NAAN MUDHALVAN – POLYTECHNIC – ODD SEMESTER 2025-26

COURSE CURRICULUM

INFORMATION NETWORK CABLING

ABOUT THE COURSE

This course equips students with advanced technical skills in designing, installing, and maintaining high-performance network cabling systems using both copper and fibre technologies. It also covers wireless networking and integration of IoT/IIoT devices for real-world industrial, commercial, and smart infrastructure applications.

COURSE NAME:	INFORMATION NETWORK CABLING
TOTAL DURATION:	60 HRS
MODE OF DELIVERY	PHYSICAL CLASSROOM TRAINING AT RESPECTIVE COLLEGES
TRAINER TO STUDENT RATIO:	1:60
TOTAL MARKS:	70 (External) + 30 (Internal)

TABLE 1	
OVERALL COURSE OBJECTIVE	• Design and Planning of Complex Cabling Systems • Implement the installation of High-Performance Optical Fibre and Copper Networks • Advanced Troubleshooting and Fault Resolution in Cabling Systems • Develop and implement comprehensive Health, Safety, and Risk Management in Network Installations • Demonstrate expert Communication and Leadership in Team Environments • Precision Measurement and Testing for Optimal Network Performance • Implementing Sustainable Solutions in High-Demand Network Installations • Continuous Professional Development and Mastery of Industry Certifications
LEARNING OUTCOME	• Design and Optimise Complex Network Cabling Systems • Design and implement systems using Diverse Cabling Technologies • Perform Advance Troubleshooting and Preventive Maintenance • Implement Robust Health, Safety, and Environmental Standards • Exhibit Effective Stakeholder Communication and Conflict Resolution

	• Comprehensive Network Performance Testing and Optimization • Sustainable Practices in Network Design and Implementation • Commitment to Lifelong Learning and Industry Leadership

TABLE 2: MODULE WISE COURSE CONTENT AND OUTCOME				
SL. NO	**MODULE NAME**	**MODULE CONTENT**	**MODULE LEARNING OUTCOME**	**DURATION (HRS)**
1	**Network Cabling Fundamentals**	Introduction to network topologies and standards (Ethernet, Fast Ethernet, Gigabit Ethernet), Types of network cables: UTP, STP, coaxial, cabling categories (Cat5e, Cat6, Cat6A, Cat7), Colour codes and pinout standards (T568A/B), Basic tools used in cabling (crimpers, strippers, testers), Safety and best practices in cabling	Interpreting the basics of network cabling, including types, standards, and installation methods.	12 hrs
2	**Advanced Optical Fibre Systems**	Structure and types of optical fibres (single-mode, multi-mode), Fibre connectors (SC, LC, ST) - Splicing methods: fusion vs mechanical, Fibre cable termination and patch panel setup, OTDR testing and loss measurement, Applications of fibre in industrial settings	Exhibit proficiency in installing, testing, and maintaining optical fibre networks.	12 hrs
3	**Copper Cabling Systems and Wireless Setup**	Advanced copper cabling installation (Cat6/Cat6A), Patch panel wiring and labeling, Wi-Fi	Master installation and management of copper and wireless	12 hrs

		networking basics (802.11 a/b/g/n/ac/ax), Wireless access point configuration and placement, Wi-Fi signal testing and optimization, Integrating IoT/IIoT devices with Wi-Fi & Ethernet	networks for IoT and IIoT applications.	
4	**Troubleshooting and Maintenance**	Diagnosing issues in wired and wireless networks, Use of cable testers and certifiers, troubleshooting tools (TDR, multimeter, signal tracers), Wireless interference and channel conflicts, Repairing damaged cables/connectors, Documentation and maintenance logs	Develop skills to diagnose, troubleshoot, and maintain network cabling systems and wireless connectivity.	12 hrs
5	**Network Performance Testing & Optimization**	Cable certification standards (TIA/EIA), End-to-end testing procedures, Using Fluke network testers and OTDRs, Interpreting test reports, Network optimization techniques, Real-time monitoring tools (Grafana, Wireshark), Industrial network case studies	Use advance testing tools and techniques to optimize network performance and reliability	12 hrs

TABLE 3: OVERALL COURSE LEARNING OUTCOME ASSESSMENT CRITERIA AND USE CASES		
LEARNING OUTCOME	**ASSESSMENT CRITERIA**	**USE CASES**
Design of a structured cabling system	Ability to design a structured cabling system that meets the needs of multi-storey office environments	**Use Case 1 - Designing a Structured Cabling System for a Multi-Storey Office** **Scenario:** Develop a cabling system for a multi-storey office to ensure reliable data and voice communication. **Task:** Design the layout and infrastructure for fiber and copper cables, meeting specifications for high-speed connectivity across multiple floors.
Implementation of high-speed fiber backbone	Ability to implement a high-speed fiber backbone in campus environments for large-scale data traffic	**Use Case 2 - Implementing High-Speed Fiber Backbone in a University Campus** **Scenario:** Implement a high-speed fiber backbone for data communication across a university campus. **Task:** Plan, install, and test the fiber backbone infrastructure to support high-bandwidth applications like online learning, research, and cloud services.
Deployment of wireless networking technologies	Ability to deploy high-performance wireless access points in health care facilities to ensure connectivity	**Use Case 3 - Deploying Wi-Fi 6 Access Points in a Smart Hospital** **Scenario:** Deploy Wi-Fi 6 access points in a smart hospital to support the growing number of connected medical devices. **Task:** Install and configure Wi-Fi 6 access points, ensuring reliable connectivity in critical areas like operating rooms and patient monitoring stations.

Expertise in high-speed networking for data centres	Ability to install Cat6A cables in data centres for 10 Gbps networking and ensure High performance data transfer	**Use Case 4 - Installing Cat6A Cables in a Data Center for 10Gbps Networking** **Scenario:** Set up a data center with high-speed Cat6A cables for 10Gbps networking. **Task:** Install and test Cat6A cables to support high-speed data transfer, optimizing cable management and minimizing signal loss.
Creation of redundant network designs	Ability to create a redundant network infrastructure for high-availability in industrial environments	**Use Case 5 - Building a Redundant Network for an Industrial Plant using Fiber Loops** **Scenario:** Build a redundant fiber network for an industrial plant to ensure continuous operations. **Task:** Design and deploy fiber loops to create a self-healing network, minimizing downtime in critical plant operations.
Deployment of IoT system	Ability to set up IoT sensors using LoRaWAN technology for smart agriculture applications	**Use Case 6 - Setting Up IoT Sensors with LoRaWAN in a Smart Agriculture System** **Scenario:** Implement an IoT system using LoRaWAN technology for smart agriculture. **Task:** Deploy sensors to monitor environmental factors like soil moisture and temperature, and connect them to a central system for data analysis.
Deployment of Wireless Networks for events	Ability to integrate wireless mesh networks for large-scale event venues to ensure connectivity	**Use Case 7 - Integrating Wireless Mesh Networks in a Large Event Venue** **Scenario:** Integrate a wireless mesh network to provide coverage in a large event venue. **Task:** Deploy mesh access points to ensure seamless connectivity for attendees, staff, and vendors during events.

Creation of smart classroom design	Ability to create a smart classroom environment with fiber uplinks and wireless access points	**Use Case 8 - Creating a Smart Classroom with Fiber Uplink and Wireless Access Points** **Scenario**: Set up a smart classroom that integrates high-speed fiber uplinks and wireless access points for efficient teaching. **Task:** Design and install the networking infrastructure to support interactive learning tools and high-bandwidth streaming.
Conduct wireless site surveys	Proficiency in planning and executing a wireless site survey for retail environments to optimize coverage	**Use Case 9 - Planning and Executing a Wireless Site Survey for a Retail Chain** **Scenario:** Perform a wireless site survey for a retail chain to ensure optimal Wi-Fi coverage and capacity. **Task:** Conduct surveys, analyze the layout, and implement necessary access points for full coverage and high-speed wireless service.
Deployment of FTTH	Ability to install and test Fiber to the Home (FTTH) for residential customers	**Use Case 10 - Installing and Testing Fiber to the Home (FTTH) in a Residential Project** **Scenario:** Deploy and test Fiber to the Home (FTTH) technology in a residential area to deliver high-speed internet. **Task:** Install fiber optic cables from the street to customer homes, ensuring optimal signal quality and high-speed internet access.

Configuration of wireless link for surveillance	Ability to configure wireless links for long-range CCTV Surveillance systems	**Use Case 11 - Configuring Wireless Links for Long-Range CCTV Surveillance** **Scenario:** Set up long-range wireless links for a CCTV surveillance system in a large campus or industrial site. **Task:** Configure point-to-point or point-to-multipoint wireless links to transmit surveillance footage to a central monitoring station.
Industrial IoT (IIoT) communication	Ability to implement IIoT communication solutions in manufacturing environments for operational efficiency	**Use Case 12 - Implementing IIoT Communication in a Manufacturing Plant** **Scenario:** Set up IIoT communication systems in a manufacturing plant to monitor and control machinery. **Task:** Implement sensors and networking solutions to collect data for real-time analytics and predictive maintenance.
Troubleshooting and maintenance skills for fibre systems	Ability to troubleshoot and resolve signal loss in fiber optic connections	**Use Case 13 - Troubleshooting Signal Loss in a Fiber Splice Box** **Scenario:** Diagnose and fix signal loss in a fiber splice box in a network system. **Task:** Perform troubleshooting steps to identify the cause of signal loss, fix the issue, and test the fiber connections for optimal performance.
Upgrading legacy network infrastructure	Ability to upgrade legacy network systems (e.g., Cat5 to Cat6A) in facilities to improve speed and performance	**Use Case 14 - Upgrading a Legacy Cat5 Network to Cat6A in a Government Facility** **Scenario:** Upgrade a legacy Cat5 network to Cat6A in a government facility for better performance and higher speeds. **Task:** Replace old cables with Cat6A cables, test the network for higher throughput, and

		ensure seamless transition without network disruption.
Integrating cabling and wireless systems	Ability to integrate cabling and wireless systems for smart parking solutions	**Use Case 15 - Integrating Cabling and Wireless for Smart Parking Systems** **Scenario:** Integrate cabling and wireless systems to create a smart parking system. **Task:** Design and install a network that connects parking sensors, cameras, and payment systems to provide real-time parking availability information.
Designing secure wireless networks	Ability to design secure Wi-Fi networks for high-security environments like bank branches	**Use Case 16 - Designing Secure Wi-Fi Networks for Bank Branches** **Scenario:** Design and deploy secure Wi-Fi networks for a bank branch to ensure data security and protect customer transactions. **Task:** Implement encryption protocols, access control, and secure authentication for wireless access in a financial institution.
Optimising wireless networks in industrial environments	Ability to optimize wireless connectivity in warehouses with mobile robots	**Use Case 17 - Optimizing Wireless Connectivity in a Warehouse with Mobile Robots** **Scenario:** Enhance Wi-Fi network for stable mobile robot connectivity in a warehouse. **Task:** Optimize the network to support tasks like inventory management and package sorting.
Test network latency and jitter	Ability to test and analyze network latency and jitter in high-stakes environments like financial trading floors	**Use Case 18 - Testing Network Latency and Jitter in a Financial Trading Floor** **Scenario:** Test network latency and jitter to ensure stable communication in a financial trading floor environment. **Task:** Implement tools to monitor network performance, detect issues, and optimize the

		network for low-latency trading.
Designing hybrid network environments	Ability to deploy hybrid networks that combine wired and wireless systems in hospitality environments	**Use Case 19 - Deploying a Hybrid Network in a Hotel with Wired IPTV and Wireless Guest Internet** **Scenario:** Design and implement a hybrid network for a hotel with both wired IPTV and wireless guest internet. **Task:** Install network infrastructure that supports IPTV services via wired connections and high-speed wireless internet for guests.
Monitoring smart grid communication networks	Ability to manage and monitor smart grid communication networks for utility companies	**Use Case 20 - Monitoring and Maintaining a Smart Grid Communication Network** **Scenario:** Monitor and maintain a smart grid communication network for a utility provider. **Task:** Implement and maintain communication systems that track real-time energy usage, improve grid efficiency, and detect outages.

TABLE 4: LIST OF FINAL PROJECTS (20 PROJECTS THAT COMPREHENSIVELY COVER ALL THE LEARNING OUTCOMES)	
S. NO.	**FINAL PROJECT** **(The Training Partner shall cover all the steps to complete a given project)**
1	Designing a Structured Cabling System for a Multi-Storey Office
2	Implementing High-Speed Fiber Backbone in a University Campus
3	Deploying Wi-Fi 6 Access Points in a Smart Hospital
4	Installing Cat6A Cables in a Data Center for 10Gbps Networking
5	Building a Redundant Network for an Industrial Plant using Fiber Loops
6	Setting Up IoT Sensors with LoRaWAN in a Smart Agriculture System
7	Integrating Wireless Mesh Networks in a Large Event Venue
8	Creating a Smart Classroom with Fiber Uplink and Wireless Access Points
9	Planning and Executing a Wireless Site Survey for a Retail Chain
10	Installing and Testing Fiber to the Home (FTTH) in a Residential Project

11	Configuring Wireless Links for Long-Range CCTV Surveillance
12	Implementing IIoT Communication in a Manufacturing Plant
13	Troubleshooting Signal Loss in a Fiber Splice Box
14	Upgrading a Legacy Cat5 Network to Cat6A in a Government Facility
15	Integrating Cabling and Wireless for Smart Parking Systems
16	Designing Secure Wi-Fi Networks for Bank Branches
17	Optimizing Wireless Connectivity in a Warehouse with Mobile Robots
18	Testing Network Latency and Jitter in a Financial Trading Floor
19	Deploying a Hybrid Network in a Hotel with Wired IPTV and Wireless Guest Internet
20	Monitoring and Maintaining a Smart Grid Communication Network

TABLE 5: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 70)

ASSESSMENT CRITERIA	DESCRIBE THE CRITERIA OF THE BELOW CATEGORY PERFORMANCE			TOTAL MARKS
	FAIR	GOOD	EXCELLENT	
Design and Optimisation of Complex Network Cabling Technologies	Demonstrates limited understanding of structured cabling, wireless, or fibre concepts.	Shows good Understanding with some minor conceptual gaps.	Demonstrates thorough knowledge of structured cabling, wireless standards, and fiber networks.	20
Installation and Integration of Diverse Cabling Technologies	Limited or incorrect use of tools like Cisco Packet Tracer, Wireshark, or testing devices.	Applies tools correctly with moderate understanding and effectiveness.	Uses advanced tools skillfully and integrates them effectively in practical scenarios.	20
Comprehensive Network Performance Testing and Optimisation	Implements use cases with errors or minimal effectiveness.	Implements use cases correctly with functional outcomes and minimal guidance.	Implements complex scenarios independently with innovation, optimization, and accuracy.	30
TOTAL				**70**

Technical Specification

S. No.	Details	Specifications
1	Software/Tools used	• Cisco Packet Tracer - Version 8.2.2 • Grafana - Version 12.0.1 • Wireshark - Version 4.4.6
2	Kit(s) used	• Router (SIM-enabled) • Copper Straight-Through Cable • Copper Crossover Cable • Fiber Optic Cable • Wire Tester • IO Crimping Tool (IO Box A & B) • RJ11 and RJ45 Crimping Tools
3	No. of kits per batch	15
4	Certification	Joint Certification by TNSDC and Ingage Technologies Pvt. Ltd.