Course Specification

(Postgraduate Programs)

Course Title:	**Random Signal Analysis I**
Course Code:	2202-531
Program:	Master in Electrical Engineering
Department:	Electrical Engineering
College:	College of Engineering
Institution:	King Faisal University
Version:	V2
Last Revision Date:	14 April 2025

Table of Contents

A. General information about the course: 3

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods: 4

C. Course Content: 6

D. Students Assessment Activities: 6

E. Learning Resources and Facilities: 7

F. Assessment of Course Quality: 8

G. Specification Approval Data: 8

A. General information about the course:

1. Course Identification:

1. Credit hours: (3)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 2/1st year					
4. Course General Description:					
This course introduces the fundamentals of random variables, random signals, and simulation of random phenomena. Topics include random variables and their key characteristics, sequences of random variables and central limit theorem, properties of random processes, correlation and spectral analysis, linear systems with random inputs, and prediction of random signals.					
5. Pre-requirements for this course (if any)**:**					
Graduate Student Standing					
6. Co-requisites for this course (if any)**:**					
None, but students must have taken some fundamentals of communication during their BS.					
7. Course Main Objective(s):					
To understand the concept and evaluate random variables and random processes and their properties.					

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Assignments**	0
3.	**Library**	0
4.	**Projects/Research Essays/Theses**	0
5.	**Others (specify)……**	
	Total	45 Hours

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Understand how to make the transition from a real-world problem to a random/probabilistic model.	K1	Lectures	-Assignments -Exams
1.2	Distinguish between random processes and random variables and their properties. Evaluate random variables under single, multiple and many scenarios.	K1	Lectures and Case Study	-Assignments -Exams
2.0	**Skills**			
2.1	Apply the fundamental concepts and methods of probability and random signals to develop an awareness of the key models and their interrelationships.	S1	Lectures	-Short assignments
2.2	Design and analyze random discrete-time and continuous-time signals and systems.	S2	Lectures	Matlab/ programming tools

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.3	Perform frequency domain analysis on random signals and systems.	S1,S2	Lectures	-Assignments -Exams
2.4	Design linear filters operating on random signals	S2	Lectures	Matlab/ programming tools
2.5	Use measurement data to formulate models for random signals and systems	S1	Lectures	-Assignments -Exams
2.6	Design a variety of computer-based components, programs and systems for applications including signal processing, communications, computer networks, and control systems	S2	Lectures	Matlab/ programming tools and case study
3.0	**Values, autonomy, and responsibility**			
3.1	Acquire lifelong experience in doing projects related to random signals using Matlab programming tools.	V3	Lectures and Study Cases	-Assignments -Exams

C. Course Content:

No	List of Topics	Contact Hours
1.	Basic of Monte Carlo computer simulation in Matlab, and one discrete random variable	6
2.	One continuous random variable and mixed random variables	3
3.	Two jointly distributed continuous random variables	3
4.	N jointly distributed continuous random variables, Limit theorems	6
5.	Hands-on experiments with Matlab (simulation and analysis of random variables)	3
6.	Basic Random Processes	3
7.	Wide Sense Stationary Random Processes	3
8.	Linear Systems and Wide Sense Stationary Random Processes	3

9.	Hands-on experiments with Matlab (simulation and analysis of random signals)	3
10	Multiple Wide Sense Stationary Random Processes	3
11	Gaussian Random Processes	6
12	Prediction of a Random Variable and Wiener Filtering	3
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Weeks 2,4,8,10,12,14	15%
2.	Project	Week 13	15%
3.	Quizzes	Weeks 3,5,9,11,13	20%
4.	Midterm	Week 7	20%
5.	Final Exam	Week 16	30%
	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	S. M. Kay, Intuitive Probability and Random Processes using Matlab. New York: Springer, 2006.
Supportive References	Handouts
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom : 30 seats
Technology equipment (Projector, smart board, software)	Data show: 1 Laptop
Other equipment (Depending on the nature of the specialty)	MATLAB

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect: Online Course Evaluation survey
Effectiveness of students' assessment	EE Faculty members and Students	Direct: Course Report Presentation Direct: Assessment using student grades Indirect: Assessment of CLOs
Quality of learning resources	Students and Instructor	Direct: Course Report
Overall course quality	Course Instructor	Direct: Course Report Presentation
Improvement Plans	EE Department	Course Report Presentation

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**EE DEPARTMENT QUALITY COMMITTEE**
REFERENCE NO.	**MEETING # 10**
DATE	**APRIL 19, 2025**