SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben Jivanlal College of Commerce & Economics (AUTONOMOUS)

Program: Bachelor of Science (Computer Science)		Semester : V	
Course: Optimization Techniques		Course Code: USMACS504	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	Credit	Continuous Assessment	Semester End Examinations (SEE)
04	4	25%	75%

Learning Objectives:

- Demonstrate the application of optimization in real life.
- Apply concepts of optimization in design of computer science.
- Develop pseudo code for analyzing optimization techniques in language and compiler design.

Course Outcomes:

After completion of the course, learners would be able to:

CO1: Apply techniques of LPP in real life situations.

CO2: Analyze the tools available to solve various problems of assignments.

CO3: Apply numerical techniques in real life situations.

CO4: Formulate different optimization techniques and apply them.

CO5: Develop techniques of problem solving.

Outline of Syllabus: (per session plan)		
Module	**Description**	**No of hours**
1	Introduction, Introduction to simplex methods	15
2	Advanced simplex methods, dual simplex algorithm and duality	15
3	Transportation and assignment models.	15
4	Solutions of Algebraic and Transcendental Equations	15
	Total	**60**

Module	Optimization Techniques	No. of Hours/Credits 60/4
1	**Introduction, Introduction to simplex methods**	**15**
	Introduction to operation research and optimization. Need of optimization, historical development, classification and formulation of optimization problem. Classical optimization methods, calculus based methods, random search algorithm.	**3**
	Linear programming problem: Formulation , objective function constraints, decision variables, canonical and standard form, parameter and variables. Graphical LPP for two variables.	**3**
	Introduction to Simplex method : simplex algorithm and tabular representation , types of solution feasible/ non feasible , generate/ non generate , unique/alternate/ infinite , bounded/unbounded solutions and their interpretation from simplex table , mutual solutions of problem solving up to four iterations.	**3**
	Integer programming : branch and bound technique , cutting plane algorithm	**3**
	Sensitivity Analysis : change in objective function coefficient(c_j), change in the coefficient of non basic variable, change in coefficient of non basic variable in cost minimization problem	**3**
2	**Advanced simplex methods, dual simplex algorithm and duality**	**15**
	Artificial variables, Big M methods, bounded / unbounded solution, pseudo optimum solution, degeneracy.	**3**
	Two Phase simplex method , dual simplex method, relationship of primal and dual , formulation of dual simplex method, rules for constructing dual from primal, advantages.	**3**
	Duality and computation of replacement ratio. bounded / unbounded solution, pseudo optimum solution, degeneracy. Comparison of duality and dual simplex method.	**3**
	Introduction to simulation : definition, working area of simulation, steps of simulation process, advantages and disadvantages of simulation, role of simulation in computer science, applications	**3**
	introduction to sequencing problem, processing n jobs through two machines	**3**
3	**Transportation and assignment models.**	**15**
	Transportation and assignment models : special case of LPP model, problem formulation, transportation algorithms NWCR, LCM, VAM. Finding optimal solution using MODI method.	**5**
	Assignment problem and problem formulation, Hungarian method traveling sales man problem, advantages and applications of transportation and assignment model.	**3**

	Game theory :introduction, two person zero sum games, pure strategies , games with saddle point.	**3**
	Introduction to decision theory : steps in decision theory approach, types of decision making environments, decision making under uncertainty , criteria of regret.	**4**
4	**Solutions of Algebraic and Transcendental Equations**	**15**
	The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation	**5** **5** **5**

RECOMMENDED READING:

ESSENTIAL READING:

1) Operation research –Theory and Applications , 7th Edition J K Sharma
2) Operation research – P K Gupta , Hira S Chand 2018
3) Introductory Methods of Numerical Methods S. S. Shastri PHI

SUPPLEMENTARY READING:

1) Mathematical Programming Techniques : Kambo N S , McGraw Hill
2) Numerical Analysis Richard L. Burden, J. Douglas Faires Cengage Learning 9 th 2011