



### Selected Topics in Decision Modeling Management

**Instructor Name:** BiswajitMahanty

**Institute:** IIT Kharagpur

**Department:** Others

**Course Intro:** : Decision Modeling is an important component of Operations Research with optimization at its core. Decision problems are in the focus of academicians and practitioners the world over and are solved everywhere from manufacturing to service organizations, airlines, government and consulting houses. The present course is taught from a practitioner's angle. Theory is introduced to complement the practice and for ease of understanding. The course is mainly meant for Engineering students. The management students will also benefit from the course. In this course on decision modeling, first 2 weeks are devoted to dynamic programming. Dynamic programming helps to solve complex decision problems with the help of Bellman's principle of optimality. Next 2 weeks cover integer programming which is again very important in decision making context. Branch and bound, cutting plane, and branch and cut methods are discussed in this section. Next 2 weeks cover nonlinear programming which includes constrained and unconstrained optimization, Karush-Kuhn-Tucker conditions and other topics. The final 2 weeks are devoted to metaheuristics that include genetic algorithm, simulated annealing, tabu search and other algorithms.

**Pre Requisites:** : Basic Operations Research

**Core/Elective:** : Core\_Elective

**UG/PG:** : Both

**Industry Support** : Manufacturing Industry, Chemical Industry, Service Industry, Management Consultancy Houses, Corporate Planning Groups.

**Reference** : 1.Ravindran, A., Philips, D.T., and Solberg, J.J., Operations research, John Wiley and Sons 2.Taha H.A., Operation Research- An Introduction, PHI 3.Hillier F.S. and Lieberman G.J., Introduction to Operation Research, McGraw Hill

**About Instructor:** Prof. BiswajitMahanty is a professor at the Department of Industrial and Systems Engineering of IIT Kharagpur. He has obtained B.Tech (Hons) degree in Mechanical Engineering and M.Tech and Ph.D. degrees in Industrial Engineering and Management all from IIT Kharagpur. He has had a rich and varied professional career with six years in industry and more than 27 years in teaching, research, and industrial consulting. His areas of interest are in Operations Research, Systems, Project Management, and Information Systems. He has guided 14 doctoral and more than 100 undergraduate and post-graduate level dissertations. He has also carried out a large number of sponsored research and industrial consulting projects. He has, to his credit, a number of publications in international journals of repute. He is also an author of the book "Responsive Supply Chain" published by the prestigious CRC press. He has developed a 20-hour NPTEL Online course on "Decision Modeling" and a 29-hour NPTEL course on "Management Information System". He has also taught at the School of Management at Asian Institute of Technology, Bangkok as a visiting faculty member.



### COURSE PLAN

SL.NO	Week	Module Name
1	1	Dynamic Programming: Bellman's Principle of Optimality, Stage Coach Problems, Recursive Relationship. Application to Assignment Problem
2	2	Dynamic Programming: Application to Knapsack Problem, Production-Inventory Problems, and Network Problems
3	3	Integer Programming: Formulation, Branch and Bound Techniques, Example Problems, Cutting Plane Methods
4	4	Integer Programming: Mixed Integer Problems, Branch and Cut Methods, Example Problems
5	5	Nonlinear Programming: Graphical Illustration, Constrained and Unconstrained Optimization, Karush-Kuhn-Tucker Conditions
6	6	Nonlinear Programming: Search Techniques, Quadratic Programming, Example Problems
7	7	Metaheuristics: Genetic Algorithm Mechanism, Performance, Data Structure, Genetic Search, Applications
8	8	Metaheuristics: Simulated Annealing, Tabu Search, Particle Swarm Optimization and others