# Simulation for Managers

## Course Objectives

This course will provide the students a thorough understanding of the systems they encounter in real life situations, the modeling of these systems for the study of their behavior under different operating conditions and different decision rules. It also enables the students to think of problems in a systemic view.

## Syllabus

System concepts, components of systems, system theories, modelling of uncertainties, random numbers and variates, process modelling for simulation, simulation study and analysis.

## Expected Outcomes

After the completion of course, the students will be able to understand systems and their properties in a systemic approach. They will be able to analyse existing systems and design modifications in systems with desired properties. References

1. Geoffrey Gordon, System Simulation, PHI

2. Narsingh Deo, System Simulation with Digital Computer,PHI

3. J. Banks, Discrete Event System Simulation, Pearson Education

4. Sterman, Business Dynamics, Tata-McGraw Hill

5. Sheldon M.Ross, Simulation, Elsevier

## Course Plan

1 Systems: Systems theories, System modelling, system analysis, system postulation, system synthesis, systems approach to problem solving, applications in industrial and business systems. Areas of application of simulation, steps in simulation study, classification of systems, different types of system models. Merits and demerits of simulation, comparison between simulation and numerical methods.

2 Random Numbers and random variates: Uniformly distributed random numbers, properties of random numbers, generation of Pseudo-Random numbers (concepts only) and testing of randomness, Generation of random processes: random walk (one dimensional only), demand

processes, lead time generation, arrival process generation, service activity generation, defects and defectives generation.

First Internal Examination

3 Types of Simulation: Monte-Carlo method, Distributed Lag models, Cobweb models. Continuous system models, feedback systems, Real-time simulation. Use of Monte Carlo method to approximate solutions and games applied to business situations. Modelling of uncertainty in maintenance and inventory systems, stock price fluctuation, demand process and market price.

4 Dynamic Business Systems: Business dynamics, properties of dynamic systems, effects of dynamic interactions - learning disabilities and System archetypes. Modelling of dynamic systems- tools of modelling - stock and flows & causal relations. Simulation of dynamic systems: Basic models and behaviour patterns, Beer Game modelling and analysis. Examples of product growth model and the manufacturing Supply Chain models.

Second Internal Examination

5 Discrete Event Simulation: Next-Event approach/Event scheduling, Fixed Time Increment method. Hand simulation of Queuing models, Business systems and Service models, other business system models. Concepts of Verification and Validation of models, statistical analysis of outputs.

Final Examination