Course Title: Operational Research (3 Cr.)
Course Code: CAOR451
Year/ Semester: IV/VIII
Class Load: 4Hrs. /Week (Theory: 3 Hrs. Tutorial: 1 Hrs)

Course Description

Operations Research is the study of scientific approaches to decision-making. Through mathematical modeling, it seeks to design, improve and operate complex systems in the best possible way. The mathematical tools used for the solution of such models are either deterministic or stochastic, depending on the nature of the system modeled. In addition, the course will learn very powerful modeling and solution techniques for decision-making problems that are used today by many successful companies to help them save/earn millions of dollars. The module covers topics that include: linear programming, transportation, assignment, inventory control, replacement theory and game theory. Analytic techniques and computer packages will be used to solve problems facing business managers in decision environments

Course Objectives

The general objectives of this course to provide a broad orientation of the field of optimization, with emphasis on basic theory and methods for continuous and discrete optimization problems in finite dimension, and it also gives some insight into its use for analyzing practical optimization problems.

Unit 1: Introduction to Operations Research **5 hrs.**

Introduction, History of Operations Research, Stages of Development of Operations Research Relationship between Manager and OR Specialist, OR Tools and Techniques, Applications of Operations Research, Limitations of Operations Research

Unit 2: Linear Programming Problem **10 hrs.**

Introduction to Linear Programming, Linear Programming Problem Formulation, Formulation with Different Types of Constraints, Graphical Analysis of Linear Programming, Graphical Linear Programming Solution, Multiple Optimal Solutions, Unbounded Solution, Infeasible Solution, Basics of Simplex Method, Simplex Method Computation, Simplex Method with More Than Two Variables, Primal and Dual Problems, Economic Interpretation

Unit 3: Transportation and Assignment Problem **8 hrs.**

Transportation Problems definition, linear form, Solution methods: North West corner method, least cost method, Vogel's approximation method. Degeneracy in transportation, Modified Distribution method, unbalanced problems and profit maximization problems. Transshipment Problems. Assignment Problem Structure and Solution: Short-Cut Method (Hungarian Method), Unbalanced Assignment Problem, Infeasible Assignment Problem, Maximization in an Assignment Problem, Crew Assignment Problem.

Unit 4: Queuing Theory **6 hrs.**

Basis of Queuing theory, elements of queuing theory, Kendall's Notation, Operating characteristics of a queuing system, Classification of Queuing models.

Unit 5: Inventory Control **6 hrs.**

Inventory classification, Different cost associated to Inventory, Economic order quantity, Inventory models with deterministic demands, ABC analysis.

Unit 6: Replacement theory **6 hrs.** Introduction, Replacement of capital equipment which depreciated with time, replacement by alternative equipment, Group and individual replacement policy

Unit 7: Game Theory **7 hrs.**

Introduction, Characteristics of Game Theory, Two Person, Zero sum games, pure strategy. Dominance theory, Mixed strategies (2x2, mx2), Algebraic and graphical methods

Teaching Methods

The general teaching pedagogy includes class lectures, presentations, group works, case studies, guest lecturers research works, project works, assignments (Theoretical and Practical). The teaching faculty will determine the choice of teaching pedagogy and encouraged to select software tools as per the requirements of topics for practical activities.

References/ Suggested Readings:

Hillier, F.S.& Lieberman, G.J. (1995). Introduction to Operations Research,7th edition. The McGraw-Hill Companies, Inc.

Natarajan, A. M.; Balasubramani, P. & Tamilarasi, A. (2007). Operations Research. Pearson Education Inc.

Sharma, J.K. (2009). Operational Research: Theory and Application. Macmillan Publishers India Ltd.

Taha, H.A. (2017). Operations Research: A Introduction, 10th edition, Global edition, Pearson Education, Inc. Pearson Prentice Hall.

Wagner, H. N. (2003). Operations Research by, Prentice hall. N D Vohra, Tata McGraw-Hill.

Winston, L.W. (2004). Operations Research: Applications and Algorithms, Indian University, 4th edition.

Evaluation

Examination Scheme				
Internal Assessment		**External Assessment**		**Total**
Theory	**Practical**	**Theory**	**Practical**	
40		**60**		**100**