Course code	Course Name	L-T-P-Credits	Year of Introduction
CH369	OPERATIONS RESEARCH	3-0-0-3	2016

Prerequisite : Nil

Course Objectives:

- To impart the scope, objectives, phases, models & limitations of operations research.
- To decide whether a problem can be solved using operations research.

Syllabus:

Introduction to Operations Research, Formulation of Linear Programming Problems, Graphical Solution and the Simplex Algorithm, Duality and Sensitivity Analysis, Transportation and Assignment Problems, Queuing theory, Replacement models, Scheduling on Machines, Network models and Project networks, Game theory and Decision theory.

Expected Outcome:

Upon completion of the subject, students will be able to:

i. Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry.
ii. Identify and develop operational research models from the verbal description of the real system
iii. Formulate a managerial decision problem into a mathematical model.

Reference Books:

1. G.Srinivasan, "Operations Research: Principles and Applications", PHI.
2. Hamdy A. Taha, “Operations Research: An Introduction”, Pearson.
3. Hillier and Lieberman, “Introduction to Operations Research”, TMH, 2001.
4. Paneer Selvam, “Operations Research”, 2nd edition, Prentice Hall of India

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Operations Research (OR):** Origin, nature and impact of OR. Development of OR as a branch of knowledge since World War II. Fields of applications of OR. Phases of OR study. **Linear Programming (LP)**: Introduction, LP and allocation of resources, LP definition, Linearity requirement, expressing LP problems, Limitations or constraints, Maximization and Minimization problem formulations.	6	15%
II	**Linear Programming** – Introduction To Graphical Linear Programming, Maximization and Minimization solution. Simplex method definition, formulating the Simplex model. LP – Simplex Method for Maximizing and minimizing, example containing mixed constraints. Duality Theory, The Primal Vs. Dual Solutions. Sensitivity Analysis - Changes in Objective Function, Changes in RHS and related sample problems.	7	15%
FIRST INTERNAL EXAMINATION			
III	**Transportation Problem:** Introduction to Transportation models: Formulation. Balanced and unbalanced transportation models. Initial solution to transportation problems – North West Corner method, Least Cost method and VAM method.	7	15%

	Optimality test – Stepping Stone and MODI method. **Assignment Problem** – problem formulation, illustration and Hungarian method for solution. Unbalanced assignment problem.		
IV	**Queuing theory:** Queuing theory, Queuing models, Assumptions, Queuing Costs, Queuing Terminology, Elements of Queues: Kendall – Lee Notation**,** Birth and death processes. Introduction to Single server and multiple server models**.** **Replacement models**: Replacement – Replacement in anticipation of failure, Individual and Group replacement. **Scheduling on Machines:** Two-job Two-machine problem, Johnson's algorithm.	8	15%
SECOND INTERNAL EXAMINATION			
V	**Network Models:** Construction of Network – Rules & Precautions, Shortest Path Method: Dijkstra's Algorithm and problems. Minimum Spanning Tree problems: Kruskal's and PRIM's algorithm and problems. Maximum Flow Problems**.** **Project Network:** CPM & PERT Networks. Obtaining of Critical Path. Time estimates for activities. Probability of completion of project. Determination of floats.	8	20%
VI	**Game theory:** Practical applications of game theory, Two-person zero-sum games, solving simple games, mixed strategy, Graphical solution, Solving by Linear Programming. **Decision Theory:** Statistical decision theory, Decision making with and without experimentation, Decision Trees, Utility theory.	6	20%
END SEMESTER EXAMINATION			

Question Paper Pattern:

Maximum Marks: 100 Exam Duration: 3 Hours

Part A :There shall be **Three questions** uniformly covering Modules 1 and 2, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)

Part B: There shall be **Three questions** uniformly covering Module 3 and 4, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)

Part C: There shall be **Three questions** uniformly covering Module 5 and 6, each carrying 20 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 20 marks for all the subdivisions put together. (2 x20= 40 Marks)