution of the commercial problem by evaluating the vertices of the feasible region	December, January
Chapter 38: Mathematical Reasoning	• Justify if a given sentence is a mathematical statement or not • Negate a given statement • Identify component statements in a compound statement • Work with statements with different types of implications • Formally validate a given mathematical statement	January
Revision + Buffer	• Work out past question papers • Buffer time for catch up	February, March

*Self-learning – students will be encouraged to work on these topics on their own. Chapter-end problems will be solved together in class to ensure clear understanding of the topic. Students will be expected to submit their work for these chapters and write tests, just like the other chapters

References:

• NIOS Senior Secondary Mathematics (311) Textbooks (I and II) – downloaded from the NIOS website
• A-level Mathematics textbooks