

Adama Science and Technology University

1	School: Electrical Eng. & Computing			Department: Electronics & Communication Eng.			
2	Course Category	Major Mandatory					
	Course Name	Probability & Random Processes					
	Course Code:	ECEg4102					
3	Synopsis:	Introducing some application area of probability and random processes and revising Set theory, Function, Factorial, Permutation and Combination. Basic concept of Probability Theory: Probability models and axioms, Conditional probability, total probability, Independence and Bayes' the0rem. Random Variables, Probability Distributions and Densities function, Discrete and Continuous random variables, Gaussian Random Variable and Q-Function, Conditional Distribution and Density Function. Expectations, variances, moments, Expectation of a Function of Random Variable, Characteristic Function, Central Limit Theorem and Transformation of Random Variables. Two and more random variables and their joint distributions and densities. Random processes, Auto and cross correlation Functions, covariance, Stationary Random Processes, Ergodic Random Processes and Power Spectral Density Function. Introduction to parameter estimation and prediction.					
4	Name(s) of Academic Staff:	Dr. Ram Sewak Singh					
5	Semester and Year offered:	Semester:	I	Year:	III		
6	Credit Hour:	3					
7	Prerequisite/ Co-requisite: (if any)	Maths1102-Applied Mathematics II					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	Discuss about fundamental of probability theory & random processes and illustrate these concepts with electrical engineering applications.					
	CLO2	Characterize probability models and function of random variables based on single & multiples random variables.					
	CLO3	Evaluate and apply moments & characteristic functions					
	CLO4	Demonstrate basic principles of random variables and random processes needed in applications					

	CLO5	Explain the concept of random processes and determine covariance and spectral density of stationary random processes.																					
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																						
	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods	Assessment								
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		Test	Quiz	Assignment	Mid Exam	Final Exam				
														L	T	P	O						
	CLO1	√											√	√				√	√	√	√		
	CLO2	√											√	√			√		√	√	√		
	CLO3	√											√	√				√	√		√		
	CLO4		√										√	√			√		√		√		
	CLO5	√											√	√			√	√	√		√		
	Indicate the relevancy between the CLO and PO by ticking “√”on the appropriate relevant box																						
10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)																						
	1	MATLAB software																					
	2																						
	3																						
11	Distribution of Student Learning Time (SLT)																						
	Course Content Outline	CLO	Teaching and Learning Activities												Total (SLT)								
			Guided learning (F2F)				Guided Learning (NF2F)		Independent Learning (NF2F)														
			L	T	P	O																	
	Chapter 1: INTRODUCTION		CLO1	√	√			√		√						5hr							
	1.1 Application																						
	1.2 Review of Set theory																						
	1.3 Review of Factorial, Permutation and Combination																						
	Chapter 2: BASIC CONCEPTS OF PROBABILITY THEORY		CLO2	√	√			√		√						20hr							

2.1 Introduction								
2.2 Experiment, Sample Space and Events								
2.3 Discrete and Continuous Sample								
2.4 Probability and Properties of Event								
2.5 Axiom of Probability								
2.6 Conditional Probability								
2.7 Total Probability								
2.8 Independent Events								
2.9 Bayes's Theorem								
Chapter 3: RANDOM VARIABLES	CLO2	√			√	√		25hr
3.1 Random Variables								
3.2 Discrete and Continuous Random Variables								
3.3 Probability Density Function								
3.4 Cumulative Distribution Functions								
3.5 Joint Probability Density and Distribution Functions								
3.6 Gaussian Random Variable and Q-Function								
3.7 Other Important Random Variables								
3.8 Conditional Distribution and Density Function								
Chapter 4: EXPECTATION	CLO3	√	√		√	√		20hr
4.1 Moments and Variance								
4.2 Expectation of a Function of Random Variable								
4.3 Characteristic Function								
4.4 Expectation of a Function of Two Random Variables								
4.5 Sum of Mutually Independent Random Variables								
4.6 Central Limit Theorem								

4.7 Transformation of Random Variables									
✓ Monotonically Increasing Functions									
✓ Monotonically decreasing Functions									
✓ Non monotonic Functions									
Chapter 5: RANDOM PROCESSES		CLO5	√				√	√	20hr
5.1 Random Process and Ensembles									
5.2 Autocorrelation Functions									
5.3 Cross-Correlation Functions									
5.4 Stationary Random Processes									
5.5 Ergodic Random Processes									
5.6 Properties of Autocorrelation Function									
5.7 Properties of Cross Correlation Function									
5.8 Power Spectral Density Function									
Chapter 6: ESTIMATION THEORY		CLO4	√				√	√	5hr
6.1 Criteria of Estimators									
6.2 Estimation of Random Variables									
6.3 Estimation of parameter									
Total									95hr
Assessment									
Continuous Assessment		Percentage Total-50(%)		F2F		NF2F		SLT	
1	Quiz	10%		√				1hr	
2	Attendance	5%		√				1.5hr	
3	Assignment	15%				√		8hr	
4	Mid exam	20%		√				2.5hr	
						√		9hr	

	Total				22hr
	Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
			√		3hr
	Grand Total SLT				120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.				
1 2	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room ...etc.)	1	MATLAB Software		
		2	Computer lab		
		3	Choose an item.		
		4	Choose an item.		
		5	Choose an item.		
1 3	Text book and reference: (note: ensure the latest edition /publication)	1	Donald G. Childers: probability and random processes using MATLAB with applications to continuous and discrete time systems-Richard D. Irwin(1997)		
		2	Miller, Scott L., Childers, Donald: Probability and Random Processes , with application to signal processing & communication, Oct, 2004		
		3	Albert Leon-Garcia ,” Probability and Random Processes for Electrical Engineering”, 2/E Publisher: Prentice Hall, 1994		
		4	Karalov, Leonid B., Sinai, Yakov G: Theory of probability and random processes Springer, 2 nd ed., (2007)		
		5	Venkatarama_Krishnan-Probability_and_random_processes-Wiley-Interscience(2006)		