Adama Science and Technology University (ASTU)
College of Electrical Engineering and Computing
Electronics and Communication Engineering
Department

Mission	Statement
M1	Produce ethical and internationally competent graduates in applied science and Technology through quality education.
M2	Conduct problem solving research.
M3	Provide demand driven community service.
M4	Serve as center for innovative knowledge and technology transfer for variousindustries.

PEO	Statement
PEO-1	To provide graduates with a strong foundation in mathematics, science and engineering fundamentals to enable them to devise and deliver efficient solutions to challenging problems in Electronics &Communications Engineering.
PEO-2	To produce ethically competent and technically qualified Electronics and Communication Engineers with the potential to become leaders in Industries and Companies associated with Electronics and Communication Engineering, and able to pursuer search or have successful Career in Academia.
PEO-3	To produce Electronics and Communication Engineers who are committed to sustainable development of Electronics and Communication Systems Companies and Industries for the Betterment of society and nation.
PEO-4	To prepare graduates that can critically analyze existing literature in an area of specialization and ethically develop innovative and research-oriented methodologies to solve the problems identified to support the socio-economic development of the nation.

1. Mapping of PEO with Missions

M /	M1	M2	M3	M4
PEO-1	√			
PEO-2				√
PEO-3			√	
PEO-4		√		

2. Student out comes (SO):

SO	Statement
SO-1	An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science, and mathematics.
SO-2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
SO-3	An ability to communicate effectively with a range of audiences.
SO-4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
SO-5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
SO-6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
SO-7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

3. Mapping of SO with PEO

PE / SO	PEO-1	PEO-2	PEO-3	PEO-4
SO-1	√			
SO-2			√	
SO-3		√		
SO-4		√		
SO-5		√		
SO-6				√
SO-7				√

4. Course Outline

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:	ECEg3103				
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:					
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 Student Learning Outcomes, Teaching Methods and Assessment:					

	Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)															
		SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
									L	T	P	O	Test	Quiz	Assignment	Mid Exam	Final Exam
	CLO1	√							√	√				√	√	√	√
	CLO2	√							√	√			√		√	√	√
	CLO3	√	√						√	√				√	√		√
	CLO4	√	√						√	√			√		√		√
	CLO5	√							√	√			√	√	√		√
	Indicate the relevancy between the CLO and SO 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						
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
			L	T	P	O			
	Chapter 1: **INTRODUCTION**	CLO1	2hr	1hr			1hr	2hr	6hr
	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	5hr	5hr			4hr	6hr	20hr
	2.1 Introduction								
	2.2 Experiment, Sample Space and Events								
	2.3 Discrete and Continuous Sample Space								
	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's1 Theorem								
	Chapter 3: **RANDOM VARIABLES**	CLO2	7hr	7hr			3hr	8hr	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	5hr	5hr			3hr	7hr	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	4hr	4hr			3hr	9hr	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	2hr	2hr			1hr	2hr	7hr
	6.1 Criteria of Estimators								
	6.2 Estimation of Random Variables								
	6.3 Estimation of parameter								
	Total								98hr

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	√		1hr
2	Test	10%	√		2hr
3	Assignment I	5%		√	6hr
4	Assignment II	10%	√		8hr
4	Mid exam	20%		√	2hr
Total					19hr

Final Exam	Percentage 50 (%)	F2F	NF2F		SLT
					3hr
Final-Exam	50	√			120hr
				Grand Total SLT	

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.

12	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.
13	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, 2nd ed., (2007)
		5	Venkatarama_Krishnan-Probability_and_random_processes-Wiley Interscience(2006)