

**PERFORMANCE ANALYSIS OF COMMUNICATIONS SYSTEMS**  
**(CSE- 843)**

**Credit Hrs** 3.0

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1. **Pre-requisite:** Communication Systems and Networks.
2. **Course Objectives:** This course will introduce the use of stochastic Petri nets in communications systems engineering and the analysis techniques and algorithms used in performance evaluation. Stochastic models are used for developing and comparing systems. In particular, stochastic Petri nets and non-Markovian models will be taught.
3. **Outcomes:** After the course the student will be able to analyse design, carry out optimization and evaluate modern day wireless, cellular and satellite communication systems
4. **Course Contents:**
  - a. Introduction
    - (1) Communication Systems
  - b. Stochastic Petri Nets
  - c. Tool Support
    - (1) Time Net
    - (2) SPNica: A prototype tool
  - d. Markovian Stochastic Petri Nets
    - (1) Discrete Time
    - (2) Continuous Time
  - e. The Method of Supplementary Variables
    - (1) Analysis of M/G/1 System
    - (2) Analysis of m/G/1/K System
  - f. General State Equations
    - (1) Definitions and Notation
    - (2) Derivation of the state equations

- g. Stationary Analysis
  - (1) General Solution Algorithm
  - (2) Computation of the Integrals
- h. Transient Analysis
- i. General Execution Policies
- j. Reducible Structures
- k. Markov Renewal Theory
- l. Concurrent Deterministic Transitions
- m. Medium Access Control

5. **Text Books/Reference Material:**

- a. Reinhard German, *Performance Analysis of Communication Systems: Modeling with Non-Markovian Stochastic Petri Nets*.
- b. Several handouts and papers.