



# Stochastic Processes, Detection, and Estimation

## ECE 7001

**Credit Hours:**

3.00 - 3.00

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**Course Levels:**

Graduate (5000-8000 level)

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**Course Components:**

Lecture

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**Course Description:**

Stochastic processes; detection and decision theory; hypothesis testing, parameter estimation; and applications to communications and signal processing.

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**Prerequisites and Co-requisites:**

Prereq: 6001 (804).

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**Course Goals / Objectives:**

- Learn mathematical properties of stochastic processes
  - Learn the theory of likelihood-ratio based hypothesis testing and signal detection in noise
  - Learn the theory of optimal parameter estimation; properties of estimators; and learn the tools for analysis of the efficacy of parameter estimators
  - Learn to design and analyze optimal and sub-optimal detection and estimation algorithms under realistic conditions
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**Course Topics:**

- Detection theory, decision theory, and hypothesis testing
  - Parameter estimation
  - Stochastic processes, characterization, white noise and Brownian motion
  - Autocovariance, crosscovariance and power spectral density
  - Stochastic processes through linear systems
  - Karhunen-Loeve and sampled signal expansions
  - Detection and estimation from waveform observations, Wiener filters
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**Designation:**

Elective