EE8103 Random processes

Overview

Instructor and Lectures

- **Instructor**
  - **Name**: Dr. Yifeng He
  - **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 ENG LG 12
- **Consulting Hours**:
  - Every Thursday, 3 - 5 PM at ENG 324

Course Evaluation

- Quizzes: 4 * 5% = 20%
  - In-class, 30-minute , each quiz has 2 questions
- 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, posted on the course website.
  - Although the assignments will not be collected, it is highly suggested that student do the assignment problems by themselves.
  - The solutions to the assignments will be 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 (question 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

(Quiz 1)

  - 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

(Quiz 2)

- *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

(Quiz 3)

- *Assignments for Chapter 3*: Assignment 2 (question 1); Assignment 3 (question 4, 6 - 11, 14); Assignment 4 (question 1- 6, 11-17)

(Midterm: covers chapter 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
  - Mean time in Transient States
- *Assignments for Chapter 5*: Assignment 4 (question 7-10); Assignment 5 (question 7, 8)

(Quiz 4)

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 (question 1-6, 9)
- (Final Exam: covers chapter 1- 6)

Schedule

Lecture No.	Content	Date
Lecture 1	Course Overview and Chapter 1	January 15
Lecture 2	Chapter 1 and Chapter 2.1	January 22
Lecture 3	Quiz 1, Chapter 2.2	January 29
Lecture 4	Chapter 3.1 and Chapter 3.2	February 5
Lecture 5	Quiz 2, Chapter 3.3	February 12
Break	Study Week	From February 15 to February 21
Lecture 6	Chapter 3.4 and Chapter 3.5	February 26
	Midterm Exam	March 5
Lecture 7	Chapter 4 and Chapter 5	March 12
Lecture 8	Quiz 3, Chapter 5	March 19
Lecture 9	Chapter 6	March 26
Lecture 10	Quiz 4, Chapter 6	April 2
Lecture 11	Review	April 9
	Final Exam	April 16