

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN MATHEMATICS
SYLLABUS WITH EFFECT FROM 2020-2021

BMA-CSA05

ALLIED: CALCULUS OF FINITE DIFFERENCES
AND NUMERICAL ANALYSIS-II
(Common to B.Sc. Maths with Computer Applications)

Learning outcomes:

Students will acquire knowledge about

- Numerical techniques used as powerful tools in scientific computing.
- Numerical Differentiation, Numerical Integration and Difference Equations.

UNIT I

Numerical Differentiation: Derivatives using Newton's forward and backward difference formulae-Derivatives using Stirling's formula- Derivatives using divided difference formula- Maxima and Minima using the above formulae.

Chapter 7 :Section 7.1- 7.4, 7.6.

UNIT II

Numerical Integration: General Quadrature formula- Trapezoidal rule-Simpson's one-third rule- Simpson's three-eighth rule- Weddle's rule- Euler-Maclaurin Summation formula- Stirling's formula for $n!$. - Chapter 7 :Section 7.7- 7.9, 7.13- 7.15.

UNIT III

Difference equations:Linear homogenous and nonhomogenous difference equation with constant coefficients- particular integrals for $a^u x^m, x^m, \sin kx, \cos kx$.

Chapter 8 :Section 8.1- 8.4, 8.6

UNIT IV

Numerical solution of Ordinary Differential Equations (I order only):

Taylor's series method- Picard's method- Euler's method- Modified Euler's method.

Chapter 9: Section 9.5-9.7, 9.9.

UNIT V

Numerical solution of Ordinary Differential Equations (I order only):

Runge-kuttamethod(fourth order only)- Predictor-Corrector method- Milne's method - Adams-Bashforth method.

Chapter 9 : Section 9.10 - 9.14.

Content and Treatment as in

“Calculus of Finite Differences and Numerical Analysis” by P. Kandasamy and K. Thilagavathy, S. Chand and Co. Pvt.Ltd.

Reference:

- 1) “Numerical Analysis “ by B. D. Gupta, Konark Publishing.
- 2) “Numerical methods in Science and Engineering” by M. K. Venkataraman, National Publishing House, Chennai.

e-Resources:

1. <https://nptel.ac.in>
2. https://www.encyclopediaofmath.org/index.php/Finite-difference_calculus