



Course Specification

— (Bachelor)

Course Title: Data Communication
Course Code: CEN 1402
Program: Bachelor in Computer Engineering
Department: Computer Engineering
College: Faculty of Computers and Information Technology
Institution: University of Tabuk
Version: 1.0
Last Revision Date: 27 July 2022



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	5
E. Learning Resources and Facilities	5
F. Assessment of Course Quality	6
G. Specification Approval	6



A. General information about the course:

1. Course Identification

1. Credit hours: (4)

2. Course type

A. University College Department Track Others
B. Required Elective

3. Level/year at which this course is offered: (7/4)

4. Course general Description:

To develop an understanding of the various aspects of data communications and computer networking systems. Topics include: Data and Signals: analog or digital signals, periodic and nonperiodic signals, transmission impairment, data rate limit, performance of data transmission; Digital Transmission: digital-to-digital, line-coding, block coding, analog-to-digital conversion, Pulse code modulation, delta modulation; Analog Transmission: digital-to-analog conversion, amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK), quadrature amplitude modulation (QAM), analog-to-analog conversion, amplitude modulation (AM), frequency modulation (FM), phase modulation (PM); Bandwidth Utilization, Multiplexing and Spectrum Spreading: frequency-division multiplexing (FDM), wavelength division multiplexing (WDM), frequency hopping spread spectrum (FHSS), direct sequence spread spectrum (DSSS); Transmission Media: characteristics and applications of guided and unguided media, twisted-pair cables and, coaxial cables, fiber-optic cables; Error Detection and Correction: types of errors, the concept of redundancy, block coding, cyclic codes, CRC, checksums, forward error correction, Hamming code.

5. Pre-requirements for this course (if any):

CEN 1303

6. Co-requisites for this course (if any):

N/A

7. Course Main Objective(s):

- Define and understand the meaning and role of a protocol, the concept of layering, appreciate the role of the TCP/IP model, and identify the major functions at each layer.
- Describe how bits are represented as a signal on various physical media of data communication systems, which include A/D conversion, modulation, spread spectrum, synchronous and asynchronous communications, multiplexing, and framing.
- Understand the various types of transmission media and their signal propagation characteristics associated with signal bandwidth.
- Demonstrate understanding of the basic concepts of error detection, checking, and correction.
- Analyze performance of communication systems in transmitting data signals.

2. Teaching mode (mark all that apply)





No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning	-	-
3	Hybrid <ul style="list-style-type: none"> • 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	30
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		75

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Understand basic concepts of data communications and layered architecture of communication protocols	K1	Lectures, textbooks, provided handouts, references, lab sessions	Exams, quizzes, assignments, labwork and the project
1.2	Explain basic concepts of communication systems and information theory	K1		
1.3	Identify basic data communication systems performance, properties, and characteristics.	K3		
1.4	Understand concepts and techniques in error detection and correction, bandwidth	K4		





Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	utilization, and Spread Spectrum.			
1.5	Understand digital signal transmission, encoding and multiplexing techniques, data transmission and impairments	K5		
2.0	Skills			
2.1	Analyze, design, and improve data communication networks.	S3	Lectures, textbooks, provided handouts, references, lab sessions	Exams, quizzes, assignments, labwork and the project.
2.2	Analyze data communication system performance	S2		
2.3	Criticize a data communication system for a certain application.	S3		
3.0	Values, autonomy, and responsibility			
3.1	The ability to demonstrate work within a team	V2	Lectures, textbooks, provided handouts, references, lab sessions	Exams, quizzes, assignments, labwork and the project.
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to communications and Networking. Lab: An overview of MATLAB	5
2.	Data and Signals: analog or digital signals, periodic and nonperiodic signals. Lab: MATLAB simulation analyzing analog and digital signal characteristics.	5
3.	Data and Signals: Transmission impairment, data rate limit, performance of data transmission. Lab: MATLAB simulation assessing the impact of transmission impairments on data transmission.	5
4.	Digital Transmission: digital-to-digital, line-coding, block coding. Lab: MATLAB implementation of digital-to-digital transmission techniques, line coding, and block coding.	5
5.	Digital Transmission: analog-to-digital conversion, Pulse code modulation, delta modulation. Lab: Implement experiments for pulse code modulation.	5
6.	Digital Transmission: delta modulation. Lab: Implement experiments for delta modulation.	5
7.	Analog Transmission: digital-to-analog conversion, amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK). Lab: MATLAB simulation for digital-to-analog conversion and various analog modulation techniques.	5
8.	Analog Transmission: quadrature amplitude modulation (QAM), analog-to-analog conversion, and Amplitude modulation (AM).	5





	Lab: MATLAB implementation of analog-to-analog conversion and modulation techniques, including QAM and AM.	
9	Analog Transmission: frequency modulation (FM), phase modulation (PM). Lab: MATLAB implementation of analog-to-analog conversion and modulation techniques, including FM and PM.	5
10.	Understands the concepts of Spectral Characteristics of AM & FM, and the principles of Error Detection and Correction. Lab: MATLAB experiments for Spectral Characteristics of AM & FM and Error Detection and Correction.	5
11.	Bandwidth Utilization, Multiplexing and Spectrum Spreading: frequency-division multiplexing (FDM). Lab: MATLAB simulation for FDM and FHSS to understand bandwidth utilization and multiplexing techniques.	5
12.	Bandwidth Utilization, Multiplexing and Spectrum Spreading: wavelength division multiplexing (WDM). Lab: MATLAB simulation for WDM to understand bandwidth utilization and multiplexing techniques.	5
13	Transmission Media: characteristics and applications of guided and unguided media, twisted-pair cables and, coaxial cables, fiber-optic cables. Lab: MATLAB-based analysis of different transmission media characteristics, focusing on guided and unguided media.	5
14.	Error Detection and Correction: types of errors, the concept of redundancy, block coding, cyclic codes, CRC. Lab: MATLAB implementation to explore error detection and correction techniques, including block coding, cyclic codes, CRC.	5
15.	Error Detection and Correction: checksums, forward error correction, Hamming code. Lab: MATLAB implementation to explore error detection and correction techniques, including checksums, and Hamming code.	5
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments, Quizzes	5,14	10%
2.	labwork	2-15	10%
3.	Two Midterm Exam	7,12	30%
4.	Project	15	10%
5.	Final Exam	16	40%

*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	Data Communications and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill Higher Education, ISBN: 0072967757
Supportive References	Data and Computer Communications, W Stallings, Prentice Hall, ISBN: 0-02-415425-3



Electronic Materials	-
Other Learning Materials	-

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom, laboratory
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	TBA

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Teaching	Faculty, Program Leaders, and Advisory Board	Both Direct and Indirect
	Students	Indirect
Effectiveness of Students Assessment	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Both Direct and Indirect
Quality of Learning Resources	Faculty, Students, and Advisory Board	Indirect
The Extent to which CLOs have been Achieved	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Direct (as in section B) and Indirect/Surveys
	Students	Indirect
Other	-	-

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	



