Course Code	21MAB206T	Course Name	Numerical Methods and Analysis	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	21MAB102T	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR)	*The purpose of learning this course is to:*	Learning
CLR-1:	*Understand the methodologies to solve algebraic and transcendental equations.*	
CLR-2:	*Gain knowledge on interpolating and extrapolating methods in various intervals in real life.*	
CLR-3:	*Understand the concept of numerical differentiation and integration.*	
CLR-4:	*Solve initial and boundary value problems in differential equations using numerical methods.*	
CLR-5:	*Solve initial and boundary value problems in partial differential equations using numerical methods.*	

Course Outcomes (CO):	*At the end of this course, learners will be able to:*	*Blooms Level (1-6)*	Program Outcomes (PO)											
			1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
			Engineering Knowledge	*Problem Analysis*	*Design & Development*	*Analysis, Design, Research*	*Modern Tool Usage*	*Society & Culture*	*Environment & Sustainability*	*Ethics*	*Individual & Team Work*	*Communication*	*Project Mgt. & Finance*	*Life Long Learning*
CO-1:	*Obtain numerical solutions to algebraic and transcendental equations.*	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-	-
CO-2:	*Learn about various interpolating and extrapolating methods.*	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-	-
CO-3:	*Compute numerical differentiation and Integration.*	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-	-
CO-4:	*Interpret initial and final value problems in differential equations.*	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-	-
CO-5:	*Interpret initial and boundary value problems in partial differential equations.*	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-	-

Unit-1: Numerical solutions of Algebraic and Transcendental Equations

Numerical Solution of Algebraic and Transcendental equation−Iteration Method, Bisection Method, Method of False Position, Newton-Raphson method and it's rate of convergence; Solving System of Simultaneous Linear Algebraic Equations − Gauss Elimination Method, Gauss Jordon Method, Jacobi Method, Gauss-Seidel Method.

Unit-2: Finite Differences and Interpolation

Introduction to Finite Differences−Forward and Backward Differences, Relation Between Operators, Differences of a polynomial−Factorial Polynomial, Newton's interpolation−Newton's forward and Backward Interpolation for Equal Intervals; Divided Differences and Properties, Interpolation with Unequal Intervals− Newton's Divided Difference Interpolation, Lagrange's Interpolation, Inverse Lagrange's Interpolation.

Unit-3: Numerical Differentiation and Integration

Numerical Differentiation−Newton's Forward and Backward Difference Formulae to Compute First and Higher Order Derivatives, Numerical Integration- Trapezoidal Rule, Simpson's One-Third Rule, Simpson's Three Eight Rule. Applications of Trapezoidal Rule, Applications of Simpson's One-Third Rule, Simpson's Three Eight Rule,

Unit-4: Numerical Solution of Ordinary Differential Equations

Taylor Series Method, Euler's Method and it's rate of convergence, Improved Euler's Method, Modified Euler's method, Runge-Kutta Second-Order Method, Runge-Kutta Fourth Order Method and their order of convergence.

Unit-5: Numerical solutions of Partial Differential Equations

Classification of Second-Order Partial Differential Equations, Elliptic Equations-Finite Difference Scheme, Standard Five Point Finite Difference Formula, Diagonal Five Point Finite Difference Formula, Liebman's Iterative Process, Solution of Laplace Equations by Liebman's Iterative process, Solution of Poisson Equation, One Dimensional Parabolic Equation− Bender-Schmidt Scheme, Crank-Nicholson scheme

Learning Resources	1. Brian Bradie, A Friendly Introduction to Numerical Analysis. Pearson. (2006) 2. D. R. Kincaid, E.W. Cheney, Numerical Analysis Mathematics of Scientific Computing, The University of Texas at Austin. Brooks/Cole Publishing Company, (1991). 3. C. F. Gerald & P. O. Wheatley. Applied Numerical Analysis (7th edition), Pearson Education, India, (2008) 4. F. B. Hildebrand Introduction to Numerical Analysis: (2nd edition). Dover, (2013). 5. M. K. Jain, S. R. K. Iyengar & R. K. Jain, Numerical Methods for Scientific and Engineering Computation (6th edition). New Age International Publishers Publications. (2012). 6. P. Kandasamy , K. Thilagavathy & G. Gunawathy, Numerical Methods, S.Chand & Sons, 3rd Revised Edition, 2013.

Studentlearningshallbeassessedwithaweightageof60%forinternalassessmentand40%forendsemesterexamination

	Bloom's Level of Thinking	**Continuous Learning Assessment(CLA) -By the Course Faculty**				**By The CoE**	
		Formative CLA-1 Average of unit test (50%)		**LifeLongLearning** CLA-2(10%)		**Summative** Final Examination (40%weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level1	Remember	20%	-	20%	-	20%	-
Level2	Understand	20%	-	20%	-	20%	-
Level3	Apply	30%	-	30%	-	30%	-
Level4	Analyze	30%	-	30%	-	30%	-
Level5	Evaluate	-	-	-	-	-	-
Level6	Create	-	-	-	-	-	-
	Total	100%		100%		100%	

Course Designers		
a) Experts from Industry	**b) Experts from Higher Technical Institutions**	**c) Internal Experts**
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COURSE COORDINATOR
(Dr. P. Sambath)

HOD/MATHEMATICS
(Dr. V. Subburayan)

Test Schedule:

S. No	Test	Date
1	CLAT-1	08.08.2023
2	CLAT-2	27.09.2023
3	CLAT-3	06.11.2023
4	Assignment-I	20.09.2023
5	Assignment-II	02.11.2023