هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title:	Network Architecture & Design
Course Code:	CNET 353
Program:	Computer & Network Engineering
Department:	Electrical & Electronics Engineering
College:	College of Engineering & Computer Science
Institution:	Jazan University
Version:	15
Last Revision Date:	23 September 2024

Table of Contents

A. General information about the course:

1. 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: (6/3)					
4. Course General Description:					
This course provides fundamental knowledge of network infrastructure design. Topics included in this course are strategies for planning, implementing and maintaining different technologies. The students will get familiar with optical networking which is latest technology used for providing network services. WAN protocols, Frame Relay and MPLS are introduced to design the network. This course also gives idea of network design model, Data Center Design					
5. Pre-requirements for this course (if any)**:**					
Computer Networks (CNET 313)					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					
This course will develop the students' ability to learn: •Identify network design strategies and planning considerations. •Design a network infrastructure according to the user requirements. •Describe the network design methodology & network lifecycle. •Describe the data center design and challenges in DC. •Implement the WAN protocols Frame Relay & MPLS.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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**	26
2.	**Laboratory/Studio**	26
3.	**Field**	--
4.	**Tutorial**	--
5.	**Others (specify)**	8
Total		60

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	**Describe** various switching techniques and fiber optics communication.	K2	● Lectures ● Classroom discussions ● Lab exercises	● Mid-Term Exam ● Assignment 1 ● Mini Project ● Final Exam
1.2	**Explain** different network media types to be used with different WAN protocols.	K3	● Lectures ● Classroom discussions ● Lab exercises	● Mid-Term Exam ● Lab Exam ● Mini Project Final Exam
2.0	**Skills**			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.1	**Apply** network design concepts and methodologies for WAN.	S2	• Lectures • Classroom discussions • Lab exercises	• Mid-Term Exam • Assignment 1 • Mini Project • Final Exam
2.2	**Analyze** various network design models with protocols	S5	• Lectures • Classroom discussions Lab exercises	• Mid-Term Exam • Lab Exam • Mini Project Final Exam
2.3	**Demonstrate** different network design methods & data center components with its challenges	S2	• Lectures • Classroom discussions • Lab exercises	• Mid-Term Exam • Lab Exam • Mini Project • Final Exam
2.4	**Design** a Network for an enterprise or campus using various tools and techniques.	S3	• Lectures • Classroom discussions • Lab exercises	• Lab Exam • Mini Project • Final Exam
2.5	**Communicate** effectively in group presentations to demonstrate their work.	S4	• Lectures • Classroom discussions • Lab exercises	• Lab Exam • Mini Project • Final Exam
3.0	**Values, autonomy, and responsibility**			
3.1	**Encourage** designing a network solution with decisions favoring environmental and societal context.	V3	• Lectures • Classroom discussions • Lab exercises	• Lab Exam • Mini Project

C. Course Content

No	List of Topics	Contact Hours
1.	**Chapter – 1: Fiber Optics Transmission** **Introduction to Fiber-Optic Transmission** **Structure of Fiber- Optics** **Advantages & Disadvantages of Fiber-Optic Communication** **Mode in Fiber Optics** • **Single-Mode in Fiber optics** • **Multi-Mode in Fiber Optics** **Light Sources** **Photo Detectors Optical Modulation**	4T + 4P

	Direct Modulation **External Modulation** **SONET** ● **SONET (Synchronous Optical Network) Network Architecture/Layers** **Synchronous Optical Network Equipment**	
2.	**Chapter – 2: Switching** **Switching and Why It Is Important?** **Types of Switching** ● **Switching of Physical circuits** ● **Switching of Time Division Multiplexing signals** ● **Cells/Packets Switching** **Packet Switching** **Circuit Switching** **Traffic Patterns** ● **Benign Loads** ● **Hotspot Loads** **Queues structures** **Queuing Systems**	6T + 6P
3.	Chapter - 3: WAN Protocols Frame Relay (FR) Introduction Frame Relay frame format ● DLCI (Data Link Connection Identifier) ● Data Link Connection Identifier Types ● Discard eligibility Frame Relay Design Congestion Control Mechanism Advantages and Disadvantages of Frame Relay MPLS ● MPLS Mechanism ● MPLS Tunnel Properties ● Forwarding plane mechanisms ● LDP (Level Distribution Protocol) ● LDP message types in MPLS ● MPLS Advantages & Disadvantages	6T + 6P
4.	Chapter - 4: Network Design Methodology Cisco Design Lifecycle (Network Life Cycle): Plan, Build, Manage: ● Plan ● Build ● Manage PPDOO phases ● Prepare ● Plan ● Design ● Implement	4T + 4P

	• Operate • Optimize Network Design Methodology • Identifying customer network requirements • Characterizing the existing network • Designing the network topology and Solutions	
5.	Chapter – 5: Network Design Models & Data Center Design Benefits of the Hierarchical Model Hierarchical Network Design • Core layer • Distribution layer • Access Layer Hierarchical Model Examples • Enterprise Campus Module Enterprise WAN	4T + 4P
6.	Enterprise DC (Data Center) Architecture Center Foundation Components • Virtualization • Unified fabric • Unified computing Data Center Topology Components Challenges in the DC Data Center Space Enterprise DC Infrastructure Data Center Storage	2T + 2P
7.	Revision the course contents	2T + 2P
8.	Final Exam	2T + 2P
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Assignments**	**4th Week**	**10%**
2.	**Midterm Exam**	**7th - 8th Week**	**20%**
3.	**Mini Project**	**12th Week**	**10%**
4.	**Lab Exam**	**13th Week**	**20%**
5.	**Final Exam**	**15th Week**	**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	• **Krzysztof Iniewski, Carl McCrosky and Daniel Minoli "Network Infrastructure and Architecture, Designing High-availability Networks", Wiley, 2008, ISBN: 9780471749066** **Anthony Bruno , Steve Jordan "CCDA 200-310 Official Cert Guide" 5th Edition, 2016, Cisco Press, ISBN-13 : 978-1587144547**
Supportive References	**Ina Minei and Julian Lucek, "MPLS-Enabled Applications " 3rd Edition, Wiley, 2011. ISBN-13: 978-0470665459**
Electronic Materials	• https://www.cisco.com/c/en/us/td/docs/solutions/Enterprise/Borderless_Networks/Unified_Access/Unified_Access_Book/UA_Design.html • https://www.cisco.com/c/en/us/products/ios-nx-os-software/multiprotocol-label-switching-mpls/index.html
Other Learning Materials	• **Krzysztof Iniewski, Carl McCrosky and Daniel Minoli "Network Infrastructure and Architecture, Designing High-availability Networks", Wiley, 2008, ISBN: 9780471749066** **Anthony Bruno , Steve Jordan "CCDA 200-310 Official Cert Guide" 5th Edition, 2016, Cisco Press, ISBN-13 : 978-1587144547**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classroom equipped with projector and whiteboard and sufficient seating arrangements.** **Lab with software installed and individual computer terminal for each student.**
Technology equipment (projector, smart board, software)	**Whiteboards and projectors for classroom and lab** **Following software for lab work:** • **Cisco Packet Tracer 8.1** **GNS3**
Other equipment (depending on the nature of the specialty)	**None**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students, HOD**	**Indirect, Direct**
Effectiveness of Students assessment	**CT / CC / HoD**	**Direct**
Quality of learning resources	**TL / CRC / PQC**	**Indirect, Direct**
The extent to which CLOs have been achieved	**CT / CC /TL / PQC**	**Indirect, Direct**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	**ENGCSEEE2411**
DATE	**10/10/24**