OTIMIZATION TECHNIQUES

V Semester: CSE / IT /EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS012	Core	2	1	-	3	30	70	100
Contact Classes: 30	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

1. Learn fundamentals of linear programming through optimization.
2. Understand and apply optimization techniques to industrial applications.
3. Apply the dynamic programming and quadratic approximation to electrical and electronic problems and applications.

COURSE OUT COMES:

1. Understand the concept of Linear programming optimization problem and apply various techniques to formulate, solve LP problems.
2. Investigate and develop innovative solutions using assignment and transport techniques for various optimization problems.
3. Demonstrate applications of Game theory and sequencing techniques in emerging areas of Industry.
4. Explore the concepts of principle of optimality and apply dynamic programming algorithms to solve real time applications.
5. Enrich the knowledge on applying quadratic approximation solutions for constrained optimization problems of various engineering streams.

COURSE LEARNING OUTCOMES (CLOs):

1. Explain the various characteristics and phases of linear programming.
2. Formulate the various linear programming problems by using graphical and simplex methods.
3. Understand the artificial variable techniques like two phase and Big-M methods.
4. Explain Transportation problem and the formulation of the problem by using optimal solution.
5. Solve the assignment problems by using optimal solutions and the variance of assignment problems.
6. Describe the travelling sales man problem.
7. Explain the sequencing and the types of sequencing methods.
8. Use n jobs through two machines and n jobs through three machines to solve an appropriate problem.
9. Use two jobs through m machines to solve an appropriate problem.
10. Understand theory of games and the terminologies used in theory of games concept.
11. Determine appropriate technique to solve to a given problem.
12. Solve the problems by using dominance principle and Graphical method.
13. Understand the Bellman's principle of optimality..
14. Describe heuristic problem-solving methods.
15. Understand the mapping of real-world problems to algorithmic solutions.
16. List out the various applications of dynamic programming.
17. Define the shortest path problem with approximate solutions.
18. Explain the linear programming problem with approximate solutions.
19. Define the various quadratic approximation methods for solving constraint problems.
20. Explain the direct quadratic approximation for solving the constraint problems.
21. Explain the quadratic approximation method by using lagrangian function.
22. Describe the variable metric methods for constrained optimization.

Unit-I	LINEAR PROGRAMMING	Classes: 09
Definition, characteristics and phases, types of models, operations research models, applications, linear programming problem formulation, graphical solution, simplex method; Artificial variables techniques: Two-phase method, Big-M method.		
Unit -II	**TRANSPORTATION AND ASSIGNMENT PROBLEMS**	**Classes: 09**
Transportation problem, formulation, optimal solution, unbalanced transportation problem, degeneracy, assignment problem, formulation, optimal solution, variants of assignment problem, traveling salesman problem.		
Unit -III	**SEQUENCING AND THEORY OF GAMES**	**Classes: 09**
Sequencing: Introduction, flow-shop sequencing, n jobs through two machines, n jobs through three machines, job shop sequencing two jobs through m machines. Theory of games: Introduction, terminology, solution of games with saddle points and without saddle points, 2 x 2 games, dominance principle, m x 2 and 2 x n games, graphical method.		
Unit -IV	**DYNAMIC PROGRAMMING**	**Classes: 09**
Introduction: Terminology, Bellman's principle of optimality, applications of dynamic programming shortest path problem, linear programming problem.		
Unit -V	**QUADRATIC APPROXIMATION**	**Classes: 09**
Quadratic approximation methods for constrained problems: Direct quadratic approximation, quadratic approximation of the Lagrangian function, variable metric methods for constrained optimization.		

Text Books:

1. A Ravindran, "Engineering Optimization",JohnWiley&SonsPublications, 4thEdition, 2009.
2. Hillier, Liberman, "Introduction to Operation Research", Tata McGraw-Hill, 2nd Edition,2000.

Reference Books:

1. Dr. J K Sharma, "Operation Research", Mac MilanPublications, 5thEdition, 2013.
2. Ronald L. Rardin, "Optimization in Operation Research", Pearson Education Pvt. Limited, 2005.
3. N V S Raju, "Operation Research", S M S Education, 3rdRevised Edition.

Web References:

1. http://www2.informs.org/Resources/
2. http://www.mit.edu/~orc/
3. http://www.ieor.columbia.edu/
4. http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm
5. http://www.wolfram.com/solutions/OperationsResearch/

E-Text Books:

1. http://engineeringstudymaterial.net/ebook/new-optimization-techniques-in-engineering-godfrey/
2. http://www.freetechbooks.com/urban-operations-research-logistical-and-transportation-planningmethods-t486.html