

# ECE 302 Final Exam Information

July 30, 2016

- The final exam is on Wednesday, August 3, 8:30 - 10:30 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))