

# EC En 670

## Syllabus

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Fall 2012

Professor: Brian Jeffs, 457 CB, phone: 422-3062, email: bjeffs@ee.byu.edu

Office hours: 3:00-5:00 Tue. 11:00-2:00 Thu., 9:00-11:00 Fri., 457 CB.

Text: *Probability and Random Processes For Engineers*,  
4th Ed., H. Stark and J.W. Woods, Pearson, 20012.

Lecture Meeting Schedule: TTh, 9:30-10:45 a.m., 435 CB.

### Course Policies:

#### 1. GRADING

	<u>% of Grade</u>
Midterm (2.5 hour, testing center, Oct. 25-27)	25
Final Exam (3 hour, <u>room 435 CB, 7:00 a.m. Thurs. Dec. 13</u> )	35
Weekly quizzes	20
Homework	20
	<hr/> Total 100

#### 2. EXAMS

All exams are timed, with open books and notes. Students generally may not take the midterm on other than the scheduled dates, so plan to take it at the earliest available time to give yourself an emergency backup day. Makeup exam dates will only be permitted if all scheduled dates conflict with a University excused absence (e.g. basketball team travel, presenting a paper at a technical conference, serious illness, etc.) Exams must be entirely your own work. The midterm is in the testing center on the date noted above. The final exam is at the University scheduled time, in 256 CB. The final WILL NOT be offered at the testing center.

### 3. HOMEWORK

Homework assignments will be made and collected approximately once a week. Collection will be at 4:30 p.m. in the box outside the instructor's office on the assigned due date. Late homework will not be graded, but up to one week late, completed problems will receive half the possible credit.

Cooperative group study on the homework is encouraged, but simply copying someone else's work is unethical and will leave the student unprepared for exams. Solutions will be posted at the time homework is collected. Questions on homework grading should first be addressed to the grader. Un-resolvable differences may be discussed with the professor during office hours.

### 4. QUIZZES

Each week, typically on Tuesdays, there will be a 10 minute closed-book quiz at the beginning of class on material covered in recent lectures and homework. Since we distribute solutions immediately following the quiz no make-up quizzes will be offered for any reason (please don't ask!). However, the lowest three scores from the semester will be dropped in final grading. If you have more than three university excused absences on quiz days, your grade will be computed using the average of the remaining quizzes.

### 5. PREPARATION FOR LECTURES

Reading assignments are shown on the lecture schedule below, and students are expected to come to class having completed the assigned reading. Students will be called on randomly to demonstrate their knowledge of the material by working problems on the board to assist the class in understanding the current discussion topic.

## Lecture Schedule / Topics:

<b>Lecture</b>	<b>Reading Assignment</b>	
<b>Dates:</b>	<b>Sections:</b>	<b>Topics:</b>
Aug. 28, 30	2.6, 3.2, 4.1,4.2	Introduction: Review of Joint pdf, functions of RVs, Expectation
Sep. 4-11	5.1, 5.2, 5.4, 5.5	Random vectors, covariance matrices.
Sep. 13	5.6-5.7	Multivariate Gaussian, vector characteristic func.
Sep. 18-25	6.1-6.4, 6.7,6.9,6.11	Parameter estimation.
Sep. 27, Oct 2	8.1-8.3	Introduction to random sequences.
Oct. 4-11	8.4	WSS random sequences, power spectral density.
Oct. 16, 18	8.5,- 8.8	Markov random sequences, state equations, Convergence properties, Laws of large numbers.
Oct. 23, 25	9.1-9.4	Introduction to random processes.
Oct. 30-Nov. 6	9.5-9.7	W.S.S. processes, power spectrum
Nov. 8, 13	10.1-10.3	Mean-square calculus for random processes.
Nov. 15, 27	10.4-10.6	Ergodicity and KLT, Bandlimited and periodic processes.
Nov. 29	11.3	Wiener filters
Nov. 4	11.2	Kalman filters
Dec. 6	11.4	Expectation Maximization algorithm

## Homework Assignments

(Preliminary. Unless otherwise noted, all problems are from Stark and Woods, 4th Ed.)

### Homework set #1 Due Thurs. Sep. 6

1. Stark and Woods prob. 2.22
2. Stark and Woods prob. 2.30
3. Stark and Woods prob. 2.31
4. Stark and Woods prob. 3.9. This transform on an image is used to deblur or correct contrast in an image.
5. Stark and Woods prob. 3.22. Use the MATLAB rand function to generate the uniform samples, transform them using your solution, and plot a histogram to confirm the pdf is right.
6. Stark and Woods prob. 4.26
7. Stark and Woods prob. 4.34
8. Stark and Woods prob. 4.51

### Homework set #2 Due Thurs. Sep. 13

1. Stark and Woods prob. 5.15  
(To help reason this out, consider  $\hat{\mathbf{R}} = \frac{1}{N} \sum_{k=1}^N \mathbf{X}_k \mathbf{X}_k^T$  where  $\mathbf{X}_k$  is the  $k^{\text{th}}$  sample drawn from vector R.V.  $\mathbf{X}$ .)
2. Stark and Woods prob. 5.21
3. Stark and Woods prob. 5.23
4. Stark and Woods prob. 5.24 a)
5. Stark and Woods prob. 5.26