Telecommunication Technician

Short term Curriculum

(Competency Based)

Council for technical education and vocational training
Curriculum Development Division
Sanothimi, Bhaktapur
2004
First Revision, 2015

Contents

Introduction
This competency based short term curriculum for **Telecommunication Technician** is designed to produce middle level technical workforce in the field of telecommunication engineering to equip with the skills, knowledge and attitudes necessary for telecommunicationtechnician in order to meet the demand of such workforce in the country so as to contribute in the national streamline of poverty reduction.

Aim
The aim of this program is to produce skilled workforce (Telecommunication Technician) in the field of telecommunication technology by providing training and link the graduates to employment opportunities.

Objectives
After the completion of this training, the trainees will be able to:

- Apply occupational health and safety
- Interpret technical drawing for the trade
- Apply mathematical calculation for the occupation
- Perform workshop practice
- Familiarize with basic electrical, electronics and telecommunication
- Install landline and optical fiber network.

Course Description
This curriculum deals with skills and knowledge related to telecommunication technology necessary for telecommunication technicians. This course imparts knowledge and skills on technical drawing, applied mathematics, basic workshop practice, basic electricity, electronics, telecommunication, landline network installation, and opticalfibre network installation so that the graduate of this course can work in the telecommunication sector as an efficient technician.

Duration
1400 hours (1100 hours in house training +300 hours OJT)

Target Group
10 grade passed interested individuals. Priority will be given to females, Dalits, Janajatis, religious minorities and conflict affected people.

Group size
Maximum 20

Target location
All over Nepal

Medium of Instruction
Nepali and/or English

Pattern of attendance
80% in theory classes and 90% in Practical (Performance)

Focus of the curriculum
This is a competency-based curriculum. This curriculum emphasizes on competent performance of the task specified in it. 80% time is allocated to the competencies and 20% to the essential related technical knowledge. So, the main focus will be on the performance of specified competencies/tasks /skills in the curriculum.

Entry criteria
Individuals who meet the following criteria will be allowed to enter in this curricular program:

- 10 grade passed
- Minimum of 16 years of age

Instructional Media and Materials
The following instructional media and materials are suggested for the effective instruction and demonstration.

- Printed Media Materials (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- Non-projected Media Materials (Display, Models, Flip chart, Poster, Writing board etc.).
- Projected Media Materials (Opaque projections, Overhead transparencies, Slides etc.).
- Audio-Visual Materials (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.).
- Computer-Based Instructional Materials (Computer-based training, Interactive video etc.).

Teaching Learning Methodologies
The methods of teachings for garden designing program will be a combination of several approaches such as illustrated lecture, group discussion, demonstration, simulation, guided practice, practical experiences, fieldwork and other independent learning.
Theory: lecture, discussion, assignment, group work.
Practical: demonstration, observation, guided practice, independent practice, field work and Project work and on the job training (OJT).

Certificate requirement
The related training institute will provide the training certificate of **"Telecommunication Technician"** to those individuals who fulfill all the requirements of this curriculum.

Trainers' Qualification

- BE in electronics and telecommunication or diploma in electronics with 5years' experience in telecommunication sector.
- Good communicative & instructional skills.

Trainer – Trainees Ratio

- 1:10 for practical classes
- Depends on the nature of subject matter and class room situation for theory classes.

Suggestion for instruction

- Select objectives.
    1. Select/write objective of cognitive domain.
    2. Select/write objectives of psychomotor domain.

3. Select/write objectives of affective domain.

- Select subject matter.
  1. Perform detail study of the subject matter.
  2. Select subject matter/content related to cognitive domain.
  3. Select subject matter/content related to psychomotor domain.
  4. Select subject matter/content related to affective domain.
- Select Instructional/teaching Method(s).
  - Identify various methods:
    1. Teacher centered methods: Lecture, demonstration, question answer, inquiry, induction & deduction methods
    2. Student initiated methods: Experimental, field trip/excursion, discovery, problem solving, exploration, and survey methods
    3. Interaction methods: Discussion, group/team teaching, micro teaching, exhibition/demonstration methods.
    4. Dramatic methods: Role play and dramatization
  - Select instructional/teaching Method(s) on the basis of :
    1. The objective(s) of the lesson: Objective(s) of cognitive domain, Objective(s) of psychomotor domain, Objective (s) of affective domain
    2. The nature of the subject matter/content
    3. The level of knowledge, skill and attitudes of the learners
    4. The available educational/learning materials
    5. The instructors background and experiences
- Select appropriate educational materials and apply/use them at right timeand place.
- Make plan(s) for class room/ field work/ workshop organization & management.
- Coordinate among objectives, subject matter/ content and instruction / teaching method(s).
- Prepare lesson plan(s) for:
  1. Theory class / lesson
  2. Performance / practical class / work /lesson.
  3. Deliver / conduct instruction / program
- Evaluate the trainees/students:
  1. Develop various tools of evaluation
  2. Evaluate the attainment of objectives related to cognitive, psychomotor and affective domains through the application/use of the various tools of trainee/student evaluation
- Evaluate the instruction / program

Suggestion for skill training

- **Demonstrate task performance**
  1. Demonstrate task performance in normal speed.
  2. Demonstrate slowly with verbal description of each and every steps in the sequence of activity flow of the task performance using question and answer techniques
  3. Repeat it for the clarification on trainees demand if necessary.
  4. Perform fast demonstration of the task performance.
- **Provide trainees the opportunity to practice the task performance demonstrated.**
  1. Provide trainees to have guided practice
  2. Create environment for practicing the demonstrated task performance
  3. Guide the trainees in each and every step of task performance

4. Provide trainees the opportunity to repeat & re-repeat as per the need to be proficient on the given task performance
5. Switch to another task demonstration if and only if the trainees developed proficiency in the given task performance

Other suggestions

1. Apply principles of skill training
2. Allocate 20% time for theory and 80% time for task performance while delivering instruction /training.
3. Apply principles of adult learning.
4. Apply principles of intrinsic motivation
5. Facilitate maximum trainees' involvement in learning and task performance activities.
6. Instruct the trainees on the basis of their existing level of knowledge, skills & attitudes.

Course Structure

(Telecommunication technician)

SN	Module and Sub-module	Time/Hours		
		Theory	**Practical**	**Total**
1.	Occupational Health & Safety	5	10	15
2.	Technical Drawings	8	32	40
3.	Applied Mathematics	10	40	50
4.	Basic Workshop Practice	20	80	100
5.	Basic Electricity	20	100	120
6.	Basic Electronics	35	105	140
7.	Telecommunication	70	310	380
8.	Landline Network Installation	30	150	180
9.	Optical Fiber Network Installation	12	58	70
10.	Communication and Professionalism	2	3	5
	Sub Total	**212**	**888**	**1100**
	OJT		300	300
	Total	**212**	**1188**	**1400**

Module 1: Occupational Health &Safety (OHS)

Course Description: This module deals with knowledge and skills related to occupational health and safety.

Course Objectives: At the end of this course, trainees will be able to:

- Explain the concept of hazard and risk.
- Apply first aid and personnel protective equipment.

Time: 15 hrs. **Theory:** 5 hrs. **Practical:** 10 hrs.

S. N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Identify Hazard and Risk	**Hazard and Risk**: • Introduction of Occupational Health& Safety • Types of hazard • Electrical Hazard • Hazard Control Principle • Job safety analysis	3	3
2.	Apply first aid skills	**First aid**: • Introduction of First Aid • First Aid kit box • ABC principle	1	3
3.	Use Personal Protective Equipment (PPEs)	**Personal Protective Equipment :** • PPEs according to work • Safety precautions and safety rules	1	4
Total			**5**	**10**

Module 2: Technical Drawings.

Course Description: This module deals with knowledge and skills related to technical drawings required for the telecom technician.

Course Objectives: At the end of this course, trainees will be able to:

- Draw free hand sketches.
- Draw different geometrical construction.
- Draw orthographic, isometric views of different objects.
- Draw different electronic circuit.

Time: 40 hrs. **Theory:** 8 hrs. **Practical:** 32 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Handle basic drawing tools/equipment	**Basic drawing tools/equipment:** • Drawing tools & instruments & their uses • Handling techniques of drawing tools and instrument	0.5	1
2.	Prepare drawing sheet with title block	**Drawing sheet with title block:** • Drawing sheets and their standard sizes • Border lines and title blocks		1
3.	Draw free hand sketches	**Free hand sketches:** • Sketch & sketching techniques of different figures • Straight lines • Circles • Arcs & curves • Difference between drawing & sketch		2
4.	Familiarize with different scales	**Scales:** • Types of scales; Plain and diagonal, Reducing and Enlarging scale • Representative Fraction • Different types of measuring systems and its conversions	1	3
5.	Draw different types of lines	**Types of lines:** • Different lines; Outlines, Dashed lines, Centre line, dimension line, extension line, hatching/section line, Leader/Pointer lines, Cutting-Plane lines, Boarder line, Long and short break line and their uses • Line thickness	0.5	1

6.	Perform lettering	**Lettering:** • Different lettering; Single-stroke letters and Gothic Letters & their writing rules • Essential features of lettering. • Writing styles of different devnagari letters	0	1
7.	Draw regular geometrical figures: (rectangle, square, triangles, parallelogram, rhombus, circle pentagon, hexagon, octagon)	**Regular geometrical figures:** • Angle & their types • Triangle & their types • Quadrilaterals & their types • Regular polygon & their types • Construction methods	0.5	1
8.	Divide a straight line into 2 or more equal parts	**Dividing a straight line:** Procedure of division of straight line into equal parts	0	1
9.	Bisect circular arc	**Bisect circular arc:** • Different engineering curves • Procedure of bisection of circular arc	0	1
10.	Draw a parabola	**Parabola:** Construction procedure of parabola. Tangent, rectangle, offset method	0	1
11.	Draw an ellipse	**Ellipse:** • Concept of conic sections • Concentric circle & Arc of circle methods	0	1
12.	Dimension the drawing	**Dimension:** • Dimension types • Procedure for dimensioning	0.5	1
13.	Perform orthographic projection of simple object (I & III angle projection)	**Orthographic projection:** • Projection & their types • Methods of orthographic projection (I & III angle projection) • Glass box (Projection box)	0.5	5
14.	Draw isometric views	**Isometric views:** • Isometric projection • Isometric scale • Process of preparation of isometric drawing • Free hand sketch of isometric view	0.5	5

15.	Draw various electrical and electronic symbols	**Electrical and electronic symbols :** • Various electrical components • various electrical and electronic symbols	1	1
16.	Draw different electronics block diagram e.g. Telephone set, Mobile set	**Electronics block diagram :** • Definition of block diagram • Types of block diagram	1	2
17.	Draw different electronics circuit diagram e.g. Telephone set, Mobile set	**Electronics circuit diagram:** • Definition of circuit diagram • Use of circuit diagram	1	2
18.	Interpret architectural plan of building	**Architectural plan of building:** • Information about the architectural plan of building • Importance of architectural plan for electrification in a building.	1	2
Total			**8**	**32**

Module 3: Applied Mathematics.

Course Description: This module deals with knowledge and skills related to mathematical calculations necessary for telecom technician.

Course Objectives: At the end of this course, trainees will be able to:

- Calculate areas and volumes of different shape and objects.
- Solve trigonometric functions, matrix and determinants.

Time: 50 hrs. **Theory:** 10 hrs. **Practical:** 40 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Familiarise with S.I system, imperial, metric system	**Various systems:** • Introduction to S.I. unit system. • Conversion of imperial to metric system and vice versa • Simple exercises	0.5	1
2.	Calculate perimeter and areas of square/triangles/rectangles/ circle/circular flat/rhombus/ellipse /trapezium/regular polygons	**Perimeter and area of:** • Square, triangles, rectangles, circular flat, rhombus, ellipse, trapezium and regular polygons	1	2
3.	Apply unitary methods	**Unitary methods**: • Calculation of unitary methods in mathematical problems	0.5	1
4.	Calculate dimensions/ weights of materials/ areas/cost	**Calculation of:** • Dimensions • Quantities • Unit Weight • Rate analysis • Cost estimate	0.5	3
5.	Calculate surface area and volume of cube/cylinder/circular cone/sphere/ pyramid.	**Calculation of surface area and volume of:** • Cube, cylinder, circular cone sphere, pyramid	0.5	2
6.	Calculate natural/exponential log	**Definition of:** • Natural log • Exponential log • Addition, subtraction, multiplication and division of log • Use of log table	1	4
7.	Calculate complex numbers.	**Complex numbers:** • Introduction • Absolute value, conjugates	0.5	1
8.	Represent graphical forms of data	**Graphical forms of data:** • Interpretation of information in graphical forms	0.5	2

9.	Solve trigonometric functions	**Trigonometric functions:** • Dependency • Side ratio • Relationship • Simple numerical exercises	1	2
10.	Solve matrix / determinants	**Matrix / determinants [3X3] size:** • Addition • Subtraction • Multiplication • Inverse	1	4
11.	Solve/apply limits	**Limits** • Introduction • Maximum and minimum	1	2
12.	Solve /apply differentiation	**Differentiation:** • Introduction • Rule of derivatives • First principles • Second principles • Examples • Exercise	1	8
13.	Solve/apply integration	**Integration:** • Introduction • Rules of integration • First principle • Second principle • Examples • Exercise	1	8
Total			**10**	**40**

Module 4: Basic Workshop Practice

Course Description: This module deals with knowledge and skills related to basic workshop practices

Course Objectives: At the end of this course, trainees will be able to:

- Apply different hand tools and instrument.
- Perform bench work.
- Perform basic sheet metal works.

Time: 100 hrs. **Theory:** 20 hrs. **Practical:** 80 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Identify/apply bench tools/ instruments.	**Tools for bench work and their uses:** • Structure and application of steel rule • Vernier Callipers • Try squire callipers • Micrometer scriber • Divider. • V-block • Angle blade combination set • Letter and number punch • Cold and wood chisel • Hack saw, • Masonry and HSS drill • Reamer, scraper, taps, files, tin-snips • Wood saws, cutter hammer, vice • Clamp, spanner, screwdriver • Pliers, drift punch, pin punch • Pipe vices, washer, scares, studs • Rivet, locking devices, crimping tools	3	10
2.	Cut/saw work piece.	**Methods of:** • Cutting • Sawing	1	2
3.	File work piece.	**Filing of work piece:** • Types of files • Methods of Filing	2	10
4.	Drill work piece.	**Drilling of work piece;** • Types of drill machine • Types and sizes of drill bits • Methods of drilling	3	6
5.	Cut sheet metal work piece.	**Cutting sheet metal:** • Method of cutting	0.5	2

6.	Fold sheet metal work piece.	**Folding:** • Process of folding • Uses of mallet	0.5	4
7.	Perform riveting on sheet metal work piece	**Riveting:** • Types of rivet • Process of riveting	2	6
8.	Make wire/cable joints	**Wire/cable joints:** • Application of joints and eyelets • Importance of soldering flux • T-joints and married Britannia • Forming eyelets • Crimping	8	40
Total			**20**	**80**

Module 5. Basic Electricity

Course Description: This module deals with knowledge and skills related to basic electricity.

Course Objectives: At the end of this course, trainees will be able to:

- Explain the common parameters of electricity.
- Explain different laws related to electricity.
- Familiarize with different electrical components.
- Explain principle of motors and generators.

Time: 120 hrs. **Theory:** 20 hrs. **Practical:** 100 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Familiarize with Charge/Voltage /Current/ Resistance / resistivity/conductivity	**Charge/Voltage /Current/ Resistance / resistivity/conductivity:** • Introduction to charge, Voltage and Current • Symbol and units • Sources of electricity and potential difference • Flow of current • Resistively of a material • Effect of temperature on resistance • Resistors in series, parallel and mixed(series & parallel) • Resisters colour code • Voltage dividers	3	4
2	Familiarise with electrical signals	**Electrical signals:** AC and DC signals Frequency and waveform AC and DC sources	1	4
3.	Perform electrical measurements	**Electrical measurements:** • Introduction to Voltmeter, Ammeter, Ohm Meter and Megger • Handling of Voltmeter, Ammeter, Ohm Meter and Megger in a circuit.	1	5
	Apply Ohm's law	**Ohm's law:** • Statement • formula	0.5	2
4.	Apply Kirchhoff's Law	**Kirchhoff's Law:** • Kirchhoff's Current and voltage law • Application of Kirchhoff's laws in series and parallel circuits • Numerical problems using Kirchhoff's law.	1	4

5.	Calculate electrical power/energy	**Electrical power/energy:** • Definition of power and energy • Relation of power with voltage and current. • Impedance matching • Maximum Power transfer theory.	0.5	5
6.	Familiarise with cell/battery	**Cell/battery:** • Introduction to cell • Cells in parallel and series. • Internal resistance of a cell • Types of cells. • Primary cell and Secondary cell • Electrolyte and Electrodes • Charging and discharging • Chemical reaction • Hydrometer • Float charge • Boost charge • Recharge, and Refresher charge • Battery Room	2	8
7.	Describe AC signal	**AC signal:** • Introduction to waveform, amplitude, RMS and P-P value, and frequency. • Impedance and reactance • Capacitive and Inductive effects.	0.5	8
8.	Describe /apply the principle of Bridges	**Principle of Bridges :** • Introduction to Wheatstone, Wein, and Hay's bridge. • Uses of bridges.	1	8
9.	Describe/apply Capacitors principle	**Capacitors principle:** • Principle of capacitor • Capacitance, Mutual capacitance and Di-electric constant • Charging, discharging and RC-time constant • Capacitors in series and parallel	0.5	5
10.	Describe/apply Inductors principle	**Inductors principle:** • Principle of inductor • Self, mutual inductance and permeability • Inductors in series and parallel	0.5	5

11.	Familiarise with /apply the concept of Electromagnetism	**Electromagnetism:** • Fundamentals of electromagnetism • Electric and magnetic fields • Lenz's law	1	5
12.	Familiarise with AC circuits	**AC circuits:** • Phase relationship, Lead / lag and power factor. • Power in AC circuit.	1	5
13.	Conceptualise/verify the principle of Transformers	**Principle of Transformers:** • Basic principle and types of transformers • Construction • Voltage and Current calculation • Efficiency and Losses	2	8
14.	Explain the principle of motors	**Principle of motors**: • A.C. and D.C. motors • Characteristics • Types • Parts/units • Testing	1.5	6
15.	Explain the principle of generators	**Principle of generators:** • A.C. and D.C. generators • Characteristics • Types • Parts/units • Testing	2	10
16.	Handle Signal Generator and Oscilloscope	**Signal Generator and Oscilloscope:** • Construction, operation, scale, range, calibration and parallax error of • Signal Generator • Oscilloscope	1	8
Total			**20**	**100**

Module 6: Basic Electronics

Course Description: This module deals with knowledge and skills related to basic electronics.

Course Objectives: At the end of this course, trainees will be able to:

- Familiarize withelectronics components.
- Solve logical expressions.

Time: 140 hrs. **Theory:** 35 hrs. **Practical:** 105 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Apply the principle of semiconductor and diodes	**Principle of semiconductor and diodes:** • Introduction of Semiconductor, types of semiconductor, effect of impurities and temperature, majority and minority carriers • Principle and types of semiconductor diodes (Silicon, Zener and Varactordiods) • Biasing of diodes • Tests • Numerical problems	4	12
2.	Applytransistors in electronics circuit	**Concept, importance, Principle and types of:** • Transistors • Transistors circuit • Transistors amplifiers • Simple biasing circuit (emitter base collector load curve: PNP, NPN) • Basic circuit configuration (CB,CC,CE)	5	12
3.	Familiarize with I.C.	**I.C.:** • Principle and types of I.C.	2	4
4.	Construct half wave/full wave rectifiers circuits	**Half wave/full wave rectifiers circuits:** • Principle and types of rectifiers circuits	2	4
5.	Apply filters circuits	**Filters circuits:** • Principle and types of filters circuits	2	4
6.	Construct Oscillators	**Oscillators:** • Concept, principle and types of Oscillators	3	8
7.	Apply the principle of Logical function on Gates, memory devices, counters, shift registers,	**Principle and types of :** • Logic Gates • Memory devices	7	20

	decoders/encoders, multiplexers/demultiplexers, adders, multivibrators	• Counters • Shift registers • Decoders / encoders • Multiplexers/demultiplexers • Adders • Multivibrators		
8.	Apply A/D and D/A converters	**A /D and D/A converters:** • Introduction of Analogue /Digital signal • Binary weighted D/A converter • Simultaneous A/D converter	4	8
9.	Convert various number system	**Various number system:** • Types of number system (binary, decimal, Hexadecimal and octal)	2	4
10.	Solve Logical expressions	**Logical expressions:** • DeMorgan's theorem • Boolean algebra	3	4
11.	Design RLC circuit	**RLC circuit:** • Concept • Designing procedure • Need and importance	1	10
12.	Design Transistor as amplifier		0	10
13.	Make Power supply using Zener diode		0	5
Total			**35**	**105**

Module 7: Telecommunication.

Course Description: This module deals with knowledge and skills related to telecommunication.

Course Objectives: At the end of this course, trainees will be able to:

- Explain the concept of telephony and switching system.
- Install radio antenna.
- Install power system.

Time: 380 hrs. **Theory:** 70 hrs. **Practical:** 310 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Conceptualise basic telephony	**Basic telephony:** • Historical development of telephone • Communication system and principle • International organization for telecommunication • Telecommunication connection • Telecom instrument and relays • Subscriber Tel set	3	2
2.	Familiarize with switching system	**Switching system:** • Introduction of switching system • Types of switches (PSTN, NGN, GSM, CDMA, POI) • Host exchange, Remote Subscriber Units (RSU) • Switching alarms and alarms handling • Routing concepts, numbering plan, charging	5	12
3.	Perform ADSL modem configuration and connection	**ADSL modem configuration and connection:** • Introduction of xDSL technology • Process of ADSL modem configuration and connection	2	6
4.	Familiarize with transmission system	**Transmission system:** • Concept, principle of transmission system • Introduction of analogue and digital signal • Introduction and types of modulation (AM, FM, and PM) • Introduction of Pulse Code Modulation (PCM) • Introduction of Multiplexing (TDM and FDM, Higher order	15	5

		Multiplexing) • Digital Modulation (FSK, PSK, QAM,16QAM)		
5.	Fit radio antenna accessories ▪ Fit boom on tower ▪ Fit rack in room ▪ Fit IDU on rack ▪ Fit ODU on antenna ▪ Fit IF cable connection	**Radio antenna accessories:** • Introduction and types of accessories	5	25
6.	Install Radio antenna	**Radio antenna:** • Introduction and types of antenna • Introduction of microwave • Introduction of line of sight (LOS) • Process of installation of antenna tower	10	30
7.	Install and maintain power system • Install/maintain battery bank • Install/maintain generator • Install/maintain solar PV • Install/maintain air conditioning (AC)	**Power system:** • Introduction to construction of secondary cell and Charging system • Battery bank installation • Generator care, fuelling, lubricating and simple maintenance • DC power supply system (SMPS, Rectifier) simple maintenance • Introduction to inverter, UPS • Connection in bus bar • Introduction to solar PV system • Air condition system care and simple maintenance • Battery care and maintenance	10	60
8.	Familiarize Wireless system	**Wireless system:** • History of wireless communication system • Concept of cellular communication • Evolution of GSM technology • GSM network architecture • Frequency reuse and handover across cells • Introduction to GPRS, SMS, MMS, UMTS • Evolution of CDMA technology • CDMA network architecture • Roaming and handoff • Difference in SIM and RUIM • Concept of HLR, VLR, AUC,	20	20

		EIR.		
9.	Complete Project work/field work on: • Switching (30 hrs) • Power system (40 hrs) • Antenna(40 hrs) • GSM (20 hrs) • CDMA(20 hrs)		0	150
Total			**70**	**310**

Module 8: Landline Network Installation.

Course Description: This module deals with knowledge and skills related to Landline network installation.

Course Objectives: At the end of this course, trainees will be able to:

- Explain the concept of landline network.
- Install aerial and underground network.
- Trouble shoot /perform fault finding.

Time: 180 hrs. **Theory:** 30 hrs. **Practical:** 150 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Familiarise withlandlinenetwork	**Landlinenetwork:** • Introduction to landline cable network • Introduction to Primary and secondary network • Symbols used in PSTN telephone network • Understanding aerial map, underground map • Introduction to MDF, Cabinet and DP, Node • Pole, stay, push brace • Manhole, Hand hole, trenching, ducting • Earthing	5	15
2.	Installaerial network ▪ Installpole, pushbrace, stay, poleaccessories ▪ Install aerial cables, splicing and enclosing joints ▪ Test cable pairs ▪ Perform network earthing	**Aerial network:** • Introduction to aerial network and pole accessories • Cable and sizes of cables • colour code of cables and binders • Process of installation of pole, push brace, stay, pole accessories • Process of installation of different sizes of aerial cable, splicing and enclosing joints • Testing procedure of cable pairs • Process of network earthing	5	30
3.	Install underground network ▪ Lay direct buried cable ▪ Install duct ▪ Pull primary cable and sub duct in ducts, ▪ Perform splicing and enclosing underground joints ▪ Test cable pairs	**Underground network:** • Introduction to underground network • Introduction to underground cables, binders, color code, duct, sub duct • Process of installation of direct buried cable • Process of pulling of primary	5	30

	▪ Install cabinet box, nodes rack, MDF frames ▪ Perform cable termination at cabinet, nodes, MDF	cable and sub duct • Process of splicing and enclosing underground joints • Testing procedure of cable pairs • Installation process of cabinet box, nodes rack, MDF frames • Cable termination at cabinet, nodes, MDF		
4.	Perform fault localization and maintenance	**Fault localization and maintenance:** • Introduction to cable fault • Fault in subscriber premises • Using Fault localiser • Characteristics of different faults: Open circuit fault, short circuit fault, loose connection fault, grounding fault. • Characteristics of the faults caused by rusting and rain. • Introduction to interference and noise • Repairing technique and flowchart.	15	25
5.	Field work			50
Total			**30**	**150**

Module 9: Optical Networks Installation

Course Description: This module deals with knowledge and skills related to Optical networks installation.

Course Objectives: At the end of this course, trainees will be able to:

- Explain the concept of optical fiber networking.
- Install optical fiber network.

Time: 70 hrs. **Theory:** 12 hrs. **Practical:** 58 hrs.

S.N.	Tasks	Related Knowledge	Time (Hours)	
			Theory	Practical
1.	Conceptualize reflection and refraction	**Reflection and refractio:** • Laws of reflection, • Types of mediums (denser and rarer) • Laws of refraction, • Refractive index and its calculations • Real depth and Apparent depth • Snell's law	2	1
2.	Describe phenomenon of dispersion.	**Phenomenon of dispersion:** • Introduction of Dispersion • Introduction of wave theory of light • Significance of wave theory of light	2	1
3.	Familiarize optical fibre communication	**Optical fibre communication:** • Enlist types of Fibres (Step index, graded index, single & multimode fibre) • Propagation of light in optical fibre • Different types of losses in optical fibre • Opticalsources (LED, LASER) • Photo detector(photo diode) • Different applications of optical fiber • Advantages of optical fibre over copper cable in communication.	3	16
4.	Install optical networks. • Install ODF, OTB • Install OFC cable • Splice optical fibres • Connect patch-cord/pig tail	**Optical networks:** • Different types of fibre network topologies(LAN, WAN, MAN etc.) • Introduction to FTTx • Architecture of FTTH	5	40

	• Test optical fibre connection • Perform fault localization	• FTTH network elements and their installation. (OLT,ODF, OTB, Splitters, Drop Cables, Indoor Cables, CPE) • Fiber termination in ODF, OTB, Access Gateways(nodes) • Mechanical connectors • Process of installation of Optical fibres in poles and underground. • Splicing process of optical fibres using arc fusion • Process of fault localization in optical fibre, if any using OTDR, Power meter.		
Total			**12**	**58**

Module 10: Communication & Professional Development

<table>
<tr><td colspan="3">Course Description: This module deals with knowledge and skills related to communication and professional development.</td></tr>
<tr><td colspan="3">Course Objectives: At the end of this course, trainees will be able to:
Communicate with others.
Develop professionalism.</td></tr>
<tr><td colspan="3">Time: 5 hrs. Theory: 5 hrs. Practical:</td></tr>
<tr><td colspan="3">Task 1: Communicate with others</td></tr>
<tr><td>Steps</td><td>Terminal performance objective</td><td>Related technical knowledge</td></tr>
<tr><td>1. Receive instruction
2. Write letters
3. Make telephone calls
4. Instruct juniors / helpers about flower arrangement / decoration
5. Inspect works of juniors / helpers
6. Exchange information with colleagues
7. Inform supervisor about the status of flower arrangement activities
8. Request for product improvement to the supervisor / manager
9. Manage workload with colleague
10. Write status report of the activities
11. Write invoice
12. Communicate with flower suppliers
13. Communicate with clients
14. Instruct clients about types of flower arrangement designs / products
15. Take precautions
16. Keep records</td><td><u>Condition (Given):</u>
Communication tools/materials as per available technology
<u>Task (What):</u>
Communicate with others
<u>Standard (How well):</u>
Communicated in simple, clear, unambiguous and understandable language of the receiver avoiding communication barriers</td><td><u>Communicating with others</u>:
Definition
Importance
Type
Mode and media
Process
Precautions to be taken</td></tr>
<tr><td>Tools /materials/equipment:</td><td colspan="2">Safety/precautions:</td></tr>
<tr><td>Telephone, paper, pen, and telephone</td><td colspan="2">Take special care on providing clear and unambiguous massage or information to others
Always overcome communication barriers</td></tr>
</table>

<table>
<tr><th colspan="3">Task 2: Develop Professionalism</th></tr>
<tr><th>Steps</th><th>Terminal performance objective</th><th>Related technical knowledge</th></tr>
<tr><td>1. Receive instruction
2. Share experience with supervisors
3. Learn from colleagues
4. Receive instruction from manager
5. Read related books
6. Attend training and workshops
7. Participate in flower exhibition
8. Attend meeting of the related association
9. Participate in the exposure visit of reputed flower arrangement workplaces
10. Think positive
11. Be cooperative
12. Browse www.
13. Read professional journals
14. Take precautions
15. Keep records</td><td><u>Condition (Given):</u>
• Reading materials and Information technology facility

<u>Task (What):</u>
• Develop professionalism

<u>Standard (How well):</u>
• The professionalism developed through the acquisition, development, and updating of the professional skills keeping pace with the recent technological changes relevant to the profession.</td><td><u>Developing professionalism:</u>
• Definition of professionalism
• Importance
• Books about professionalism
• Different web sites
• Professional association
• How and why to browse www
• Precautions to be taken</td></tr>
<tr><td>Tools /materials/equipment:</td><td colspan="2">Safety/precautions:</td></tr>
<tr><td>Computer with internet facility, Other IT technology and devices, Books, Journals, papers/publications, pen diary</td><td colspan="2">• Take special care on updating the related technical skills</td></tr>
</table>

On the Job Training (OJT)

Course Description: The aim of the OJT is to provide the trainees the maximum experience & exposure of "World of Work".On-the-Job Training is an individual training approach designed to practice certain tasks learned during the training period in the real work environment. During the OJT, the training will be relate in a real work setting.

Course Objectives: After completion of OJT the trainees will be able to:

- To practice/apply the skills/knowledge developed by the trainees through institutional training in the real world of the related occupation.
- To practice the skills gained through institutional training that the trainees have not got enough opportunity to practice and apply them due to the institutional constraints/limitation.
- To gain world of work experiences.
- To acquire skills and knowledge newly developed in the related field of occupation.
- To make trainees familiar with the future occupation/ job they are going to hold.
- To provide trainees with supporting skills and knowledge necessary for the related occupation.
- To make trainees familiar with the day to day administrative/managerial activities applicable in their related occupation.
- To build of the self-confidence of trainees to perform the job.

Time: 300 hrs. **Theory:** **Practical:**300 hrs.

Competencies to be performed during OJT

The trainees are suggested to practice all the critical competencies listed under each course and module during the period of OJT.

OJT Time Division Table

S.N.	Description	Time
1.	Telecommunication	100 hrs.
2.	Landline Network Installation	100 hrs.
3.	Optical Fibre Network Installation	100 hrs.
Total		**300 hrs.**

OJT Evaluation

The OJT will be evaluated by:

- Related supervisor of employer agency.
- Related instructor of the training institute.

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Equipment, tools and materials

S. N.	Descriptions of tools, equipment and materials	Quantity (for 20 students)
A.	**For Workshop**	
1.	Hammer	10
2.	Chisel	10
3.	Sheet metal cutter	10
4.	File	10
5.	Set square	10
6.	Pliers	10
7.	Screwdriver	10
8.	Hack saw	10
9.	Soldering Iron	10
10.	Drill	5
11	Wooden Wiring Board	10
B.	**Electrical and Electronics Practical**	
1.	Multi meter	10
2.	Voltmeter	10
3.	Ammeter	10
4.	Resistors, Capacitors, Inductors	As required
5.	Printed circuit board	10
6.	Oscilloscope	1
7.	Transistor and Diode	As required
8.	Transformer	As required
9.	DC power supply	10
10.	AC power supply	10
11.	Bread board	10
C.	**Outside plant**	
1.	Aerial cable	As required
2.	Underground cable	As required
3.	Simera (Vice)	2
4.	Roller	4
5.	Eriband Tools	2
6.	Digging set	2
7.	Crimping tools (UYC, drop wire, earth sheath)	2/2/2
8.	Insertion tools	4
9.	Tone Tester	2 set
10.	Megger	2
11.	C-meter	2
12.	Measuring tape/measuring wheel	1
13.	Cable cutter	5
14.	Cable splicer set	5
15.	Enclosure	5
16.	Distribution Box	10
17.	Main Distribution Frame	10

S. N.	Descriptions of tools, equipment and materials	Quantity (for 20 students)
18.	Ladder	2 (with various lengths)
19.	Earthling Kit with all accessories	1 set
20.	Cable fault localiser	1 set
21.	House and jumper wire	As required
22.	Drop wire	As required
23.	EPABX	5
D.	**Optical network**	
1.	Aerial optical fibre cable	As required
2.	Underground optical fibre cable	As required
3.	Drop fibre	As required
4.	Arc fusion splicer	1 set
5.	Stripper	2
6.	Cleaver	1
7.	OTDR	1
8.	Power meter	1 set
9.	Mechanical connector	As required
10.	Pig tail/patch cord	As required
11.	OTB	1

Physical facilities:

The theory class rooms at least should have area of 10 square feet per trainee and in the workshop it should be at least of 30 square feet per trainees. All the rooms and laboratory should be well illuminated and ventilated.

- Electrical/Electronics Lab. 1
- Workshop 1
- Class room 1
- Office room 1
- Principle room 1
- Reception room 1
- Store room 1

General Quality Indicators

Input Level

SN	Criteria	Objectively verifiable indicator (OVI)	Means of verification (MOV)
1	**Mechanisms to identify training needs in the labour market:**		
		• Training Needs Assessment /Rapid Market Appraisal (or other appropriate method) is following standard methodology and depicts demand for skilled workers and their training needs at local level is conducted at least once per year.	TNA or RMA report
		• T&E regularly meets Chambers of Commerce, representatives of local businesses and bigger industries as well as actively participates in local employment and training review events.	No. of meetings, list of participants and minutes of the meetings.
2	**Schemes used to promote better access to VST:**		
		• Training announcements are disseminated widely through different media (e.g., Local FM, posters, local community organization etc.)	Frequency and content of information broadcasted in media and through other channels
		• Trainees are selected as per the trainee selection guideline of the programme.	List of selected trainees (incl. detailedinformation on their eligibility as per the selection criteria).
3	**Availability of training curriculum and manual:**		
		• Curriculum standardized by CTEVT is accessible to the instructors.	Training event monitoring report
		• Training manuals/materials are developed based on the CTEVT standard curriculum and are of relevance for the labour market.	Training manuals/materials.
4	**Selection of Instructors:**		
		• At least two	Profile of instructors. Training event monitoring report
		• At least one of the two instructors has minimum Diploma in Electronics with one year work experience or skill test level 2 pass with three years' work experience	Profile of all instructors

		• At least one of the two instructors successfully completed at least five day's customized TOT for level 1 and at least four days for elementary level conducted by a nationally recognized institute (such as TITI)	Profile of all instructors
		• All instructors are oriented before training start on the overall programme as well as the use of the curriculum and manual(s).	Pre training orientation report
5	**Training Cycle Management:**		
		• Timely preparation of training calendar (start and end date of training, OJT placement plan, skill testing date, job placement plan and post-training support plan)	Training calendar
Process Level			
SN	**Criteria**	**Objectively verifiable indicator (OVI)**	**Means of verification (MOV)**
1.	**Trainees' participation:**		
		• Trainees are with regards to gender, caste, ethnicity, education level and geographical origin from the eligible target group.	Database of trainees
		• Maximum 20 per group	Database of trainees. Training event monitoring report
		• Throughout the training at least 80% of the trainees are attending.	Trainee attendance sheet. Training event monitoring report
2	**Involvement of Instructors:**		
		• The trainee vs instructors' ratio is during theoretical training maximum 20:1 and during practical training maximum 10:1.	Training event monitoring report. Training session plan
3.	**Physical Facilities**	• Adequate facilities as specified in the training programme document and fact sheet. • At least two clean toilets separate for male and female with running water and soap.	Training event monitoring report

		• All tools and equipment have appropriate safety measures. Safety related information and checklist posted at the lab/ workshop. Trainers and trainees are instructed about health and safety measures. First aid box continuously replenished, clearly marked and accessible in the workshop. Trainers are instructed on how to provide first aid.	Training event monitoring report. Training session plan.
4	**Provisions for practical training**		
		• Ratio of theoretical and practical classes is 20:80	Training event monitoring report. Training session plan.
		• Each trainee practices all tasks on the respective equipment and/ or with the tools specified in the sector and occupation-wise quality standards.	Training event monitoring report. Training session plan.
		• Each trainee participates in OJT, industrial practice, exposure visits etc. as defined in the standard curriculum.	Training event monitoring report. List of OJT placement, industrial practice,exposure visits.
5	**Provisions for soft and business skills training**		
		• Trainees have access to training on labour rights, HIV/ AIDS & reproductive health, business skills training, life skills training and overseas orientation as per their needs	Training event monitoring report. Training session plan.
6	**Instructional Plan and Implementation:**		
		• Training is implemented in accordance with the training calendar.	Training event monitoring report. Training calendar.
		• Lesson plan is developed based on curriculum and training calendar. Log book maintained.	Training event monitoring report
		• Training follows the curriculum standardized by CTEVT and the respective manuals are used in the classroom by the instructor and trainees.	Training session plan, Training event monitoring report
7	**Provision of placement and counseling support:**		
		• Placement and counselling support in place with adequate staffing	Monitoring report

		• Experts from employers invited to trainee selection training and skill test. Employers provide OJT opportunities. Graduates are employed immediately after training.	Monitoring report, Employment & Income verification report
		• Graduates are linked to financial institutions for access to loan/ seed money for enterprise development	Monitoring report, MOU between training provider and financial institution(s)
Output Level			
SN	**Criteria**	**Objectively verifiable indicator (OVI)**	**Means of verification (MOV)**
1	**Completion rate of training:**		
		• Not more than 10% drop-outs among trainees	Trainee database
2	**Skills testing**		
		• At least 90% of the trainees attend the skills test.	NSTB skills test results
		• At least 80% of the trainees pass the skills test.	NSTB skills test results
Outcome Level			
SN	**Criteria**	**Objectively verifiable indicator (OVI)**	**Means of verification (MOV)**
1	**Placement rate of graduates**		
		• From each training event at least 60% of the graduates are employed.	Income verification report/ Tracer study report
		• Employed graduates earn at least the specified minimum income (if specified).	Income verification report/ Tracer study report
2	**Utilization of acquired skills at the workplace:**		
		• 90% of the employed graduates are in employment related to the occupational training.	Income verification report/ Tracer study report
		• At least 80% of the graduates and 70% of the employers are satisfied with the skills acquired in the training.	Tracer study report. Employers survey