5MCAEC23: SYSTEM MODELING AND SIMULATION

Total No. of Hours: 52   **Hours/Week: 04**

Course Objective: To provide strong foundation on concept of simulation and modelling and practice to design simulation models for various case studies like inventory, traffic flow networks.

Unit I	**Modeling and Simulation**: Nature of Simulation systems, Models and Simulation, Continuous and Discrete Systems, System Modeling, Concept of Simulation, Components of modeling, Static and Dynamic physical models, Static and Dynamic Mathematical models. Introduction to Static and Dynamic System Simulation, Advantages, Disadvantages and pitfalls of Simulation.	10 hrs
Unit II	**System Simulation and Continuous System**: Simulation Types of System Simulation, Monte Carlo Method, Comparison of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model, Continuous System Models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time Simulations.	10 hrs
Unit III	**System Dynamics & Probability Concepts in Simulation:** Exponential growth and decay models, logistic curves, Generalization of growth models, System dynamics Representation of Time Delays, Discrete and Continuous Probability functions, Continuous Uniformly Distributed Random Numbers, Generation of Random Numbers, Generating Discrete Distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.	11 hrs
Unit IV	**Simulation of Queuing Systems and Discrete System:** Simulation Poisson arrival patterns, Exponential Distribution, Service Times, Normal Distribution Queuing Disciplines, Simulation of Single and Two Server Queue. Application of queuing theory in computer system, Discrete Events. Generation of arrival patterns, Simulation Programming tasks, Gathering Statistics, Measuring Occupancy and Utilization, Recording Distribution and Transmit Times	11 hrs
Unit V	**Introduction to Simulation Languages and Analysis of Simulation Output GPSS:** Action Times, Succession of events, Choice of paths, Conditional Transfers, Program Control Statements, SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements Estimation Methods, Replication of Runs, Batch Means, Regenerative Techniques, Time Series Analysis, Spectral Analysis and Autoregressive Processes	10 hrs

REFERENCE BOOKS
[1] Jerry Banks, John S Carson, "*Discrete event System Simulation*", Pearson Education
[2] Gordon G., "*System Simulation*", PHI Learning India
[3] DrShailendra Jain, "*Modeling &Simulaion Using Matlab and Simulink*", Wiley
[4] David Cloud, Larry Rainey, "*Applied Modeling and Simulation*", TMGH
[5] Frank L Severence, "*System Modeling and Simulation An Introduction*", Wiley
[6] Thomas J Sciber, "*Simulation using GPSS*", Wiley & Sons
[7] James Harrington, KerimTumay, "*Simulation Modeling Methods*", TMGH