CSH- 611 Numerical Algorithms and Operation Research

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week	Class Test -12Marks
Tutorials: 1 hr/Week	Teachers Assessment - 6Marks
	Attendance – 12 Marks
Credits: 4	End Semester Exam – 70 marks

Course Objectives:

1. To comprehend various computational techniques to find approximate value for possible root(s) of non-algebraic equations, to find the approximate solutions of system of linear equations and ordinary differential equations.
2. To make the students familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty or randomness.
3. This course develops the ideas underlying the Simplex Method for Linear Programming Problem, as an important branch of Operations Research.
4. The course covers Linear Programming with applications to Transportation problem. Such problems arise in manufacturing resource planning and financial sectors.
5. To render the students to several examples and exercises that blend their everyday experiences with their scientific interests.

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Detailed Syllabus

Unit-1 **Computer Arithmetic:** Floating point representation of numbers, arithmetic operations with normalization, consequences of normalized floating point representation of numbers, Errors in numbers.
Unit-2 **Finding the roots of an equation:** Iterative method: Introduction, Beginning an iterative method, Bisection method, Newton Raphson method, Regula Falsi method. Comparison of Iterative methods, Order of Convergence of Newton Raphson Method and Secant Method.
Unit-3 **Ordinary differential equations:** Euler"s method, Taylor series method, Range Kutta II and IV order methods. **Numerical Integration:** Simpson"s 1/3 and 3/8 rule, Trapezoidal rule.
Unit-4 **Solving simultaneous linear equations:** Introduction, Gauss Elimination method, pivoting, ill conditioned equations, Gauss Jordon method, and Gauss-Seidel iterative method. Comparison of direct and iterative methods..
Unit-5 Some important definitions – Solutions to LPP, Feasible Solution, Basic Solutions, Basic Feasible Solution, Optimum Basic Feasible Solution, Unbounded Solution. Assumptions in LPP, Limitations of LPP, Applications of LPP and advantages of LPP Standard Linear Programming – Formulation of a Linear Programming Solving L.P.P. by Graphical Method Problem and Simplex Method.
Unit-6 Transportation Problems – Method of finding initial basic feasible solution to Transportation problem-North West Corner, Least Cost Method and Vogel"s Method. Method of finding initial basic feasible solution to Assignment Problem using Hungarian Method. **Reference Books:** 1. Computer Oriented Numerical Methods by Rajaraman. V. 2. "Operation Research", by S.D.Sharma Kedarnath Ramnath Publishers 16th edition 2010 3. Numerical Methods by S.S. Sastry.

Course Outcomes:

1. Apply some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain given level of precision.
2. Understand the applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.
3. Establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.
4. Solve an algebraic or transcendental equation using an appropriate numerical method.
5. Analyze and solve linear programming models of real life situations.
6. Find the graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of the simplex method is developed.

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