Course Specification

(Postgraduate Programs)

Course Title:	Communication Systems I
Course Code:	2202- 533
Program:	Master in Electrical Engineering
Department:	Electrical Engineering
College:	College of Engineering
Institution:	King Faisal University
Version:	V2
Last Revision Date:	17 April 2025

Table of Contents

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 1/1st year				
4. Course General Description:				
Principles of communication theory applied to the representation and transmission of information. Topics include essential review on signals and spectra, formatting and baseband modulation, baseband demodulation/detection, bandpass modulation and bandpass demodulation/detection.				
5. Pre-requirements for this course (if any)**:**				
Graduate Student Standing				
6. Co-requirements for this course (if any)**:**				
None, but student must have taken some fundamentals of communications during their BS program				
7. Course Main Objective(s):				
In this course, the overall digital communication system, basic signal transformations, main concepts of random variables, and additive white Gaussian noise (AWGN) mode are reviewed. Moreover, the relationship between power spectral density and autocorrelation, and the basics of signal transmission through linear systems are established. The course includes in-depth coverage of formatting, baseband signaling, the detection of signals in Gaussian noise, and receiver optimization and finally the bandpass signaling and its associated modulation and demodulation/detection techniques.				

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.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)……**	
	Total	45

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	Explain the building blocks of digital communication systems and the transition from analog to digital communications.	K1	Lectures	HW and Exams
1.2	Identify several digital modulation techniques.	K1	Lectures	HW and Exams
2.0	**Skills**			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.1	Apply sampling and quantization theorems to convert analog signals to digital	S1	Lectures	HW and Exams
2.2	Analyze the performance of digital modulation schemes over AWGN channels and choose appropriate modulation schemes.	S1	Lectures	HW and Exams
2.3	Calculate communication system parameters such as power, SNR, bandwidth and data rate.	S1	Lectures	HW and Exams
2.4	Design digital communication systems (e.g., choose modulation scheme, coherent vs. non-coherent), given constraints on data rate, bandwidth, power, and bit error rate.	S2	Lectures	HW and/or Project(s)
2.5	Use MATLAB in simulation projects to solve computational problems in digital communication systems and show the results in a presentation and/or a report.	S2	Lectures with Illustrative MATLAB Simulations	HW and/or Project(s)
3.0	**Values, autonomy, and responsibility**			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.1	Use MATLAB in simulation projects to solve computational problems in digital communication systems and show the results in a presentation and/or a report.	V1	Lectures with Illustrative MATLAB Simulations	HW and/or Project(s)
3.2	Read literature in Digital Communication Systems and write a review article on a selected topic	V2	Lectures	Review Article and Presentation

C. Course Content:

No	List of Topics	Contact Hours
1.	Essential review on signals and spectra	6
2.	Formatting and baseband modulation	12
3.	Baseband demodulation/detection	9
4.	Bandpass modulation	9
5.	Bandpass demodulation/detection.	9
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Project(s) / Homework / Presentation(s)	Once in every three weeks	35%
2.	Midterm Exam	Week 8	25%
3.	Final Exam	Week 16	40%
	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	Simon Haykin, Michael Moher, Communication Systems, 5th ed., Wiley, 2009.
Supportive References	1. Bernard Sklar and Fredric Harris, Digital Communications: Fundamentals and Applications, 3rd ed., Pearson, 2020. 2. John Proakis, Masoud Salehi, Digital Communications, 5th ed., McGraw Hill, 2008. 3. Simon Haykin, Digital Communication Systems, Wiley, 1st ed, 2014.
Electronic Materials	KFU Blackboard: https://bblms.kfu.edu.sa/ KFU Electronic Library: https://www.kfu.edu.sa/en/Deans/Library/Pages/elibrary1.aspx IEEE Communications Society: https://www.comsoc.org/
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 Survey
Effectiveness of students' assessment	Students and Faculty	Direct and Indirect Assessment
Quality of learning resources	Students and Faculty	Indirect- Online Survey
The extent to which CLOs have been achieved	Students and Faculty	Direct and Indirect Assessment
Other	None	None

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**