

ECE 235: STOCHASTIC PROCESSES IN ENGINEERING
TENTATIVE COURSE OUTLINE

1. Events and algebras. Review of probability theory, distribution and density functions, and random variables.
2. Conditional expectation as a random variable. Definition of stochastic processes. Fundamental random processes: Wiener and Poisson. Independent increment processes.
3. Types of convergence (e.g., in probability, mean-square). Central limit theorem.
4. Markov processes. Chapman-Kolmogorov equation. Gauss-Markov processes.
5. Martingale processes and the Doob-Meyer decomposition. Innovations processes.
6. Stochastic calculus. Mean-square derivatives and integrals. Continuity.
7. Spectral representations. Power spectral density and distribution. Application to analysis of linear systems with random inputs.
8. White-noise integrals. Wiener integral. Analysis of linear systems driven by white Gaussian noise.
9. Introduction to estimation theory. Minimum variance estimators. Linear estimation and the noncausal Wiener filter.
10. Spectral factorization and the causal Wiener filter. Recursive filtering and estimation.