MODELLING AND ANALYTICS FOR SUPPLY CHAIN MANAGEMENT

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INTENDED AUDIENCE : Students from Management, Industrial and Systems Engineering, Mechanical Engineering, and related disciplines.

INDUSTRIES APPLICABLE TO : Tata Group of Industries, Multinationals, L&T, and similar manufacturing and service organizations including IT companies

COURSE OUTLINE :
This course focuses on the application of analytical techniques for determining effective solutions to problems associated with supply networks considering the constraints of demand and supply. The objectives of the course are to understand the nature of supply networks, goal of supply networks and explain the impact of analytics based supply chain decisions on the success of a firm. The coverage includes key metrics that track the performance of the supply network in terms of each driver, identification of the key factors to be considered when designing a distribution network and use of analytical techniques for developing a framework for network design. Emphasis is laid on the use of optimization techniques for facility location, capacity allocation and evaluation of supply chain design decisions under uncertainty. Along with these objectives, this course is also aimed at understanding the concepts of multi-criterion decision making in supplier selection and rating, inventory management techniques under uncertain demand and supply environment, mathematical models for design of transportation networks, and the role of soft computing techniques for matching supply with demand.

ABOUT INSTRUCTOR :
Prof. Kunal Kanti Ghosh has over three decades of experience at various levels in the automobile industry. He was the "Corporate Initiatives Head" of Tata Technologies Ltd and was adjudged the "Best Young Materials Manager" by the Indian Institute of Materials Management in 1986. He also received the "Best young Manager's Award" from All India Management Association in 1990. He was the prime architect of "Parts Supply Management System" for Nissan Plant in Australia, Melbourne. He was the project manager in charge of installation and commissioning of semi-automated (Kurimoto Presses) in Jamshedpur plant of Tata Motors in 1988. He holds B Tech (Mechanical Engineering), M Tech (IE & OR), and PhD (Automotive Design). He is a fellow member of the Institution of Engineers (India).

Prof. Anupam Ghosh obtained Masters Degrees with specializations in Supply Chain Management, Accounting, and Commerce. His PhD is on Information Visibility in Supply Chain. He has about 13 years of teaching experience in Supply Chain Management, Supply Chain Analytics, and International Marketing. He was a Visiting Scholar to Bentley University, Waltham, MA, USA during 2004-05. He has worked on projects on Healthcare Information Systems in USA, Fixing Transportation Fares for Public Transportation Systems in India, and has conducted various Management Development Programs on Supply Chain Management and Materials Management.

COURSE PLAN:

Week 1 : Introduction to Modeling and Analytics in Supply Networks:
Introduction to Supply Network, Performance Measures for Efficiency and Effectiveness, SCOR model, Strategic Fit and Scope, Types of Distribution Networks, Analytics in Management, Design of Distribution Networks

Week 2 : Supplier Selection Analytics:
Linear Programming, Rating method, Ranking method, Borda Count, Clustering, Goal Programming and related multi-criterion decision making (MCDM) techniques

Week 3 : Transportation Modeling and Analytics:
Transportation models, Route planning, Transshipment, Shipment schedule, Flow path optimization.

Week 4 : Warehousing Modeling and Analytics:
Warehouse location problem, MILP formulation, Location with foreign exchange risks, space calculation for warehouse, Non-linear optimization for warehouse space allocation

Week 5 : Strategic Performance Improvement:
Data Envelopment Analysis for competitive comparisons among multiple warehouses and service units and formulation of strategic action plans for improving the efficiencies of non-performing DMUs, Stochastic Frontier Analysis.

Week 6 : Inventory Analytics - I:
Elementary Concepts related to Inventory Management, Economic Order Quantity (Instantaneous Replenishment), Economic Production Lot Size, Inventory Model with Planned Shortages (Back-Orders), Inventory Management under Uncertainty – Concept of Safety Stock, Continuous Review System, Periodic Review System

Week 7 : Inventory Analytics - II:
Newsvendor Model, Performance Measures: Expected Lost Sales, Expected Sales, Expected Leftover Inventory, Expected Profit, Fill Rate, In-Stock Probability, and Stock-Out Probability

Week 8 : Inventory Analytics - III:
Choosing an Order-up-to Level to Meet a Target Service Level, In-Stock Probability, and Desired Fill-Rate

Week 9 : Inventory Analytics - IV:
Assemble-to-Order, Make-to-Order and Quick Response with Reactive Capacity, Reducing Mismatch Costs with Make-To-Order

Week 10 : Modeling Coordination in Supply Chains:
Information Distortion in Supply Network and Bull-Whip Effect, Coordination and collaboration modeling in supply networks.

Week 11 : Risk Analytics in Supply Network Design:
Mapping the riskiness profile of a country, taxation, Mapping the riskiness profile of possible international routes and Designing the route plan based on riskiness profile

Week 12 : Design and Modeling the global supply chain:
Design and optimization of global supply chain networks, Multi-period supply chain network design