

DAY 1

Linear Programming

- Introduction to Optimisation; Multi-variate Optimisation Problems; Determining the Objective Function; Constraints to Problems; Sign Restrictions; The 'feasibility region'; Graphical Representation; Implementation using Solver in Excel
- Using Linear Programming to Solve Production and Supply Chain / Logistics Problems, such as optimising the products from a refinery, and minimising the manufacturing and delivery costs for a complex supply chain (with and without batch manufacturing, and with and without warehousing)

DAY 2

Newtonian and Genetic Optimisation Methods

- Linear and Non-linear Optimisation Problems; Stochastic Search Strategies; Introduction to Genetic Algorithms; Biological Origins; Shortcomings of Newton-type optimisers; How to Apply Genetic Algorithms; Encoding; Selection; Recombination; Mutation; How to Parallelise; Implementation using Solver in Excel
- How to Solve a range of Optimisation Problems, Culminating in the classic '*travelling salesman problem*' by optimising the motion trajectory of a large manufacturing robot, both with and without forced constraints

DAY 3

Scenario Analysis

- Introduction to Scenario Analysis; A What-If example in Excel; Types of What-If analysis; Performing manual what-if analysis in Excel; One Variable Data Tables; Two-variable data tables
- Using Scenario Manager in Excel; Using scenario analysis to predict business expenses and revenues for an uncertain future

DAY 4

Markov Models

- Understanding Risk; Introduction to Markov Models; 5 Steps for Developing Markov Models; Manipulating Arrays and Matrices inside Excel; Constructing the Markov Model; Analysing the Model; Roll Back and Sensitivity Analysis; First-order Monte Carlo; Second-order Monte Carlo
- Decision Trees and Markov Models; Simplifying Tree Structures; Explicitly Accounting for Timing of Events
- Using Markov Chains to simulate an insurance no claims discount scheme, and Modelling the Outcomes of a Healthcare System

DAY 5

Monte Carlo Simulation

- Introduction to Monte Carlo Simulation; Monte Carlo building blocks in Excel; Using the RAND() function; Learning to model the problem; Building worksheet-based simulations; Simple problems; How many iterations are enough?; Defining complex problems; Modelling the variables; Analysing the data; Freezing the model; Manual recalculation; "Paste Values" function; Basic statistical functions; PERCENTILE() function
- Monte Carlo Simulation solutions to problems of traffic flow in a city, dealing with uncertainty in the sale of product, predicting market growth and assessing risk in currency exchange rates