

 VIT[®] BHOPAL <small>www.vitbhopal.ac.in</small>	Applied Numerical Methods										Course Type		LT		
Course Code :	MAT2003										Credits		3		
Prerequisite:	Basics of Engineering Mathematics														
Course Objectives:															
This course attempts to cover certain basic and important numerical methods as computational tools for analyzing problems that arise in engineering and physical sciences. Students are expected to use MATLAB as the primary computer language for verification of the solutions to a few assigned problems.															
Course Outcomes (CO):															
Students will be able to															
CO1. Apply numerical methods to solve linear equations. KL3															
CO2. Apply numerical methods to solve nonlinear equations. KL3															
CO3. Analyze the problems connected with data analysis using numerical methods and concepts. KL4															
CO4. Apply numerical differentiation and integration in real time problem solving. KL3															
CO5. Solve the ordinary and partial differential equations of their respective domains. KL3															
Correlation of COs with POs															
CO \ PO	CKL	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PKL		3	5	6	5	6				NA	M	3	M	3	3
CO1	3	3	2	2	2	2				0	2				
CO2	3	3	2	2	2	2				0	2				
CO3	4	3	3	2	3	2				0	2				
CO4	3	3	2	2	2	2				0	2				
CO5	3	3	2	2	2	2				0	2				
CO	Topics to be discussed													Lecture	
CO1	Gauss-Elimination – Thomas Algorithm for tridiagonal linear system of equations - Gauss-Seidel iteration method - Diagonal dominance and convergence of Gauss-Seidel iteration method													4	
CO2	Introduction to Direct and Iterative methods – (Fixed point) Iteration method - order and condition of convergence - Secant and Newton-Raphson methods for simple roots – Rates of convergence													4	
CO3	Finite difference operators: Forward, Backward, Central, Average, Shift and Differential – Relation between these difference operators – Interpolation - Newton’s forward and backward Interpolations — Lagrange Interpolation - Newton’s Divided Difference Interpolation - Cubic spline interpolation for a tabulated function with equally spaced data													6	
CO4	Derivatives using Newton’s Forward and Backward interpolations – Newton-Cotes Quadrature rule - Trapezoidal rule, Simpson’s 1/3 and 3/8 rules – Gaussian Quadrature rule - Two point and three point Gauss-Legendre quadrature rules – composite quadrature rules - Romberg method													6	
CO5	First order initial value problems - Taylor’s Series method - Euler’s method - Modified Euler’s method - Runge–Kutta method of fourth order - Adams-Bashforth													10	

	predictor-corrector method - Finite difference method for second order boundary value problems Classification of second order linear partial differential equations – Finite difference method – Explicit and Implicit methods - Schmidt and Crank-Nicolson methods for 1-D heat equation – Explicit method for 1-D wave equation – Liebmann’s iteration method for 2-D Laplace and Poisson equations	
	Total Lecture: (1 Lecture = 1.5 Hrs.)	30
Text books:		
1.	Numerical methods for scientific and Engineering by M. K. Jain, S. R. K. Iyengar and R. K. Jain,, New Age International Ltd., 5th Edition, 2010.	
2.	Applied Numerical Methods with MATLAB for Engineering and Scientists by Steven C. Chapra, Tata McGraw-Hill Companies, Second edition, 2008.	
Reference Books, Web reference:		
1	Introductory Methods of Numerical Analysis by S. S. Sastry, , PHI Pvt Ltd, 5th Edition, New Delhi, 2009.	
2	Applied Numerical Methods Using MATLAB by W.Y. Yang, W. Cao, T.S. Chung and J. Morris, Wiley India Edition, 2007.	
3	Numerical Methods for Scientists and Engineers by K. Sankara Rao, PHI Learning Pvt. Ltd., 3 rd Edition, New Delhi, 2012.	
4	Numerical methods in engineering and science: with programs in C, C++ and MATLAB by B.S. Grewal and J.S. Grewal, 10 th edition, Khanna Publishers, 2014.	
Recommendation by the Board of Studies on		22-04-2017
Approval by Academic council on:		
Compiled by:		Dr.V.Prabhakar & Dr.C.Vijayalakshmi

*KL – Revised Blooms Knowledge Level (Cognitive Domain)