## ICS2123 STOCHASTIC MODELS

**Credits and contact hours:** 10 UC  Credits /10 hours (2:40 hours lectures; 1:20 hours assistantship and 6 hours individual work hours per week)

**Instructor's name:** Alarcón Alvaro, Gazmuri Pedro, Halcartegaray Pedro, Senosiain Pablo, Villavicencio Alfredo

**Course coordinator's name** Gazmuri Pedro

**Textbook:** Gazmuri, P. Modelos Estocásticos para la Gestión de Sistemas, Ediciones Universidad Católica de Chile, 1995.
Kulkarni, V. Modeling, Analysis, Design and Control of Stochastic Systems, first edition, Springer, 1999.

**Course Catalog Description:** This is an introductory course on stochastic modeling that requires previous background in calculus based probability. The focus is placed on building models that incorporate uncertainty, and computing performance measures or other type of indicator. The course covers discrete time and continuous time Markov chains, giving particular emphasis to Poisson processes and queuing models. Basic concepts of renewal processes, and an introduction to discrete event simulation are also covered.

**Prerequisite Courses:** EYP1113  Probability - Statistics and ICS1113 Optimization

**Co-requisite Courses:** None

**Status in the Curriculum:** Required

**Course Learning Outcomes:**
1. Explain the concept of stochastic process y give stochastic processes examples in continuous and discrete timing.
2. Identify and explain fundamental properties of stochastic processes.
3. Formulate stochastic processes for frequent engineering situations and that meet certain properties and assumptions.
4. Analyze the Markov chains behavior in the short term in continuous and discrete timing with particular emphasis in the Poisson process.
5. Analyze the Markov chains limit behavior in continuous and discrete timing.
6. Describe the renovation stochastic process behavior and calculate the basic probabilities associated to them.
7. Formulate, analyze and compare services (with queue)stochastic

systems models results oriented for Markov chains in continuous
8. Formulate models for non-Markov chains service systems.
9. Explain the fundaments for the stochastic simulation of discrete events. Apply random number generation and variable instances

**Relation of Course to ABET Criteria:**

a. Knowledge of mathematics, science and engineering
b. Design and conduct experiments: analyze and interpret data
e. Identify, formulate, and solve engineering problems

**Topics covered:**

1. Introduction. Basic concepts of stochastic modelling and stochastic processes. Examples.
2. Review of probability concepts.
3. Poisson process.
4. Basic concepts of renewal processes
5. Discrete time Markov chains.
6. Continuous time Markov chains.
7. Queueing systems.
8. Introduction to discrete event simulation.

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