Republic of the Philippines

Department of Education

DepEd Complex, Meralco Avenue, Pasig City

STRENGTHENED SENIOR HIGH SCHOOL CURRICULUM

BROADBAND INSTALLATION

Grade 11/12

Course Description:

This course covers broadband installation, focusing on fixed wireless systems and fiber optic broadband. Students will learn broadband technologies, network layouts, site surveys, mast and cable installation, and configuring customer equipment. Upon completion, learners are eligible to take assessments to earn National Certificate Level II in Broadband Installation (Fixed Wireless Systems), higher education, and careers in the broadband installation sector industry.

Elective: Technical Professional
Prerequisite: None
Time Allotment: In Grade 11, 320 hours for two semesters, 8 hours per week/In Grade 12, 320 hours for one semester, 16 hours per week
Schedule: First/Second Semester

QUARTER 1

CONTENT STANDARD	The learners demonstrate an understanding of the principles, tools, safety procedures, and technical requirements necessary for the proper installation of mast, guy, and accessories in accordance with industry standards.
PERFORMANCE STANDARD	The learners perform mast and cable installation in accordance with technical specifications and industry standards.

LEARNING COMPETENCIES	**CONTENT**

1. Discuss the fundamentals of broadband installation	Fundamentals of Broadband Installation
	• Broadband technologies
	  o types of broadband
	  o broadband network topologies
	  o data transmission
	• Tools, equipment and materials
	• Trends in broadband installation
	Career and business opportunities

2. Discuss Fixed Wireless Systems	Fixed Wireless Systems
	• Fundamentals of Fixed Wireless Systems
	  o characteristics
	  o advantages and limitations
	  o applications
	• Wireless communication technologies
	• Spectrum and frequency bands
	Network architecture

3. Discuss preparations for mast installation	Site Preparation • Site assessment • Clearance and access • Environmental considerations OHS Procedures • Safety hazards and precautions • Hazard and risk assessment mechanisms Personal Protective Equipment (PPE)
4. Perform installations of mast and accessories	Mast and Accessories Installation • Mast installation procedures • Guy installation procedures and tensioning Installation documentation and reporting
5. Discuss preparations for cable layout and installation	Set Up Installation Equipment • Tools and equipment for cable layout and installation o Work safety requirements o Safety procedures • Proper handling of cables Installation requirements and constraints
6. Perform cable layouts and installations	Cable Layout and Installation • Installation requirements and constraints • Methods of cable routing • Testing operation procedures in devices and instruments Permanent Cable Support Structures • Conduit bending and radius tolerance

QUARTER 2

CONTENT STANDARD	The learner demonstrates an understanding of the tools, technical specifications, and configuration procedures necessary to install and set up Customer Premises Equipment (CPE) effectively, ensuring optimal functionality and connectivity.
PERFORMANCE STANDARD	The learners perform CPE installation and configuration in accordance with technical specifications and industry standards.

LEARNING COMPETENCIES	CONTENT
1. Discuss the principles of Customer Premises Equipment (CPE)	Customer Premises Equipment (CPE) • Tools, materials, devices and PPE • Line of Sight (LOS) verification • Base Transceiver Station (BTS) • Role of CPE in broadband systems
2. Perform installations of Customer Premises Equipment (CPE) in accordance with industry standards	CPE Installation • Physical installation o CPE Placement and Mounting o Cabling and Connections o Grounding and Protection • Hardware setup o Device placement ▪ Power Connections ▪ Device Configuration • Software installation o Software Updates and Upgrades o Software Configuration
3. Perform configurations of Customer Premises Equipment (CPE) in accordance with industry standards	CPE Configuration • Network configuration • Service configuration • Security configuration
4. Perform testing and adjustment of Customer Premises Equipment (CPE) in accordance with the industry's installer manual	CPE Testing and Adjustment • Testing methodologies • Adjustment procedures

QUARTER 3

CONTENT STANDARD	The learners demonstrate an understanding of the fundamentals of fiber optic broadband network installation, maintenance, and quality assurance.
PERFORMANCE STANDARD	The learners perform installation and maintenance of fiber optic networks, achieving high signal quality, low loss, and reliable system operation, while adhering to the industry's best practices and safety standards.

LEARNING COMPETENCIES	CONTENT
1. Discuss the fundamentals of fiber broadband	Fundamentals of Fiber Broadband • Introduction to fiber broadband o evolution of broadband technologies o advantages over traditional broadband (DSL, cable, satellite) o types of fiber optic cables • Types of fiber networks o FTTH (Fiber to the Home) o FTTP (Fiber to the Premises) o FTTC (Fiber to the Curb/Cabinet) o FTTB (Fiber to the Building/Business) o FTTN (Fiber to the Node/Neighborhood) • Structure of fiber optic cables • Light transmission principles • Single-mode vs. multi-mode fibers • Wavelengths and transmission speeds • Key components of a fiber network o optical fiber cables o Optical Line Terminals (OLT) o Optical Network Terminals (ONT) o Passive Optical Network (PON) and Active Optical Network (AON) o splitters and connectors
2. Discuss preparation for fiber optic cable layout and installation	Preparation for Fiber Optic Cable Layout and Installation • Site survey and planning • Selection of fiber optic cable and components • Regulatory and safety compliance • Cable route preparation • Equipment and tool preparation • Worksite readiness and logistics

3. Discuss preparation of fiber optic cable for splicing and joining	Fiber Optic Cable Splicing and Joining Preparation
	• Cable stripping and cleaning
	  o fiber coating removal
	  o fiber cleaving (proper cleaving techniques and tools)
	• Fusion Splicer preparation
	  o splicer setup and calibration
	  o electrode cleaning and maintenance
	  o environmental considerations (temperature, humidity, etc.)
	• Protection Sleeve preparation
	  o sleeve selection (size, type)
	  o sleeve loading onto the fiber

4. Perform splicing/joining fibers and installing protection sleeves using a fusion machine	Splicing/Joining Procedures using Fusion Machine
	• Fiber alignment
	  o manual and automatic alignment methods
	  o understanding alignment indicators
	• Fusion splicing
	  o arcing parameters (current, time)
	  o splicing modes (single mode, multimode)
	  o loss evaluation (pre- and post-splice)
	• Sleeve application and shrinking
	  o proper sleeve placement
	  o using the heat shrink oven
	• Testing and quality assurance
	  o visual inspection of spliced fibers
	  o OTDR (Optical Time-Domain Reflectometer) and power meter testing
	  o identifying and troubleshooting splice loss issues

QUARTER 4

CONTENT STANDARD	The learners demonstrate an understanding of principles in splicing/joining fibers and installation of protection sleeves using the mechanical method as well as installation of aerial and underground cable support.
PERFORMANCE STANDARD	The learners perform splicing/joining fibers and installation of protection sleeves using mechanical method as well as installation of aerial and underground cable support while adhering to the industry's best practices and safety standards

LEARNING COMPETENCIES	**CONTENT**

1. Perform splicing/joining fibers and installation of protection sleeves using the mechanical method	Splicing/Joining Fibers using the Mechanical Method
	• Mechanical splicing process
	  o preparing the fiber
	  ▪ stripping
	  ▪ cleaning
	  ▪ cleaving
	  o alignment of fiber cores
	  o insertion into the mechanical splicer
	  o securing the splice
	• Installation of protection sleeves
	  o purpose of protection sleeves
	  o types of protection sleeves
	  o proper installation techniques
	  o ensuring strain relief and durability
	• Testing and quality control
	  o visual inspection of the splice
	  o loss measurement using an Optical Time-Domain Reflectometer (OTDR)
	  o attenuation testing
	troubleshooting common mechanical splice issues

2. Perform installation of aerial cable closure and support	Aerial Cable Support and Installation Procedures • Site preparation and safety considerations • Installation of messenger wire and support hardware • Lashing fiber optic cable to the messenger • Placement and securing of fiber closures on poles • Grounding and bonding requirements
3. Perform installation of underground cable closure and support	Underground Fiber Optic Installation Procedures • Trenching, duct installation, and conduit placement

	• Pulling or blowing fiber optic cable through conduits • Manhole and handhole preparation • Installation of fiber closures in underground enclosures • Sealing and waterproofing for underground environments
4. Perform connection of fiber to the premises	Connecting Fiber to the Premises • Fiber entry point selection/installation of Termination Point (TP) • Fiber cable routing • Drilling and cable management • Optical Network Terminal (ONT) installation Power supply setup
5. Perform testing & activation	Testing & Activation • Signal strength testing • Connectivity verification • Speed testing • ONT configuration • Troubleshooting & adjustments

GLOSSARY

broadband installation	the process of setting up a high-speed internet connection, including equipment, tools, and configurations necessary for wired or wireless networks
fixed wireless systems	internet delivery method that uses radio signals to connect customers to the internet, often employing line-of-sight technology
mast	a tall vertical structure used to support antennas or other equipment for telecommunications and broadcasting
guy	cables or wires used to stabilize a mast or pole, ensuring structural integrity against wind or other forces

Line Of Sight (LOS)	a clear path between the transmitter and the receiver that allows signals to be transmitted without obstruction
Base Transceiver Station (BTS)	a piece of equipment that facilitates wireless communication between the network and devices
Customer Premises Equipment (CPE)	devices installed at a customer's location, such as modems, routers, and antennas, enabling connectivity to the network
frequency spectrum	the range of electromagnetic frequencies used in communication systems to transmit data
bandwidth	the amount of data that can be transmitted over a network within a given time
cable layout	the process of planning and installing cables to connect network devices, ensuring efficient and organized connectivity
router	a network device that forwards data packets between computer networks
access point	a device that allows wireless devices to connect to a wired network
repeater	a network device that amplifies or retransmits signals to extend the range of a network
Personal Protective Equipment (PPE)	safety gear worn to minimize exposure to hazards that cause workplace injuries or illnesses
IP address	a unique string of numbers assigned to each device connected to a computer network
network troubleshooting	the process of diagnosing and resolving problems in a network, including connectivity and performance issues

ping	a diagnostic tool used to test the reachability of a host on a network and measure round-trip time
traceroute	a network diagnostic tool used to track the pathway that data takes to reach its destination
netstat	a command-line tool that provides information about network connections, routing tables, and interface statistics
IP config	a command-line tool used to display and manage the ip addresses assigned to devices on a network
environmental considerations	factors such as weather, terrain, and physical obstructions that impact the installation and operation of wireless systems
conduit bending	the process of shaping conduits to route and protect cables during installation
managed switch	a network switch that can be configured and managed for advanced network functionality
unmanaged switch	a plug-and-play network switch that does not require configuration
network architecture	the design and structure of a network, including its physical and logical components

MATERIALS, TOOLS, AND EQUIPMENT

TOOLS	EQUIPMENT	MATERIALS
Adjustable wrench	Computer w/ NIC Card	Safety goggles
Blade cutter	Radio antenna/modem	Tex Screw , 3/16”
Combination Plierss	Internet Subscription	Guy anchor
Compass	L Tables and chairs	Hose clamp, No. 16
Diagonal pliers	Projector	Whiteboard
RJ-45 crimper	Whiteboard	RJ 45 connectors
Extension cord	Company manual	
Flash light	Safety harness	
Standard Screwdriver	Safety gloves	
Hammer	Safety goggles	
Extension Ladder		
Level		
Long nose pliers		
Combination wrenches		
Toolbox		
Vise grip		