Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
AIR4C1:	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Numerical and Optimization Techniques	**3**	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- Numerical approach enables solution of a complex problem with a great number of very simple operations. It is useful to find the solution with use of computers making calculation easy and fast.
- The optimization techniques makes the students aware of the various techniques, which provides an analytical and objective basis for decisions.

Prerequisites: Basic knowledge of determinants, matrices, differentiation and integration of functions, vector algebra, and probability theory.

UNIT-I

Numerical solutions of algebraic and transcendental equations: Bisection method, Regula-falsi method, Newton-Raphson method.

Solution of system of linear algebraic equation: Gauss-Seidel, Gauss Jacobi's and relaxation methods.

Numerical solution of I order ordinary differential equation: solution by Euler's and Runge's methods.

UNIT-II

Interpolation: Finite difference operators, Newton's and central difference interpolation formulae, divided differences, Lagrange's interpolation.

Numerical differentiation using newton's formulae, maxima and minima.

Numerical integration- General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.

UNIT-III

Linear Programming: Formulation of LP problem, solution by graphical, simplex, big M and two phase methods, duality and dual simplex method, degeneracy and sensitivity analysis.

UNIT-IV

Assignment models: Definition, mathematical formulation, balanced and unbalanced assignment problems, Hungarian method of solution.

Transportation Problems: Definition, mathematical formulation, balanced and unbalanced transportation problems, degeneracy and its resolution.

UNIT-V

Game Theory: Definitions and terminologies of Matrix game theory, Fundamental theorem of matrix games theory, game with mixed strategies and principle of Dominance.

Dynamic programming- Characteristics, dynamic programming approach of solving LPP, optimal subdivision problem, dynamic programming under certainty.

Learning Outcomes:

Upon completing the course, students will be able to:

- Learn that many problems were analytical methods seems to fail, like solving highly nonlinear equation, numerical methods works very well.
- Use the optimization techniques to provide a mathematical model to represent complex functional relationships.

Books Recommended:

1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 42/e, 2015.
2. Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
3. Hillier, F. S., Lieberman, G. J. – Introduction to Operation Research, 8th Ed., New York, McGraw-Hill, 2005.
4. Taha, H. A. – Operations Research: An Introduction, 7th ed., Macmillan Publication Co.,2003.
5. P K Gupta, D S Hira, Operations Research, S. Chand., 2008.