1 : MODELLING, ANALYSIS AND SIMULATION

Course Objective

To cover concepts, techniques, tools for modeling and simulation systems and environments through the use of computers.

Course Contents :

Modelling Process : Taxonomy of model types; Steps in model building; Simulation; Algorithms and Heuristics; Simulation Languages

Primitive Models : Establishing relationships via physical laws; Establishing relationships via curve fitting; Parameters estimation problems; Elementary state transition models.

Forecasting : Nature of data; Statistical attributes of data; probability distributions and their mechanisms; Generation of random numbers; Time series.

Pattern Recognition : Neighborhood and distances; Cluster analysis,, Individual and group preference patterns.

Growth and Decay Processes : Discrete and continuous growths; Limits to growth; Competition among species; Growth process and integral equations; Discrete event approach; population planning.

Simulation of Discrete and Continuous Processes : Monte Carlo methods; Stochastic Simulation; System identification; Inverse problems; Virtual reality; typical example and case studies related to Civil Engineering.

Pre-requisite : Nil

Reference Books:

1. R Haberman, Mathematical Models, Prentice Hall.
2. D. P. Maki and M. Thompson, Mathematical Models and Applictions, Prentice Hall
3. R.E. Shannon, System Simulation: Art and Science, Prentice Hall

Practical:

Based on content following practical are carried out**:**

1. Introduction to modeling in transportation engineering.
2. Basic laws and applications of probability.
3. Probability distributions.
4. Programmes of probability distributions and applications in problem solving.
5. Random number generation.
6. Queing theory problems and application in transportation.
7. Semester problem.