



# GUJARAT TECHNOLOGICAL UNIVERSITY

Integrated M.Sc. (Computer Science)

Semester: III

Subject Name: Numerical Methods

Subject Code: 1330305

## Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

## Content:

Sr. No.	Content	Teaching Hours	Module Weightage (%)
1.	<b>Approximations and Errors:</b> Significant figures, accuracy and precision, Errors, round-off and truncation errors, error propagation. <b>Roots of Equations:</b> Mathematical background, Bisection, RegulaFalsi, NR method, Secant, Successive approximation method, Budan's Theorem, Barristow's method, case studies.	8	15
2.	<b>Interpolation:</b> Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation method, Inverse Interpolation, Newton's Divided Difference Interpolation, Error Estimates, Cubic Spline Interpolation.	10	25
3.	<b>Numerical Integration:</b> Newton-Cotes integration formulas; trapezoidal rule and Simpson's rules, case studies. <b>Numerical Differentiation:</b> Using Newton's Forward Difference, Newton's Backward Difference, Newton's Divided Difference for both tabulated and un-tabulated points (First and Second Order Differentiation only)	8	20
4.	<b>Ordinary differential equations:</b> Taylor Series method, Euler's method, Modified Euler's method, Picard's method, Runge - Kutta method of order two, Runge -Kutta method of order Four, Milne and Adam's Predictor-Corrector Methods.	8	20
5.	<b>Curve Fitting:</b> Least Square method, Curve Fitting of Linear, quadratic and exponential curves. <b>Systems of linear equations:</b> Mathematical background, matrix inversion, Gauss elimination; pitfalls and techniques for improvement, Gauss Jacobi and Gauss-Seidel methods.	6	15

## Reference Books:

1. Steven C Chapra, Raymond P Canale, "Numerical Methods for Engineers", 5<sup>th</sup> Edition, Tata McGraw Hill Publication, Special Indian Edition.
2. Dr. N Datta, "Computer Oriented Numerical Methods", Vikas Publication.
3. Introduction to Numerical Analysis, S. S. Sastry, PHI Publication.
4. Numerical Methods in Science & Engineering Program, Dr. B. S. Grewal, Khanna Publication.
5. Computer Oriented Numerical Methods, R. S. Salaria, Khanna Publisher.



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## Course Outcome:

After learning the course, the students should be able to:

No.	CO statement
CO-1	Apply Mathematical Modelling and for Engineering Problem Solving.
CO-2	Solve Mathematical Equations by various methods.
CO-3	Solve system of linear equations.
CO-4	Find Best Curve fitting for given data.
CO-5	Apply Numerical Integration.
CO-6	Solve Differential Equations.

