EE8103 Random processes

Overview

Instructor and Lectures

- **Instructor**
  - Dr. Yifeng He, Assistant Professor
    - **Office**: ENG 324
    - **Tel.**: 4904
    - **Email**: yhe@ee.ryerson.ca

- **Course Website:**
  - http://www.ee.ryerson.ca/~courses/ee8103/
- **Lectures**:
  - Every Thursday, 6 - 9 PM at VIC104
- **Consulting Hours**:
  - Every Thursday, 3 - 5 PM at ENG 324

Course Evaluation

- Quizzes: 4 * 5% = 20%
  - In-class, 30-minute , 2 questions for each quiz
- Midterm Exam: 35%
  - 3-hour
- Final Exam: 45%
  - 3-hour
- **********
  - All quizzes, midterm and final exams are closed-book.
  - One A4 double-sided formula sheet is allowed.

Textbook and References

- Textbook:
  - R.D. Yates and D. J. Goodman, *Probability and Stochastic Processes, a friendly introduction for electrical and computer engineering*, Second Edition, John Wiley & Sons Inc., 2004.

- Other References:
  - Sheldon M. Ross, *Introduction to Probability Models*, Eighth Edition, Academic Press, 2003.
  - A. Papoulis and S. Unnikrishna Pillai, *Probability, Random Variables and Stochastic Processes*, McGraw Hill 2002.
  - M. H. DeGroot and M. J. Schervish, *Probability and Statistics*, Addison Wesley, third edition, 2002.
  - P. Z. Peebles JR, *Probability Random Variables and Random Signal Principles*, McGraw-Hill.

Assignments

- Assignments
  - There are 5 assignments, which are posted on the course website.
  - Although the assignments are not collected, it is highly suggested that students do the assignment questions by themselves.
  - The solutions to the assignments are posted on the course website.

Lecture Overview

- **Chapter 1: Experiments, Models, and Probabilities**
  - Set Operation
  - Sample Space, Events and Probabilities
  - Probability Axioms
  - Conditional Probability
  - Independence
  - Bayes' Theorem
- ***Assignments for Chapter 1***: Assignment 1 (questions 1 - 7)

Lecture Overview (Cont')

- **Chapter 2: Random Variables**
  - Chapter 2.1: Random Variables
    - Random Variables (RVs)
    - Cumulative Distribution Function (CDF)
    - Probability Density Function (PDF)
    - Continuous-type Random Variables: Normal (Gaussian), Uniform, Exponential, and Rayleigh RV
    - Discrete-type Random Variables: Bernoulli, Binomial, Poisson, Uniform, and Geometric RV
  - Chapter 2.2: Statistics of RVs
    - Mean (Expected Value)
    - Variance of a RV
    - Moments and Characteristic Function (CF)
    - Chebychev Inequality
    - Functions of a Random Variable
- *Assignments for Chapter 2*: Assignment 1 (question 8 - 11); Assignment 2 (question 2 - 12); Assignment 3 (question 1, 2, 3, 12, 13)

Lecture Overview (Cont')

- **Chapter 3: Two Random Variables**
  - Chapter 3.1: Distribution Functions of Two RVs
    - Joint PDF
    - Marginal PDF
    - Independence of RVs
    - Functions of RVs
  - Chapter 3.2: Correlation, Covariance, Moments and CF
    - Correlation and Covariance
    - Joint Characteristic Function
    - Independence
  - Chapter 3.3: Gaussian RVs and Central Limit Theorem
    - Jointly Gaussian RVs
    - Central Limit Theorem
  - Chapter 3.4: Conditional Probability Density Functions
  - Chapter 3.5: Conditional Mean
    - Conditional Mean
    - Computing Expectation by Conditioning
    - Computing Probability by Conditioning
- *Assignments for Chapter 3*: Assignment 2 (question 1); Assignment 3 (questions 4, 6 - 11, 14); Assignment 4 (question s1- 6, 11-17)

(Midterm: covers Chapters 1- 3)

Lecture Overview (Cont')

- **Chapter 4: Stochastic Processes**
  - Definition and Types of Stochastic Processes
  - Independent, Identically Distributed Random Sequences
  - Expected Value, Autocovariance, and Autocorrelation of a Stochastic Process
- *Assignments for Chapter 4*: Assignment 3 (question 5)

- **Chapter 5: Markov Chains**
  - Markov Property
  - Classification of States
  - Chapman-Kolmogorov Equation
  - Steady-State Probabilities
- *Assignments for Chapter 5*: Assignment 4 (question 8-10); Assignment 5 (questions 7, 8)

Lecture Overview (Cont')

- **Chapter 6: Exponential Distribution and Poisson Process**
  - Exponential Distribution
  - Poisson Process
  - Composing and Decomposing Poisson Processes
  - Racing Poisson Processes
- *Assignments for Chapter 6*: Assignment 5 (questions 1-6, 9)
- (Final Exam: covers Chapters 1- 6)

Schedule

Lecture No.	Content	Date
Lecture 1	Course Overview and Chapter 1	Sep.15
Lecture 2	Chapter 1 and Chapter 2.1	Sep. 22
Lecture 3	Chapter 2.1, Quiz 1 (at 8:00 PM)	Sep. 29
Lecture 4	Chapter 2.2	Oct. 06
Lecture 5	Chapter 2.2, Quiz 2 (at 8:00 PM)	Oct. 13
Lecture 6	Chapter 3.1 – 3.3	Oct. 20
	Midterm Exam	**Oct. 27**
Lecture 7	Chapter 3.4 – 3.5	Nov. 03
Lecture 8	Chapter 4, Quiz 3 (at 8:00 PM)	Nov. 10
Lecture 9	Chapter 5	Nov. 17
Lecture 10	Chapter 6, Quiz 4 (at 8:00 PM)	Nov. 24
Lecture 11	Chapter 6	Dec. 01
	Final Exam	**Dec. 08**