Devi Ahilya University, Indore, India Institute of Engineering & Technology				MSc – I Year (Applied Mathematics) with Specialization in Computing & Informatics Semester- 1			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
AM1PC3: Numerical Analysis / Integral Equations	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Objective: Study of algorithms and techniques that use numerical approximation for the problems of mathematical analysis. Study Integral equations which are important in many applications such as radiative energy transfer and the oscillation of a string, membrane, or axle.
Prerequisite(s): NIL

COURSE OF CONTENTS

UNIT I
Errors and Approximation: Representation of integers and fractions, fixed point and floating point arithmetic, error propagation, loss of significance, condition and instability, computational method of error propagation. Solution of Nonlinear Equations: Iterative methods of 2^{nd} degree- Muller's method, Chebyshev's method, multi-point method, modified secant and Newton Raphson method, Methods for multiple roots, convergence of methods.

UNIT II
Solution of Linear Systems: Elimination with and without pivoting, triangular factorization, error and residual of an approximate solution. Backward errors and iterative improvement, relaxation method. Polynomial Interpolation: Existence and uniqueness of interpolation polynomial, error of the interpolating polynomial, Interpolation using differences, spline interpolation, hermite interpolation, piecewise interpolation, approximations.

UNIT III
Extrapolation methods, Numerical differentiation, Numerical Integration: Newton Cote's integration methods, Gaussian integration methods, composite integration methods, Romberg Integration, double integration. Solution of ODEs: Initial and boundary value problems, difference equations, Routh Hurwitz criterion, single step method, Multistep method, Predicator-Corrector methods, Stability analysis, Shooting methods and finite difference methods.

UNIT IV
Integral Equations: Preliminary concepts, formulation of integral equations, and classification of linear integral equations. Integral differential equations, conversions of ordinary differential equations to integral equations, finite difference approximations. Volterra Integral Equations: Basic concepts - Relationship between Linear differential equations and Volterra integral equations - Resolvent Kernel of Volterra Integral equation - Solution of Integral equations by Resolvent Kernel - The Method of successive approximations - Convolution type equations.

UNIT V
Fredholm Integral equations: Fredholm equations of the second kind, Fundamentals – Method of successive approximations, Constructing the resolvent Kernel with the aid of iterated Kernels, recurrence relation and determinant method - Integral equations with degenerate Kernels, eigen numbers and eigen functions, solution of homogeneous integral equations with degenerate Kernel - nonhomogeneous symmetric equations - Fredholm alternative.

BOOKS RECOMMENDED:
1. Shanti Swarup and shiv Raj Singh, Integral Equation, 22nd edn., Krishna Prakashan,2012
2. A.B. Chandramouli, Integral equation with Boundary Value Problems, 2nd edition, Shiksha Sahitya Prakashan, 2008-2009.
3. Conte S.D. and deBoor C., Elementary Numerical Analysis - An Algorithmic Approach; 3rd edn., McGraw Hill, 1981.

4. Computer Oriented Numerical Methods: Raja Raman V., Prentice Hall 1988.
5. Jain N.K., Iyengar, S.R.K. and Jain R.K., Numerical methods for scientific and Engineering Computations, Wile Eastern Ltd., 1984.
6. S.S. Sastry, Introductory methods of Numerical Analysis, 3rd ed., Prentice Hall of India, 1998.
7. G. Shanker Roa, Numerical Analysis, 3rd edition, new age International (p), Limited Publishers.
8. M. D. Raisinghania, Integral Equation & Boundary Value Problems, 7th edition, S. Chand., 2007.
9. Froberg C.E., Numerical Mathematics - Theory and Computer Applications; Benjamin Cummings Pub. Co., 1985.