

ECE 302 Final Exam Information

July 31, 2016

- The final exam is on Wednesday, August 3, 8:00 - 10:00 AM in PHYS 203.
- The exam will be closed-book, closed-notes, but a scientific calculator may be used. Some reference formula will be provided.
- The exam will contain a mixture of multiple choice questions and work-out problems. No partial credit will be given for multiple choice questions. Partial credit will be given for the work-out problems but work must be shown to receive credit.
- The exam will cover all material from lecture, homework and quizzes.
- Additional office hours will be posted.
- A review session will be held in class on Tuesday, August 2.

Exam Topics:

- Random Experiments
 - Definition of outcomes, events, probability and sample space
 - Types of sample spaces
 - Finding sample spaces and events from description of random experiment.
- Probability Theory
 - Set theory (definitions, operations, properties)
 - Axioms of probability
 - Properties of probability
 - Conditional probability
 - Bayes rule
 - Total probability theorem
 - Independence of Events
 - Sequences of independent experiments (binomial probability law, geometric probability law)
- Random Variables
 - Definition of a random variable
 - Types of random variables (discrete, continuous, mixed)
 - Distribution functions (pmf, cdf, pdf)
 - Functions of one random variable (distribution method, density method)
 - Expectation (mean, variance, moments, central moments, expected value of functions, properties)
 - Conditional distributions (pmf, cdf, pdf, expectation, total probability)
 - Gaussian random variables (pdf, cdf, properties)
 - Important random variables (properties)
 - Characteristic functions (definition, properties, theorems)

- Two Random Variables
 - Distribution functions (jpmf, jcdf, jpdf, properties)
 - Conditional distributions (pmf, pdf, expectation, total probability, bayes theorem)
 - Independence of random variables (definition, properties)
 - Joint expectation (correlation, covariance, properties)
 - Functions of two random variables (distribution method, density method)
 - Jointly Gaussian random variables (definition, properties)
 - Estimation of random variables (MAP, ML, MMSE, LMMSE)
 - Sums of random variables (mean, variance, characteristic function, sample average)

- Random Processes
 - Definition of a random process
 - Analysis of a random process (sample functions, pmf/pdf for fixed t)
 - Mean value function
 - Autocorrelation function
 - Wide-sense stationary processes (definition, properties of autocorrelation function)
 - Poisson process (application of exponential, erlang, and poisson random variables)
 - Power Spectrum Density (definition, properties)
 - Response of LTI systems (mean, autocorrelation of output)

- Practice problems for Midterm 1: 2.14, 2.22, 2.62, 2.77, 2.79 (a)-(c), 2.95, 2.106, 3.7, 3.20, 4.16, 4.17, 4.54 find the cdf and pdf of Y (a)

- Practice problems for Midterm 2: 3.31, 3.53, 3.69, 4.35, 4.56, 4.63, 4.77, 4.105, 4.106, 5.8, 5.105, 5.111

- Practice problems for new material: 6.68, 7.2, 7.9, 9.13 (autocorrelation instead of autocovariance, also find pdf of $Z(t)$), 9.34, 9.63 ((a) and (c))