OPERATIONS RESEARCH

VIII Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME021	Core	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes:45		

OBJECTIVES:

The course should enable the students to:

I. Formulate the mathematical model of real time problem for optimization.

II. Establish the problem formulation by using linear, dynamic programming, game theory and queuing models.

III. Apply stochastic models for discrete and continuous variables to control inventory.

IV. Visualize the computer based manufacturing simulation models.

COURSE OUTCOMES (COs)

CO1: Formulate the mathematical model of real time problem for optimization, using Linear programming

CO2: Establish the problem formulation by using transportation, assignment models

CO3: Apply sequencing for flow and replacement for maintenance of machines programming, game theory and queuing models

CO4: Formulate game theory model and apply stochastic models for discrete and continuous variables to control inventory.

CO5: Formulate queuing models and visualize dynamic programming and simulation models

COURSE LEARNING OUTCOMES (CLOs):

1. Understand the characteristics, phases, types of operation research models and its applications.
2. Visualize modeling principles scope, decision making, general methods for solving OR models.
3. Understand linear programming concepts, problem formulation and graphical models.
4. Understand simplex method and artificial variable techniques.
5. Comprehend two-phase method and Big-M method of linear programming.
6. Apply to build and solve transportation models of balanced.
7. Understand the degeneracy model problem of transportation, unbalanced type, maxization.
8. Apply to build assignment models for optimal solution.
9. Understand variants of assignment model and travelling salesman model.
10. Understand the flow shop sequencing model of 'n' jobs through two machines and three machines.
11. Comprehend job shop sequencing of two jobs through 'm' machines.
12. Understand the concept of replacement of items that deteriorate with time when money value is not counted .
13. Understand the concept of replacement of items that deteriorate with time when money value is n counted .
14. Visualize the replacement of items that fail completely and group replacement.
15. Understand minimax (maximini) criterion, optimal strategy, solution oF games with saddle point.
16. Visualize dominance principle while solving game theory problem.
17. Apply to solve m * 2 , 2 *n model of games and graphical method.
18. Understand the concepts of deterministic inventory model and purchase inventory model with one price break and multiple price breaks.
19. Visualize stochastic inventory models – demand may be discrete variable or continuous variable.
20. Understand the concepts of waiting line model of single channel and multi server model.
21. Visualize dynamic programming concepts and models
22. Comprehend the simulation models, phases of simulation, application of simulation.
23. Visualize the application of simulation for inventory and queuing problems.

UNIT-I	INTRODUCTION AND ALLOCATION	Classes: 09
Development, definition, characteristics and phases, types of operation research models, applications; Allocation: linear programming, problem formulation, graphical solution, simplex method, artificial variables techniques, two–phase method, big-M method.		
UNIT-II	**TRANSPORTATION AND ASSIGNMENT PROBLEM**	**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 REPLACEMENT**	**Classes: 09**
Sequencing: Introduction, flow, shop sequencing, n jobs through two machines, n jobs through three machines, job shop sequencing, and two jobs through 'm' machines. Replacement: Introduction: Replacement of items that deteriorate with time, when money value is not counted and counted, replacement of items that fail completely, group replacement.		
UNIT-IV	**THEORY OF GAMES AND INVENTORY**	**Classes: 09**
Theory Of Games: Introduction, minimax (maximin) criterion and optimal strategy, solution of games with saddle points, rectangular games without saddle points, dominance principle, mx2 and 2xn games, graphical method; Inventory: Introduction, single item, deterministic models, purchase inventory models with one price break and multiple price breaks, shortages are not allowed, stochastic models, demand may be discrete variable or continuous variable, instantaneous production, instantaneous demand and continuous demand and no set up cost, single period model.		
UNIT-V	**WAITING LINES, DYNAMIC PROGRAMMIMG AND SIMULATION**	**Classes: 09**
Waiting Lines: Introduction, Terminology, Single Channel, Poisson arrivals and exponential service times with infinite population and finite population models, Multichannel, Poisson arrivals and exponential service times with infinite population. Dynamic Programming: Introduction, Terminology, Bellman‟s Principle of optimality, Applications of dynamic programming, shortest path problem, linear programming problem. Simulation: Introduction, Definition, types of simulation models, steps involved in the simulation process - Advantages and Disadvantages, Application of Simulation to queuing and inventory.		

Text Books:

1. J. K. Sharma, "Operations Research", Macmillan, 5th Edition, 2012.
2. R. Pannerselvan, "Operations Research", 2nd Edition, PHI Publications, 2006.

Reference Books:

1. A. M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2013.
2. Maurice Saseini, ArhurYaspan, Lawrence Friedman, "Operations Research: Methods & Problems", 1st Edition, 1959.
3. Hamdy A. Taha, "Introduction to O.R", PHI, 8th Edition, 2013.
4. Harvey M.Wagner, "Operations Research", PHI Publications, 2nd Edition, 1980.

Web References:

1. https://www.aicte-india.org/flipbook/p&ap/Vol.%20II%20UG/UG_2.html#p=8
1. https://www.britannica.com/topic/operations-research

E-Text Books:
1. http://www.pondiuni.edu.in/storage/dde/downloads/mbaii_qt.pdf 2. https://www.pdfdrive.com/operations-research-books.html