OPERATIONS RESEARCH

V Semester: ME								

Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME021	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes:60		

COURSE OBJECTIVES:
The students will try to learn:
  I. Formulation of the mathematical model for real time problem using optimization techniques
  II. The problem formulation by using linear, dynamic programming, game theory and queuing models.
  III. The stochastic models for discrete and continuous variables to control inventory.
  IV. The computer based simulation of manufacturing models to optimize the production decision making.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO 1 **Outline** the developments of the operation research required for different approaches and its applications.

CO 2 **Identify** the principles of allocations such as graphical solution, simplex method, artificial variables techniques, two–phase method, big-M method to solve problems related to real time applications.

CO 3 **Develop** the theoretical workings of the simplex method for linear programming to perform iterations to solve complex problems involved in various industries.

CO 4 **Identify** the problem formulation by using assignment models to optimize the solution.

CO 5 **Apply** the sequencing for flow and replacement for maintenance of machines.

CO 6 **Define** game theory with and without saddle point for solving problems related to games.

CO 7 **Classify** stochastic models for discrete and continuous variables to control inventory.

CO 8 **Identify** the concept of rank capacity locations, plan and schedule production for supply and demand.

CO 9 **Identify** appropriate method for application of simulation to solve inventory and queuing problems for real world applications.

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
2. https://www.britannica.com/topic/operations-research

E-Text Books:

1. https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf