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## **CU5002 COMMUNICATION NETWORKS MODELLING AND SIMULATION**

### **DETAILED SYLLABUS**

#### **UNIT I INTRODUCTION TO MODELING AND SIMULATION**

Introduction, Discrete-event Simulation, Modeling for Computer Simulation, Tools and Methods for Network Simulation, The Simulation Platform, Simulation Framework, Tools and Modeling Approaches for Simulating Hardware.

#### **UNIT II MONTE CARLO SIMULATION**

Fundamental concepts, Application to communication systems, Monte Carlo integration, Semianalytic techniques, Case study: Performance estimation of a wireless system.

#### **UNIT III LOWER LAYER & LINK LAYER WIRELESS MODELING**

Physical Layer Modeling, Description of the Main Components of the PHY Layer, Accurate Simulation of Physical Layers, Physical Layer Modeling for Network Simulations, Link Layer Modeling, Medium Access Control (MAC) Protocols, Logical Link Control, Forward Error Detection and Correction, Backward Error Detection and Correction, Queueing and Processing Delay.

#### **UNIT IV CHANNEL MODELING & MOBILITY MODELING**

Channel Modeling :The Physics of Radiation, The Nature of Electromagnetic Radiation, Classification of Propagation Models, Deterministic Approaches by Classical Field Theory, Deterministic Geometric Optical Approaches, Empirical Path Loss Approaches, Stochastic Shadowing Models, Stochastic Fading Models, MIMO Channel Models. Mobility modeling :Categorization of Mobility Models, Mobility Models, Random Walk Model, Random Waypoint Model, Random Direction Model, Gauss-Markov Model, Manhattan Model, Column Model , Pursue Model, Nomadic Community Model, Selection of Appropriate Mobility Models.

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## **UNIT V HIGHER LAYER MODELING & MODELING THE NETWORK TOPOLOGY**

Higher Layer Modeling :Modeling the Network Layer and Routing Protocols, Components of a Routing Protocol, Metrics, Virtual Routing on Overlays, Modeling Transport Layer Protocols, Modeling Application Traffic. Modeling the Network Topology : Abstraction of Network Topologies by Graphs, Characterizing Graphs, Common Topology Models, Geometric Random Graphs – The Waxman Model, Hierarchical Topologies, Preferential Linking – The Barabási-Albert Model , Modeling the Internet.

### **OBJECTIVES:**

- The students should be made to be
- Learn modeling and simulation
- Understand Monte Carlo simulation
- Study channel modeling and mobility modeling

### **REFERENCES:**

1. Irene Karzela, “Modeling and Simulating Communications Networks”, Prentice Hall India, 1998
2. K.Wehrle. Gunes, J.Gross, “Modeling and Tools for Network simulation”, Springer, 2010.
3. M.C. Jeruchim, P.Balaban and K. Sam Shanmugam, “Simulation of Communication Systems: Modeling, Methodology and Techniques”, Plenum Press, New York, 2001.
4. Nejat; Bragg, Arnold, “Recent Advances in Modeling and Simulation Tools for Communication Networks and Services”, Springer, 2007
5. William.H.Tranter, K. Sam Shanmugam, Theodore. S. Rappaport, Kurt L. Kosbar, “Principles of Communication Systems Simulation”, Pearson Education (Singapore) Pvt. Ltd, 2004.