Title of the Course: Applied Mathematics

Programme: B.Sc. (Information Technology) Semester III

Syllabus for 4 credit Course from the academic year- 2024-2025

Sr. No.	Heading	Particulars
1	**Description of the course:**	This course covers foundational topics in mathematics, including matrices, complex numbers, differential equations, Laplace transforms, and special functions like Beta and Gamma functions, aiming to equip students with essential mathematical tools for various scientific and engineering applications.
2	**Vertical :**	Minor
3	**Type :**	Theory
4	**Credit**:	4 credits
5	**Hours Allotted :**	60 Hours
6	**Marks Allotted**:	100 Marks Continuous Evaluation: 40 Marks Semester End: 60 Marks
7	**Course Objectives**: ● To understand the fundamental concepts and properties of matrices and complex numbers, enabling students to solve linear systems and represent complex quantities effectively. ● To develop proficiency in solving differential equations of various types, including first-order, linear with constant coefficients, and those reducible to such forms, employing both analytical and methodical approaches. ● To familiarize students with the Laplace transform technique for solving differential equations, emphasizing its applications in engineering and physics.	
8	**Course Outcomes**: ● Students will be able to apply matrix operations, determine ranks, and perform elementary transformations, along with comprehending the geometric interpretation of complex numbers on the Argand plane. ● They will demonstrate the ability to solve diverse types of differential equations, including those with constant coefficients, using techniques like separation of variables, integrating factors, and Laplace transforms. ● By the end of the course, students will have the skills to employ Laplace transforms effectively in solving ordinary differential equations with constant coefficients and simultaneous differential equations, as well as applying special functions like Beta and Gamma functions in problem-solving contexts.	
9	**Module 1: MATRICES AND COMPLEX NUMBER**	
	● Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values. ● Complex number, Equality of complex numbers, Graphical representation of complex number (Argand's Diagram), Polar form of complex numbers, Polar form of x+iy for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles.	
	Module 2: DIFFERENTIAL EQUATIONS	

	● Separation of variables, Equations homogeneous in x and y, non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution. ● Introduction, The Differential Operator, Linear Differential Equation f(D) y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.
	Module 3: LAPLACE TRANSFORM AND INVERSE
	● Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives. ● Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations
	Module 4: FUNCTIONS & DUIS
	● Beta and Gamma Functions – Definitions, Properties and Problems. Duplication formula. ● Differentiation Under the Integral Sign, Error Functions.

Reference Books:

Author /sP. N. Wartikar ,**Title:**A text book of Applied Mathematics Vol I,**Publisher**. N. Wartikar , Pune Vidyathi Graha

Author/S:P. N. Wartikar and J. N. Wartikar **Title:**Applied Mathematics II, ,**Publisher:** Pune Vidyathi Graha

Internal Continuous Assessment: 40%	**Semester End Examination : 60%**
Continuous Evaluation through:	Practical Assessment

Format of Question Paper:

Scheme of Evaluation Pattern
Table 1A: Scheme of Continuous Evaluation (CE/Practical)
Scheme of Evaluation Pattern

Sub-components	aximum Marks	Conditions for passing
1) Practical exam	30	a) A learner must be present for each of the sub-components.
2) Journal and Viva	10	
Total	40	

Table 1B: Scheme of Semester End Examination (SEE) Evaluation
Question Paper Pattern for Semester End Examination (SEE)

Maximum Marks: 60 **Duration: 2 Hrs.**

Note: All questions are compulsory. Each question has an internal choice.

Question Number		Nature of Questions	Maximum Marks
1)		**Attempt any 3**	
	a)		15
	b)		
	c)		
	d)		
	e)		
2)		**Attempt any 3**	15
	a)		
	b)		
	c)		
	d)		
	e)		
3)		**Attempt any 3**	15
	a)		
	b)		
	c)		
	d)		
	e)		
4)		**Attempt any 3**	15
	a)		
	b)		
	c)		
	d)		
	e)		