Course No	Course Name	L-T-P-Credits
MA 409	NUMERICAL ANALYSIS	3-0-0: 3

Prerequisite: NIL

Course Objectives: The objective of the course is to provide a theoretical understanding of some numerical methods/techniques which will be helpful in solving several mathematical problems occurred in real world situation.

Course Outcomes: Upon successful completion of the course, students will be able to:

1. Solve systems of linear equations using iterative methods.
2. Obtain approximate root(s) of algebraic and transcendental equations.
3. Construct a polynomial for a given set of data using interpolation.
4. Evaluate integrals using numerical integration formulae.
5. Solve initial value problems using single and multi-step methods.

SYLLABUS

Module	Contents	Hours
I	**Systems of Linear Equations:** Gaussian elimination, pivoting strategies, vector and matrix norms, error estimates and condition number; iterative techniques for linear systems: Jacobi, Gauss Seidel.	8
II	**Iterative Method for Non-Linear Equations:** Bisection method, fixed point iteration schemes, Newton's method, secant method.	6
III	**Interpolation:** Polynomial interpolation-Lagrange and Newton's divided difference; piecewise interpolation.	8
IV	**Numerical Integration:** Newton-Cotes quadrature formulas, composite Newton-Cotes quadrature formulas, Gaussian quadrature formulas.	6
V	**Numerical Solution of IVPs:** Single step methods, multi-step methods.	8

Essential Readings:

1. K. E. Atkinson, "*An Introduction to Numerical Analysis*" John Wiley & Sons, 2nd edition, 1989.
2. M. K. Jain, S. R. K. Iyengar, and R. K. Jain, "*Numerical Methods for Scientific and Engineering Computation*", New Age International, 6th edition, 2012.

Supplementary Readings:

1. B. Bradie, "*A Friendly Introduction to Numerical Analysis*", Pearson Prentice Hall, 1st edition, 2007.
2. D. Kincaid and W. Cheney, "*Numerical Analysis: Mathematics of Scientific Computing*", AMS, 3rd edition, 2010.
3. G. M. Phillips and P. J. Taylor, "*Theory and Applications of Numerical Analysis*", Academic Press, 2nd edition, 1996.