



# Marwadi University

## Bachelor of Computer Application

### Semester III

**Subject Code: 05BC0301**

**Subject Name: Foundation of Mathematics-III (Computer Oriented Numerical Methods)**

**Learning Objectives:**

- With the current deployment of computer technology and tools, it is very important to develop efficient algorithms for solving in science, engineering, technology, insurance and banking.
- Thus, the objective of this course is to enable students to obtain an intuitive and working Understanding of numerical methods for the basic problems of numerical analysis and gain an experience in the implementation of numerical methods using a computer.
- They would also gain an appreciation of the concept of error handling in these methods and need to analyze and predict it.

**Prerequisites:**

- Basic knowledge of Functions, Matrix, Differentiation & Integration.

**Course Content:**

Sr. No.	Course Content	Hours
1	<p><b>FLOATING-POINT ARITHMETIC:</b></p> <ul style="list-style-type: none"> <li>• Addition Operation</li> <li>• Subtraction Operation</li> <li>• Multiplication Operation</li> <li>• Division Operation</li> </ul> <p><b>ERRORS:</b></p> <ul style="list-style-type: none"> <li>• Data Errors</li> <li>• Truncation Errors</li> <li>• Round-off Errors</li> <li>• Computational Errors</li> </ul> <p><b>MEASURES OF ACCURACY:</b></p> <ul style="list-style-type: none"> <li>• Absolute Error</li> <li>• Relative Error</li> </ul>	<b>04</b>
2	<p><b>ITERATIVE METHODS FOR FINDING ROOTS:</b></p> <ul style="list-style-type: none"> <li>• Bisection Method</li> <li>• False Position Method</li> <li>• Secant Method</li> <li>• Method of Successive Approximation</li> </ul> <p style="margin-left: 400px;">} Discuss convergence only without derivation</p>	<b>07</b>
3	<p><b>INTERPOLATION AND APPROXIMATION:</b></p> <ul style="list-style-type: none"> <li>• <b>Polynomial interpolation :</b> <ul style="list-style-type: none"> <li>○ Lagrangian Interpolation, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Newton's Divided Difference Interpolation</li> </ul> </li> <li>• <b>Approximation :</b> <ul style="list-style-type: none"> <li>○ Least Square Curve Fitting, Linear Regression and Non</li> </ul> </li> </ul>	<b>12</b>



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	linear(Fitting Straight line, Polynomial, Geometric Curve, Exponential Curve, Hyperbola)	
4	<b>NUMERICAL DIFFERENTIATION &amp; INTEGRATION:</b> <ul style="list-style-type: none"><li>• <b>Differentiation :</b><ul style="list-style-type: none"><li>○ Using Newton's Forward Difference, Newton's Backward Difference, Newton's Divided Difference (First Order Differentiation only)</li></ul></li><li>• <b>Integration :</b><ul style="list-style-type: none"><li>○ Using Trapezoidal rule, Simpson's 1/3 &amp; Simpson's 3/8 rules</li></ul></li></ul>	12
5	<b>MATRIX AND SOLUTION OF SIMULTANEOUS LINEAR &amp; DIFFERENTIAL EQUATIONS:</b> <ul style="list-style-type: none"><li>• <b>Matrix:</b><ul style="list-style-type: none"><li>○ Eigen values and Eigen vectors of a matrix.</li></ul></li><li>• <b>Solution of Simultaneous Linear Equations:</b><ul style="list-style-type: none"><li>○ Gauss Elimination method, Gauss-Jordan method, Gauss-Seidel Method, Jacobi's method</li></ul></li><li>• <b>Solution of Ordinary Differential Equations :</b><ul style="list-style-type: none"><li>○ Runge-Kutta 2<sup>nd</sup> Order and 4<sup>th</sup> Order methods,</li></ul></li><li>• <b>Predictor-Corrector Methods :</b><ul style="list-style-type: none"><li>○ Milne Simpson and Adam's Moulton methods</li></ul></li></ul>	13

#### Text Book(s):

1. "Computer Oriented Numerical Methods" by R. S. Salaria, Khanna Publisher.

#### Reference Book(s):

1. T Veerarajan, T Ramachandran, "Numerical Methods with Programs in C", 2<sup>nd</sup> Edition, Tata McGraw Hill Publication
2. V. Rajaraman, "Numerical Methods", 3<sup>rd</sup> Edition, Prentice-Hall India Pvt. Ltd.
3. R M Somasundaram, R M Chandrasekaran, "Numerical Methods with C++ Programming", Prentice-Hall India Pvt. Ltd.
4. C F Gerald, P O Wheatley, "Applied Numerical Analysis", 7<sup>th</sup> Edition, Pearson Education Asia, New Delhi
5. Atkinson, Han, "Elementary Numerical Analysis", Wiley India Edition
6. Dr. V N Vedamurthy, Dr. N. Ch. S N Iyengar, "Numerical Methods", Vikas Publication
7. Richard L Burden, J Douglas Faires, "Numerical Analysis", Cengage Publication
8. Srimanta Pal, "Numerical Methods", Oxford University Press



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#### CHAPTER WISE COVERAGE FROM TEXT BOOK:

UNIT	CHAPTER	TOPICS/SUBTOPICS
1	2	2.5, 2.7, 2.8
2	3	3.6, 3.7, 3.8, 3.10
3	6	6.4, 6.5, 6.6(6.6.1 to 6.6.3), 6.7(6.7.1 to 6.7.3), 6.8
	7	7.1 to 7.5, 7.6(7.6.1 to 7.6.3)
4	8	8.1 to 8.3
	9	9.2(9.2.1, 9.2.2, 9.2.3)
5	4	4.16
	5	5.1, 5.2, 5.3, 5.4(5.4.1 & 5.4.2), 5.5, 5.6
	10	10.8, 10.9(10.9.2 & 10.9.3)