

## **CP5003 PERFORMANCE ANALYSIS OF COMPUTER SYSTEMS**

### DETAILED SYLLABUS

#### **OBJECTIVES**

- To understand the mathematical foundations needed for performance evaluation of computer systems
- To understand the metrics used for performance evaluation
- To understand the analytical modeling of computer systems
- To enable the students to develop new queuing analysis for both simple and complex systems
- To appreciate the use of smart scheduling and introduce the students to analytical techniques for evaluating scheduling policies

#### **UNIT I OVERVIEW OF PERFORMANCE EVALUATION**

Need for Performance Evaluation in Computer Systems – Overview of Performance Evaluation Methods – Introduction to Queuing – Probability Review – Generating Random Variables for Simulation – Sample Paths, Convergence and Averages – Little’s Law and other Operational Laws – Modification for Closed Systems.

#### **UNIT II MARKOV CHAINS AND SIMPLE QUEUES**

Discrete-Time Markov Chains – Ergodicity Theory – Real World Examples – Google, Aloha – Transition to Continuous-Time Markov Chain – M/M/1.

#### **UNIT III MULTI-SERVER AND MULTI-QUEUE SYSTEMS**

Server Farms: M/M/k and M/M/k/k – Capacity Provisioning for Server Farms – Time Reversibility and Burke’s Theorem – Networks of Queues and Jackson Product Form – Classed and Closed Networks of Queues.

#### **UNIT IV REAL-WORLD WORKLOADS**

Case Study of Real-world Workloads– Phase-Type Distributions and Matrix-Analytic Methods– Networks with Time-Sharing Servers – M/G/1 Queue and the Inspection Paradox – Task Assignment Policies for Server Farms.

#### **UNIT V SMART SCHEDULING IN THE M/G/1**

Performance Metrics– Scheduling Non- Preemptive and Preemptive Non- Size- Based Policies- Scheduling Non- Preemptive and Preemptive Size- Based Policies – Scheduling - SRPT and Fairness.

## REFERENCES

1. K. S. Trivedi, —Probability and Statistics with Reliability, Queueing and Computer Science ApplicationsII, John Wiley and Sons, 2001.
2. Krishna Kant, —Introduction to Computer System Performance EvaluationII, McGraw-Hill, 1992.
3. Lieven Eeckhout, —Computer Architecture Performance Evaluation MethodsII, Morgan and Claypool Publishers, 2010.
4. Mor Harchol - Balter, —Performance Modeling and Design of Computer Systems – Queueing Theory in ActionII, Cambridge University Press, 2013.
5. Paul J. Fortier and Howard E. Michel, —Computer Systems Performance Evaluation and PredictionII, Elsevier, 2003.
6. Raj Jain, —The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation and ModelingII, Wiley-Interscience, 1991.