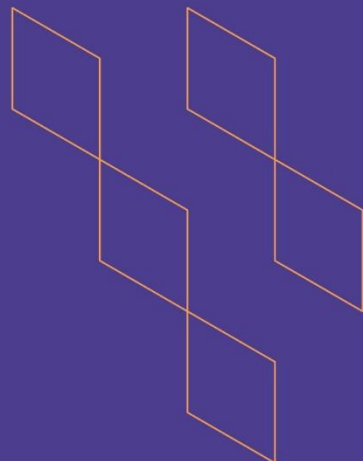




T-104
2022

Course Specification



Course Title: Data Communication & Computer Networks
Course Code: ITEC-251
Program: Bachelor in Information Technology (BIT) Bachelor in Computer Science (BCS)
Department: Information Technology & Security
College: Computer Science and Information Technology
Institution: Jazan University
Version: 1
Last Revision Date: 13-09-2022



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A. General information about the course:

Course Identification

1. Credit hours: 3

2. Course type

a. University ☐ College ☒ Department ☐ Track ☐ Others ☐

b. Required ☒ Elective ☐

3. Level/year at which this course is offered: 4th /6th /2nd Year

4. Course general Description

This is an entry-level course in data communication and networking. This course explains the students with the fundamentals of data communications and networking in detail. The topics include fundamentals of data communications: essential elements of data communications: simplex, half-duplex and full duplex transmission, basic concepts of networking: network criteria, network applications and benefits. Configurations, and categories of networks: line configuration, network topologies (mesh, star, tree, bus, ring, hybrid), internetwork or internet, types of network connection, intranet, and extranet. Introduction to OSI and TCP/IP network models: The OSI Model, The OSI layers, TCP/IP Protocol Suite in detail. Physical layer and media: analog and digital signals, periodic and non-periodic signals, signal parameters, time and frequency domains concepts, transmission impairment, transmission media: guided media, unguided media, circuit, and packet switching. Data link layer control: framing, error control and flow control, error detection and correction techniques: VRC, LRC, CRC, checksum, and hamming code techniques. Wired LAN (Ethernet), IP addressing, subnetting, supernetting. networking and internetworking devices, and VLANs. Students will be trained on the existing components and products related to Cisco such as wireless networking, switches, routers, bridges, gateways, repeaters, hubs, cellular communication, and satellite communication.

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

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

7. Course Main Objective(s)

- ✚ Understand the fundamental concepts of data communication and networking.
- ✚ Outline the layering concepts, network models e.g., Open System Interconnect (OSI) and the Internet Model (TCP/IP).
- ✚ Study the concepts of analog and digital transmission, flow control, and error control, error detection and correction techniques in detail.
- ✚ Identify various types of transmission media, network devices, and performance assessment parameters for each guided and unguided media and connecting device. Also, discuss Ethernet and wireless networks.



- Learn and apply the skills acquired concerning physical (MAC) and logical addressing (IP), subnetting and supernetting, network topologies, and VLANs.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	44	100%
2.	E-learning	--	--
3.	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 	--	--
4.	Distance learning	--	--

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	22
2.	Laboratory/Studio	22
3.	Field	--
4.	Tutorial	--
5.	Others (Self-Study + Revision + Final Theory Exam)	8
	Total	52



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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Outline the basic concepts concerning data communication, and networking.	K1	Visual & Verbal [Lectures/ Presentations]	Exams, Assignment
1.2	Summarize the concepts of layered architecture, OSI & TCP/IP network models, and analog and digital transmission.	K2	Visual & Verbal [Lectures/ Presentations]	Exams, Assignment
2.0	Skills			
2.1	Analyze and Compare different error detection and correction mechanisms.	S1	Visual & Verbal [Lectures/ Presentations]	Exams, Assignment
2.2	Create subnets, and VLANs to meet the network requirements of an organization.	S2	Visual & Verbal [Lectures/ Presentations]	Exams, Assignment
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate the ability to work in a group considering collaborative tasks.	V2	Active class participation in group Activities.	Assignment/Se If-Study

C. Course Content

No	List of Topics	Contact Hours
1.	UNIT-1: Overview of Data Communication & Networking <ul style="list-style-type: none"> Introduction to Data Communication Effectiveness of Data Communication Components of Data Communication System Simplex, Half-Duplex, Full-Duplex Data Flow Introduction to Networks Network Criteria, Types of Connection Network Topologies (Star, Bus, Ring, Mesh, Tree, Hybrid) Network Categories (LAN, MAN, WAN), Internet, Intranet, Extranet Protocol, Key Elements of Protocols, Standards 	4T + 4P
2.	UNIT-2: Network Models <ul style="list-style-type: none"> Layering Architecture Concepts 	4T + 4P



	<ul style="list-style-type: none"> • TCP/IP or Internet Model • Organization of Layers • Functions of TCP/IP Layers • Physical Layer & its Responsibilities • Datalink Layer and its Responsibilities • Network Layer and its Responsibilities • Transport Layer and its Responsibilities • Application Layer and its Responsibilities • Addressing (Physical, Logical, Port, & Specific) • Flow Control, Error Control, & Segmentation • OSI Model & its Layers • Session Layer and its Responsibilities • Presentation Layer and its Responsibilities • Comparison of TCP/IP & OSI Network Models 	
3.	<p>UNIT-3: Signals, Multiplexing, and Switching</p> <ul style="list-style-type: none"> • Analog, and Digital Data • Periodic and Aperiodic Signals • Period, Frequency, Amplitude, and Phase Shift • Time and Frequency Domain of a Sine Wave • Bandwidth of Periodic and Non-Periodic Composite Signals • Baseband and Broadband Transmission • Transmission Impairment, and its Causes • Attenuation, Distortion, and Noise • Types of Noise (Thermal, Induced, Crosstalk, and Impulse) • Signal to Noise Ratio (SNR) • Performance Parameters (Bandwidth, Throughput, Latency) • Propagation, Transmission, and Queuing Time • Switching, and Switching Networks • Circuit Switching, Packet Switching • Multiplexing, Frequency Division & Time Division Multiplexing • Datagram Networks, and Virtual Circuit Networks • Self-Study: All solved examples related to all topics of Unit-3 	4T + 4P
4.	<p>UNIT-4: Error Detection & Correction, Wired LAN, and IP Addressing</p> <ul style="list-style-type: none"> • Error and Types of Error • Single Bit Error, and Burst Error • Error Detection, its Methods • Parity Check, 2D Parity Check, CRC, Polynomials, & Checksum • Error Detection Mechanisms • Retransmission, Forward Error Correction, and Burst Error Correction • Hamming Codes • Wired LAN (Ethernet-IEEE 802.3), Ethernet Evolution, Categories of Standard Ethernet 	4T + 4P





	<ul style="list-style-type: none"> Fast Ethernet and its Implementation Unicast, and Multicast Addresses IPv4 Addresses, Notations, Classful (Classes & Blocks) IP Addressing Subnetting, and Supernetting Self-Study: All solved examples related to topics of Unit-4 	
5.	UNIT-5: Transmission Media, Connecting Devices, and VLANs <ul style="list-style-type: none"> Introduction to Transmission Medium Classification of Transmission Media Guided Media Twisted-pair, Coaxial, and Optical Fiber Cables STP Versus UTP, Categories of Coaxial Cable, BNC Connectors, Applications of Coaxial Cable Fiber Optic Cable and its Construction, Connectors, and Applications, Advantages and Disadvantages Unguided Media (Wireless), Propagation Methods of Wireless Transmission 	
6.	<ul style="list-style-type: none"> Types of Wireless Transmission Waves (Radio, Microwave, Infrared) Bands of Wireless Transmission Propagation Types of Antenna for Wireless Transmission Cellular Telephony, Satellite Networks, Orbits Categories of Satellites Networks (GEO, MEO, LEO) Connecting Devices Passive Hubs, Active Hubs, Repeaters, & Bridges Switches, Routers, and Gateways Collision Domains, Backbone Networks Virtual Local Networks (VLANs), VLANs Membership, VLANs Advantages 	6T + 6P
7.	<ul style="list-style-type: none"> Self-Study + Revision + Final Theory Exam 	4T + 4P
Total		26T + 26P

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exam	5-7 th	15%
2.	Assignment	6 th	20%
3.	Quiz	8 th	5%
4.	Final Lab Exam	10-11 th	20%
5.	Final Theory Exam	12-13 th	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	❖ Behrouz A Forouzan, Data Communications and Networking, 6 th Edition, 2022, ISBN-13: 978-1-26-436335-3.
Supportive References	❖ William Stallings, "Data and Computer Communication", Pearson Education, 10 th Edition, 2014, ISBN-13: 9781292014388. ❖ James Kurose, "Computer Networking: A Top-Down Approach", Pearson, 8 th Edition, 2021, ISBN-13: 9780136681557. ❖ Larry Peterson, "Computer Networks: A Systems Approach", Morgan Kaufmann, 6 th Edition, 2022, ISBN-13: 9780128182000 Andrew Tanenbaum, "Computer Networks", 6 th Edition, 2021, ISBN 13: 9781292374062.
Electronic Materials	✓ http://highered.mheducation.com/sites/0073376221/information_center_view0/index.html ✓ http://williamstallings.com/DataComm/ ✓ https://book.systemsapproach.org/
Other Learning Materials	Cisco Packet Tracer, Networking Toolkit

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom / Labs
Technology equipment (projector, smart board, software)	Projector, Smart Board, Cisco Packet Tracer
Other equipment (depending on the nature of the specialty)	Networking Tool Kit, Cables, Network Devices

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	HOD/QAU/PL/Students	Indirect
Effectiveness of students assessment	HOD/QAU/PL/CC	Indirect
Quality of learning resources	HOD/PL/Lab Unit/Students	Direct
The extent to which CLOs have been achieved	PL/QAU/Track Leaders	Direct

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	MEETING NO. 1, AGENDA NO.2
DATE	13/09/2022

