EE 214 Probability and Random Processes in Electrical Engineering

Study Guide: Module 1

Expected Duration:
2 Weeks (Sept 27 - Oct 8, 2021)

Objectives
The objectives for this module are to:
- review the concept of discrete and continuous random variables
- compute for expected values and variance of random variables
- transform one random variable to another using a transformation function
- simulate simple events, measure mean and variance, and plot results

Introduction
This module covers random variables. Most, if not all, of the topics in this module should have been covered in the undergrad prerequisite course. Note that some parts are also covered in the diagnostic quiz in the previous module. We will also start simulating in this module.

Activity 1: Review
Some parts of this module are already covered in the diagnostic quiz from the previous module. If you missed some questions in the diagnostic quiz that are related to random variables, you may check the materials for these topics. For topics you may not have encountered in the undergraduate course, lecture slides are also provided. Once you have gone through all the materials you might not have encountered before, or need to review, try out the **online quiz** in UVLe. You will be given 2 tries to take the quiz, and the higher score will be retained.

The detailed topics for this module are as follows:

Topic	Reading Materials	Video/s	Others
Discrete Random Variables, PMFs, CDFs, Transformation of Discrete RVs	Lecture 1A slides; Ref 1: 2.1 - 2.4	MIT OCW Discrete Random Variables[4]	Ref 2: Chap 5
Expected Values and	Lecture 1B slides		Ref 2: Chap 6

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[4] https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013/unit-i/lecture-5/#?w=535

Variance of a Discrete RV			
Continuous Random Variables, PDFs, CDFs, Transformations	Lecture 2A slides	MIT OCW Continuous Random Variables[5]	Ref 2: Chap 10
Expected Values and Variance of a Continuous RV	Lecture 2B slides		Ref 2: Chap 11

References:

[1]   Bertsekas, Dimitri, and John Tsitsiklis. Introduction to Probability. 2nd ed. Athena Scientific, 2008. ISBN: 9781886529236.

[2]   Kay, Steven. Intuitive Probability and Random Processes using MATLAB. Springer, 2005. ISBN: 978-0387241579

[3]   Peebles, Peyton Z. Probability, Random Variables and Random Signal Principles, 2nd ed. McGraw-Hill. ISBN 007-049219-0

Activity 2: Simulation

Simulations will be done all throughout the course. We will be using MATLAB for our simulations. For those without MATLAB yet, you may avail of the MATLAB Access for UPD[6]. After installation, start by going through the **Lab Exercise 1**. You are to answer the questions in the lab manual and submit a report via the UVLe submission bin. *You need to be able to finish this exercise before you can proceed to the next module*.

Activity 3: Modeling

Now that you've finished Lab Exercise 1, you are now ready to do the exercises needed for this course. Now, move on to **Lab Exercise 2**.

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[5] https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013/unit-ii/lecture-8/#?w=535
[6] https://www.mathworks.com/academia/tah-portal/university-of-the-philippines-diliman-31501203.html