CURRICULUM

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Telecommunication Outside/External Plant Technician

(SHORT COURSE)

Council for Technical Education and Vocational Training

CURRICULUM DEVELOPMENT DIVISION

Sanothimi, Bhaktapur

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Introduction

Most human activities depend on using information. In the past, messages have been carried by runners, carrier pigeons, drumbeats and torches. These schemes were adequate for the distances and "data rates" of the age. In most parts of the world, these modes of communication have been superseded by electrical communication systems i.e. telecommunications, which can transmit signals over much longer distances (even to distant planets and galaxies) and at the speed of light.

Rapid changes in technology (especially in the field of telecommunication) are driving forward the boundaries in which we live. Examples of developments in wireless phone such as Mobile, WLL, CDMA, 3 G phone etc. provide exciting opportunities for today's technician. As we can see, in landline telephone sector, Nepal Telecom has already installed more than 5 lakhs telephone. Another company STM is also starting their work in landline sector. Also, in every private and public office like hospitals, departments, schools, industries, colleges, banks etc have their own telephone switch (EPABX). But these companies have been facing the problem of not getting enough appropriately trained and skilled manpower to be employed there.

This competency based and market oriented curriculum for**Telecommunication Outside /External Plant Technician** is designed to produce basic level employable workforce equipped with knowledge, skills and positive attitudes related to the occupationin order to meet the demand of competent telecommunication outside/external plant technicians. It is hopedthat the trained workforces are then eligible to work in telecommunication sector, specifically at theoutside plant networks. The skills and knowledge included in this curriculum improve trainees' knowledge and skills and make them competent workforce needed for the occupation.

Once the trainees acquired the competencies they will have ample opportunity for employment in telecommunication sector, through which they will contribute in the national streamline of poverty reduction in the country.

Aim

The main aim of this curricular program is to produce basic levelcompetentworkforceas **outside /external plant technicians**who could provide services in the telecommunication sectorin the country and the overseas.

Objectives

After completion of training the trainees will be able:

1. To identify, handle and apply bench tools related to the occupation
2. To interpret and draw engineering drawings

3. Perform mathematical calculations
4. To illustrate the principles of electricity and electronics implies in telecommunication
5. To develop the concept of basic optics & optical fiber communication
6. To fulfill the gap of skill telecom technician as per offices, industries requirement
7. To supply skilled workforces in overseas employment
8. To develop skills and knowledge on computer fundamental
9. To perform aerial and underground line construction works
10. To carry out subscriber line installation as well as fault localization &telephone set maintenance works
11. To develop concept of MDF installation and MCC procedure.

Course Description

This course is based on the job required to perform by an outside/external plant technician in Nepal and overseas.This course intends to provide skills and knowledge onconstruction of outside plant network of telecommunication system**.** This course is divided into modules. The first moduledeals with Basic telecommunicationas a foundationcourse and which imparts knowledge and skills on Workshop technology, Technical drawing, Electrical principle, Electronic principle, Basic telecommunication, Basic optic and optical fiber and Computer fundamental as sub modules. Similarly, the second module deals with Outside or external plantnetwork as a specialized moduleand which imparts knowledge and skills on Aerial line and under ground line constructions, Subscriber line installation, Fault localization and set maintenance and MDF installation and MCC procedureas sub modules.

Trainees will practice and learn skills by using typical tools, equipment and materials necessary for the program.

Duration

The total duration of the course is **943 hours. (783 hoursin house training and 160 hours On the Job Training)** After completion of the prescribed in house training course, the trainees should undergo OJT for the period as mentioned above. Trainees will learn and practice the knowledge and skills at the institutional level and apply them during the period of OJT so as to have exposure/ experience of the world of work.

Target Group

The target group for this training program will be youths with educational prerequisite of minimum S.L.C. pass.

Target Location

The target location for this training program will be all over Nepal.

Group Size

The group size of this training program will be maximum 20, provided all necessary resources to practice the tasks/ competencies as specified in this curriculum.

Medium of Instruction

The medium of instruction for this program will be English, Nepali or both.

Pattern of Attendance

Trainee should have 90% attendance during the training period to get the certificate.

Focus of Curriculum

This curriculum emphasizes on performance of competencies. 80% time is allotted for performance and remaining 20% time for related technical knowledge. So, the main focus will be on performance of the specified competencies in the curriculum.

The provision of OJT is made mandatoryto practice learnt skills, knowledge and attitude in the world of work.

Entry Criteria

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

- Minimum of 18 years of age
- Minimum of SLC pass
- Citizenship certificate (for the name, parents' name, age, date of birth and address verification purpose only)
- Should pass entrance examination as administered by institute.

Teaching Learning Methodologies

The methods of teachings for this 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 and Self-practice.

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.).

Students Evaluation Details

- Continuous evaluation of the trainees' performance is to be done by the related instructor/ trainer to ensure the proficiency over each competency under each area of the whole course.
- Related technical knowledge learnt by trainees will be evaluated through written or oral tests as per the nature in the institutional phase of training.
- Trainees must secure minimum marks of 60% in an average of both theory and practical evaluations.
- The entrance test will be administered by the concerned training institute.

Trainer's Qualification

- BE in electronics and communications for instructor
- Diploma in electronics with 3 years of experience in related field for assistant instructor
- Good communication and instructional skills

Trainer-Trainees Ratio

- In theory classes 1(trainer): 20 (trainees)
- In practical classes (in workshop and laboratory) 1(trainer): 10 (trainees)

Certificate Requirements

The related training institute will provide the certificate of **"Telecommunication Outside/External Plant Technician**"to those trainees who successfully complete the prescribed course and conducted evaluation. The sample of the certificate is given in annexure 1.

Physical Facilities

The theory class rooms should have at least area of 30 square feet and in the workshop it should be at least of 60 square feet per trainees. All the rooms and laboratory should be well illuminated and ventilated.

- Electrical /Electronics Lab -1
- Computer Lab -1
- Aerial & UG Practical room - 1
- Workshop -1
- Class room -1
- Office room -1
- Principle room -1
- Faculty Room -1
- Reception room -1
- Library - 1
- Store room -1
- Projector -1

List of tools, equipment and materials

S.N	Descriptions of tools, equipment and materials	Quantity (for 20 students)
A.	***For Workshop***	
1.	Hammer	25
2.	Chisel	25
3.	Sheet metal cutter	25
4.	File	25
5.	Set square	25
6.	Pliers	25
7.	Screwdriver	25
8.	Hack saw	25
9.	Soldering Iron	25
10.	Drill	2
11	Wooden Wiring Board	20
12	Right angle	20
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	20
7.	Transistor and Diode	As required
8.	Transformer	As required

S.N	Descriptions of tools, equipment and materials	Quantity (for 20 students)
9.	DC power supply	10
10.	AC power supply	10
11.	Bread board	10
C.	***Computer Lab***	
1.	Computer	5 Nos.
D.	***Outside plant***	
1.	Aerial cable of different pairs	As required
2.	Underground cable of different pairs	As required
3.	Cable cutter	10
4.	Cable splicer	10
5.	Enclosure	5
6.	Distribution Box	5
7.	Main Distribution Frame	5
8.	Ladder	4 (with various lengths)
9.	Earthling Kit with all accessories	3 set
10.	Cable fault localiser	3 set
11.	U-nut	As required
12.	3M Modular Connector	As required
13.	UY connector	As required
14.	Steel bands in rolls of 25 mtrs	As required
15.	Seal for steel band	As required
16.	Screws for clamp on wall	As required
17.	House wire & jumper wire	As required
18.	Flat wire	As required
19.	Screw grip, screw	As required
20.	RJ 11 Tool	2 set
21.	RJ 11 jack	As required
22.	Drop wire	As required
23.	EPABX	2Nos.
24	Eriband Tools	As required
25	Simara	As required
26	Sheath Cutter	As required
27	MSAN	As required

Course Structure of Telecom Outside/External Plant Technician

S.N.	Modules/ Sub modules	Nature Pr /Th.	Time (Hrs.)	
			Theory	Practical
A				
1.	Workshop Technology	T+P	8	16
2.	Basic Engineering Drawing	T+P	14	52
3.	Applied Mathematics	T+P+TU	7	13
4.	Electrical Principle	T+P+TU	26	36
5.	Electronics Principle	T+P+TU	17	30
6.	Basic Telecommunication	T+TU	16	12
7.	Basic optics & Optical fiber Communication	T	16	25
8.	Computer Fundamentals	T+P	9	19
		Sub total	**113**	**203**
B				
1	Aerial Line Construction	T+P	29	161
2.	Underground Line Construction	T+P	26	136
3.	Subscriber line Installation& fault localization & maintenance.	T+P	11	64
4.	Entrepreneurship Development	T+P	18	22
		Sub total	**84**	**383**
		Total	**197**	**586**
		Total (Part A & B)	**783**	
5	**On the Job Training (1 months)**	P	160	
		Grand total	**943**	

T = Theory, P = Practical, TU= Tutorial

Module I: Basic Telecommunication

Module description

Thismodule is designed to provideknowledge and skills on Basic Telecommunicationas a foundation course for mastering on outside plant network specialized module. This moduleincludesWorkshop technology, Basic Engineering drawing, Applied mathematics, Electrical principle, Electronics principle, Basic telecommunication, Basic optics and optical fiber communication and Computer fundamentals as the sub modules.

Sub modules:

1. Workshop Technology
2. Basic Engineering Drawing
3. Applied Mathematics
4. Electrical Principle
5. Electronics Principle
6. Basic Telecommunication
7. Basic optics & Optical fiber communication
8. Computer Fundamentals

Task Analysis

Sub module 1: Workshop Technology

Duration: 24hrs (8 hrs theory &16hrs practical)

Task No.1: Orient with general safety rules.

Time :3hrs**Theory:** 1 hr**Practical:**2hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define safety. 2. Enlist importance of safety precaution. 3. Enlist workshop hazards. 4. Enlist personal safety rules and regulations. 5. Enlist workshop safety rules and regulations. 6. Keep records.	**Condition (Given):** Class room Computer, OHP, transparency, handouts and safety poster **Task (What):** Orient with safety rules. **Standard (How Well):** Various safety rules and regulation oriented.	➢ Definition of safety ➢ Safety rules and regulations. ➢ Importance of safety precaution ➢ Workshop hazards ➢ Personal and workshop safety rules and regulations

Required tools/ equipment: Safety tools & equipment
Safety: Handle OHP Properly

Task Analysis

Task No: 2.Enumerate/identify bench/ outside tools/ instruments/ accessories/ materials. **Time :4**hrs**Theory:**2hr**Practical** :2hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect bench tools, instruments& materials. 3. Collect outside tools, instruments, accessories & materials. 4. Identify benchtools, instruments, & materials. 5. Identifyoutside tools, instruments, accessories & materials. 6. Restore all tools &equipment. 7. Keep records.	**Condition (Given)** Workshop, necessary tools, instruments, accessories and materials **Task (What)** Enumerate/identify bench/ outside tools/ instruments/ accessories/ materials. **Standard (How Well)** Bench/ outside tools/ instruments/ accessories/ materials enumerated & Identified.	▪ Identification of various bench tools, outside plant tools, instruments, materials and accessories like 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, Anchoring Eye, Simera, Roller, Eriband Tool, Pintype Bracket, Suspension clamp, RJ 11 tool, U-nut etc.

Required tools/ equipment: Divider, V-block, Angle blade, Lebel, Chisel, Pliers, Saws, Rivet, Vices, Clamps, Hammer etc

Safety: Handle tools properly

Task Analysis

Task No: 3. Apply/ handle sheet metal cutter. **Time :3**hrs**Theory:**1hr**Practical** :2hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools & materials. 3. Measure the work piece. 4. Mark the work piece. 5. Cut the work piece. 6. Restore all tools &equipments. 7. Keep records.	**Condition (Given)** Workshop, necessary tools, instruments, accessories and materials **Task (What)** Apply/ handle Sheet metal cutter. **Standard (How Well)** Sheet metal cutter applied/ handled.	• Different types of metal cutter • Handling Process • Uses of tools • Safety precautions

Required tools/ equipment: Divider, Lebel, Pliers, Saws, Hammer, Metal cutter etc.
Safety: Handle Sheet metal properly.

Task Analysis

Task No: 4. Apply/ handle drill machine. **Time :3**hrs**Theory:**1hr**Practical** : 2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools & materials. 3. Dimension the object. 4. Mark the object. 5. Connect the jack in electric supply. 6. Switch on the supply. 7. Fit the drill bit as per required size. 8. Make different holes. 9. Restore all tools &equipments. 10. Keep records.	**Condition (Given)** Workshop, necessary tools, instruments, accessories and materials **Task (What)** Apply/ handle Sheet metal cutter. **Standard (How Well)** Drill machine applied/ handled.	• Different types of drill machines (hand drill, electric drill etc.) • Uses of tools • Handling procedure • Safety precautions

Required tools/ equipment: Level, Hammer, Drill machine, etc.
Safety: Drill bit should be tightly fit.

Task Analysis

Task No: 5. Measure/ file/drill/ cut/ saw work piece. **Time :7**hrs**Theory:**2hr**Practical** :5hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instructions. **2. Measurement**: 1.1 Measure the dimension. (Inch/centimeter, millimeter, meter) **3. Marking**: 3.1 Measure the dimension as per drawing. 3.2 Mark the point by using scriber or pencil. **4. Filling** 4.1 Read drawing 4.2 Measure the work piece by using scale. 4.3 clamp work piece on the vice. 4.4 File the work piece using appropriate file. 4.5 Check filling surface level and perpendicular using by back square. 4.6 Measure the final dimension. 4.7 Clean work place. **5. Sawing**: 5.1 Mark on the work piece as per drawing. 5.2 Clamp the work piece on the bench vice. 5.3 Collect and fix hacksaw blade on hacksaw. 5.4 Saw on the work piece. 5.5 Apply coolant. **6.Drilling:** 6.1 Obtain finished work piece. 6.2 Mark layout line on the work piece. Punch the center. Clamp the work piece on the machine vice. Mount the required drill bit on drill chuck. Set up R.P.M. as per drill bit size. Set coolant-housing pipe. Start the machine & give hand feed. Drill until the required depth is obtained. 6.10 Stop the machine. 6.11 Remove the work piece from vice & clean it. 6.12 Measure the center & the size of hole as per given drawing. 6.13 Remove the drill bit & clean tools & working place. **7.** Keep records.	**Condition (Given)** Workshop, necessary tools, instruments, accessories and materials **Task (What)** Measure/ File/drill/ cut/ saw work piece. **Standard (How Well)** Work piece filed/drilled/ cut/ sawn.	• Concept of measurement, marking, filling, sawing and drilling • Procedure of measurement, marking, filling, sawing and drilling • Safety precautions

Required tools/ equipment: Divider, V-block, Angle blade, Level, Chisel, Pliers, Saws, Rivet, Vices, Clamps, Hammer etc

Safety: Handle tools properly& use safety accessories.

Task Analysis

Time :4hrs**Theory:**1 hr**Practical :**3hrs

Task No: 6. Perform wire/ cable joints.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Obtain the required drawing. 2. Study the drawing. 3. Obtain the required tools. 4. Obtain the required wire/cable piece. 5. Measure and mark the wire/cable piece according to the drawing. 6. Cut the insulation of wire/cable by electrification knife/cutting pliers/wire stripper. 7. Remove the insulation of wire/cable by pliers/wire stripper. 8. Over lap the stripping parts of wire/cable each other. 9. Twist the wire/cable each other slowly and carefully by pliers. 10. Apply paste in conductor tip. 11. Make connection with applying soldering wire. 12. Check joint continuity with multimeter. 13. Restore all tools and instruments. 14. Keep records.	**Condition (Given)** Workshop, necessary tools, instruments, accessories and materials **Task (What)** Perform wire/ cable joints. **Standard (How Well)** Wire/ cable joints performed.	• Application of joints and eyelets • Importance of soldering flux • T-joints and married Britannia • Forming eyelets • Crimping • Procedure Safety precautions

Required tools/ equipment: Pliers, Cutter, Solder iron, Solder wire, De solder wire, Paste, Crimping tool, Connectors, Stand etc

Safety: Don't scratch on wire.

Task Analysis

Time:2hrs**Theory:**1hr**Practical:**1hr

Task No: 7. Handle fire extinguishers.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect tools & instruments. 3. Obtain fire extinguisher. 4. Enlist purpose of fire extinguishers. 5. Enlist the classes of fires. 6. Open the seal of fire extinguishers. 7. Handle fire extinguishers. 8. Close fire extinguishers. 9. Keep records.	**Condition (Given)** Workshop/classroom fire extinguishers and safety manual **Task (What)** Handle fire extinguishers. **Standard (How Well)** Fire extinguishers handled. .	**Fires and fire extinguishers** • Classes of fires A, B, C, D and their respective extinguishers • Fire prevention technique.

Required tools/ equipment: Fire extinguishers and other related tools and materials
Safety: Handle Fire extinguishers properly.

Sub module 2: Basic Engineering Drawing
Duration: 66hrs (14hrs theory &52hrs practical)

Task No.1:Identify/handle/applydrawing instruments/materials.

Time :4hrs**Theory:** 1 hr**Practical:**3hr

Steps	Terminal performance Objectives	Related Technical Knowledge

1. Receive instruction. 2. Collect drawing instruments and materials. 3. Identify drawing instruments and materials. 4. Handle drawing board. 5. Handle/apply set-square. 6. Handle/apply T-square. 7. Handle instrument box. 8. Handle/apply scale. 9. Handle/apply protector. 10. Handle/applyFrench curve 11. Handle/apply drawing pencil 12. Handle sand -paper block. 13. Restore instruments and materials. 14. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Identify/handle/applydrawing instruments/materials. **Standard (How Well)** Drawing instruments and materials identified, handled and applied.	• Introduction of drawing instruments and materials • Various drawing instruments and materials and their uses. • Procedure

Required tools/ equipment: Ruler and Scale, Pencil, Rubber etc.
Safety:

Task No: 2.Prepare drawing sheet with title block.

Time :3hrs**Theory:**1 hr**Practical:**2hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Find drawing sheet. 4. Fix drawing sheet on drawing board. 5. Draw boarder lines. 6. Draw inner parallel line. 7. Draw block letter. 8. Clean the drawing paper. 9. Remove the drawing from drawing board. 10. Restore tools, instruments and materials. 11. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Prepare drawing sheet with title block. **Standard (How Well)** Drawing sheet with block prepared.	• Drawing sheets and their standard sizes • Border lines and title blocks • Procedure

Required tools/ equipment: T-square, Drawing Sheet, Pencil, Eraser, Cello Tape, Drawing board.

Safety:

Task No: 3. **Familiarize with different scales.** **Time:**4hrs**Theory:**1 hr**Practical:**3hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Obtain drawing sheet. 4. Fix drawing sheet on drawing board. 5. Obtain instruction of scales. 6. Draw line in plain scale. 7. Draw line in diagonal scale. 8. Draw line in reduce scale. 9. Draw line in enlarge scale. 10. Remove the drawing from drawing board. 11. Restore tools, instruments and materials. 12. Keep records.	**Condition (Given)** Class room, handouts and drawing book **Task (What)** Familiarize with different scales **Standard (How Well)** Different types of scale familiarized.	• Types of scales; plain and diagonal, reducing and enlarging scale • Representative Fraction • Different types of measuring systems and their conversions.

Required tools/ equipment: Pencil, Eraser, scale, Measuring Tape, Paper etc.
Safety:

Task No : 4.Draw different types of lines.

Time:5hrs**Theory:** 1 hr**Practical:**4hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw boarder lines. 5. Draw out lines. 6. Draw dashed lines. 7. Draw center lines. 8. Draw hatching/section lines. 9. Draw leader/pointer lines. 10. Draw cutting-plane lines. 11. Draw long and short break lines. 12. Clean the drawing paper. 13. Remove the drawing from drawing board. 14. Restore tools, instruments and materials. 15. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Draw different types of lines **Standard (How Well)** Different types of lines drawn. Thickness of different line maintained as per standard.	▪ 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. • Procedure • Safety precautions

Required tools/ equipment: Paper, Pencil, Eraser, Scale, Drawing board, Cello tape etc.
Safety:

Task No: 5.Draw English letter /Devnagiri letter.

Time:4hrs**Theory:** 1 hr**Practical:**3hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw boarder lines. 5. Write single stroke letter. 6. Write gothic letter. 7. Collect 8. Clean the drawing paper. 9. Remove the drawing from drawing board. 10. Restore tools, instruments and materials. 11. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Draw English letter / Devnagiri Letter. **Standard (How Well)** English letter and Devnagiri letters drawn with types and style.	**English lettering** • Different lettering; Single-stroke letters and Gothic Letters & their writing rules. • Essential features of lettering. **Devanagari lettering** • Writing style of letter • Essential features of lettering.

Required tools/ equipment: Pencil, Eraser, English writing paper, Drawing board etc.
Safety:

Time:3hrs**Theory:**1hr**Practical:**2hrs

Task No: 6.Draw free hand sketches.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw boarder lines. 5. Sketch different object. 6. Remove the drawing from drawing board. 7. Restore tools, instruments and materials. 8. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Draw free hand sketches. **Standard (How Well)** Free hand sketches drawn.	• Difference between drawing and sketch • Sketch and sketching techniques of different figures: ▪ Straight lines ▪ Circles ▪ Arcs and curves

Required tools/ equipment: Pencil, Eraser, Drawing board, Drawing sheet, Scale, Cello tape etc.
Safety:

Task No: 7.Construct regular geometrical figures(rectangle/square/triangles/parallelogram/ rhombus/circle). **Time:6**hrs**Theory:** 1hr**Practical:**5hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw boarder lines. 5. Draw triangles. 6. Draw rectangles. 7. Draw squares. 8. Draw parallelogram. 9. Draw circle. 10. Draw rhombus. 11. Clean the drawing paper. 12. Remove the drawing from drawing board. 13. Restore tools, instruments and materials. 14. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Construct regular geometrical figures (rectangle/square/triangles /parallelogram/ rhombus/circle). **Standard (How Well)** Regular geometrical figures; rectangle, square, triangles, parallelogram, rhombus and circle constructed.	• Angle & their types. • Triangle & their types • Quadrilaterals & their types • Procedure

Required tools/equipment: Pencil, Eraser, Drawing board, Drawing sheet, Scale, Cello tape, Templates etc.

Safety:

Time:6hrs**Theory:**1hr**Practical:**5hrs

Task No: 8.Construct regular polygons(Pentagon/Hexagon/Octagon).

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw boarder lines. 5. Draw pentagon. 6. Draw hexagon. 7. Draw octagon. 8. Clean the drawing paper. 9. Remove the drawing from drawing board. 10. Restore tools, instruments and materials. 11. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Construct regular polygons (Pentagon/Hexagon/Octagon). **Standard (How Well)** Regular polygons (Pentagon, Hexagon, Octagon) constructed.	▪ Regular polygon & their types ▪ Construction methods

Required tools/equipment: Pencil, Eraser, Drawing board, Drawing sheet, Scale, Cello tape, Templates etc.

Safety:

Time:6hrs**Theory:**1hr**Practical:**5hrs

Task No: 9.Dimension the drawing.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw straight line. 5. Dimension the line. 6. Clean the drawing paper. 7. Remove the drawing from drawing board. 8. Restore tools, instruments and materials. 9. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Dimension the drawing. **Standard (How Well)** The drawing dimensioned.	▪ Concept of dimensioning ▪ Dimensioning systems (align & unidirectional systems) ▪ Dimensioning procedure

Required tools/equipment: Pencil, Eraser, Drawing board, Drawing sheet, Scale, Cello tape etc.
Safety:

Time:8hrs**Theory:**2hr**Practical:**6hrs

Task No: 10.Carryout orthographic projection of simple object (III angle projection).

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Define projection. 5. Step out methods of orthographic projection. 6. Draw an object. 7. Draw isometric projection of any object. 8. Draw oblique projection of any object. 9. Draw prospective projection of any object. 10. Clean the drawing paper. 11. Remove the drawing from drawing board. 12. Restore tools, instruments and materials. 13. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Carryout orthographic projection of simple object (III angle projection) **Standard (How Well)** Orthographic projection of simple object (III angle projection) carried out in top view, front view and side view. .	**Principles of projections** • Projection and their types • Methods of orthographic projection • Technical lines • Dimensioning styles • Isometric, oblique and prospective projection • Procedure

Required tools/ equipment: Pencil, Eraser, Drawing paper, Compass, Cello tape, Scale, Protractor etc.

Safety:

Time:5hrs**Theory:** 1 hr**Practical:**4hrs

Task No: 11.Draw different symbols, block and circuit diagram of electrical & electronics.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw Boarder line. 5. Divide the drawing paper into block. 6. Define block diagram. 7. Define circuit diagram. 8. Draw different electrical and electronics symbols. 9. Draw block diagram. 10. Identify the electrical and electronics symbol. 11. Draw circuit diagram. 12. Clean the drawing paper. 13. Remove the drawing from drawing board. 14. Restore tools, instruments and materials. 15. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Draw different block and circuit diagram of electrical & electronics. **Standard (How Well)** Different block and circuit diagram of electrical & electronics drawn	**Block & circuit diagram** • Types of different symbols. • Definition of block diagram • Types of block diagram • Definition of circuit diagram • Use of circuit diagram • Procedure

Required tools/ equipment: Scale, Pencil, Eraser, Small scale, Drawing Sheet and Board, Set Square etc.

Safety:

Task No: 12.Interpret different symbols used in telecommunication.

Time:12hrs**Theory:** 2hrs**Practical:**10hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Fix A4 drawing paper on drawing board. 4. Draw Boarder line. 5. Divide the drawing paper into block. 6. Collect telecommunication symbol. 7. Draw different telecommunication symbol. 8. Make as built drawing. 9. Clean the drawing paper. 10. Remove the drawing from drawing board. 11. Restore tools, instruments and materials. 12. Keep records.	**Condition (Given)** Drawing room, drawing instrument and materials **Task (What)** Interpret different symbols used in telecommunication. **Standard (How Well)** Different symbols used in telecommunication read and interpreted.	**Symbols used in telecommunication** • Symbols used in external plan network (Existing, to be installed, dismantled) • Map Drawing • Network plan sheet drawing • Drawing of direct service area

Required tools/ equipment: Pencil, Eraser, Templates, Scale, Compass, Protractor, Divider, Drawing board etc.

Safety:

Sub module 3: Applied Mathematics
Duration: 20 hrs (7 hrs theory & 13hrs practical)

Required tools/equipment:

Task No.1:Elucidate metric system.

Time :2hrs**Theory:** 1 hr**Practical:** 1 hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define metric system. 2. Define unit and quantity. 3. Enlist the types of unit 4. Describe system of units 5. Discuss about engineering constants.	**Condition (Given)** Classroom, handout, books and problems **Task (What)** Elucidate with metric System. **Standard (How Well)** All the steps followed in sequence. Metric system elucidated.	**Metric system** • Definitions • Types of unit • Units and dimensions • Engineering constants

Safety:

Task No: 2.Interpret/calculate exponents. **Time :1**hr**Theory:**hr**Practical:** 1 hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define exponent. 2. Discuss the use of exponents. 3. Describe the properties of exponents. 4. Practice numerical problems. 5. Keep records.	**Condition (Given)** Classroom, handout, books and problems **Task (What)** Interpret/calculate exponents. **Standard (How Well)** All the steps followed in sequence. Exponents interpret and calculated.	**Exponents** • Properties • Calculation • Procedure

Required tools/equipment:
Safety:

Task no: 3.Solve logarithm related problem. **Time:3**hrs**Theory:**1hrs**Practical:** 2 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define logarithm. 2. Discuss properties of logarithm. 3. Explain log in base10. 4. Solve different Numerical using required formulas. 5. Keep records.	**Condition (Given)** Classroom, handout, books and problems **Task (What)** Solve logarithm related problem. **Standard (How Well)** All the steps followed in sequence. Logarithm related problem solved.	**Logarithm** • Definition, properties • $\log_a(xy) = \log_a x + \log_a y$ • $\log_a x^p = p \log_a x$ • $\log_a(x/y) = \log_a x - \log_a y$ • $\log_b a.\log_a b = 1$ or $\log_a b = 1/\log_b a$ • $\log_a a = 1$ and $\log_{10} 1 = 0$ • Log in base 10, Natural log • Use of log/antilog table and calculations. • Procedure

Required tools/equipment:
Safety:

Task No: 4. Calculate/interpret set/ function/graph.

Time:4hrs**Theory:**2 hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define set. 2. Discuss about Venn diagram & its types. 3. Explain different laws. 4. Define function. 5. Discuss different functions and graphs. 6. Keep records.	**Condition (Given)** Classroom, handout, books and problems **Task (What)** Calculate/interpret set/ function/graph **Standard (How Well)** All the steps followed in sequence. Set, function and graph calculated and interpreted.	**Set, Function and graph** • Notations • Types Venn Diagrams, Operation on sets (Union Intersection, Complement, Difference) • Laws (Commutative, associative, distributive and De-morgans) • Functions: Dependent and independent variables Axis, scales, Straight lines, circular, parabolic functions and experimental graphs • Procedure

Required tools/equipment:
Safety:

Task No: 5. Calculate area / volume of plane/ solid figures.

Time:3hrs**Theory:** 1 hr**Practical:** 2 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Discuss different types of plane figures. 2. Write the formulas to calculate area and perimeter of plane figures. 3. Define right angle triangle. 4. Discuss Pythagoras Theorem. 5. Solve different Numerical using required formulas. 6. Keep records.	**Condition (Given)** Classroom, handout, books and problems **Task (What)** Calculate area / volume of plane/ solid figures. . **Standard (How Well)** All the steps followed in sequence. Area and volume of plane and solid figures calculated. Pythagoras theorem applied.	• Basic geometrical concept and calculations • Area and volume, Right angled triangle, Pythagoras theorem and calculations

Required tools/equipment:
Safety:

Time:4hrs**Theory:** 1 hr**Practical:** 3 hrs

Task No: 6.Solve numerical problems related to trigonometric functions.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Explain trigonometry and its necessity in technical field. 2. Clarify different system of measurement of angle 3. Explain trigonometric ratio and identities. 4. List all the required formulas used in trigonometry 5. Solve many trigonometric exercises. 6. Keep records.	**Condition (Given)** Classroom, handout, books and problems **Task (What)** Solve numerical problems related to trigonometric functions **Standard (How Well)** All the steps followed in sequence. Simple numerical problems related to trigonometric functions solved.	**Trigonometry:** • Dependency • Side ratio • Relationship • Simple numerical exercises

Required tools/equipment:
Safety:

Time:3hrs**Theory:** 1 hr**Practical:** 2 hrs

Task No: 7.Perform calculation related to Decibel, DBm and dBr.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define Decibel. 2. Give the idea about dBm, dBr 3. Calculate dB related problems. 4. Keep records.	**Condition (Given)** Classroom, handout, books and problems **Task (What)** Perform calculation related to Decibel, DBm and dBr. **Standard (How Well)** All the steps followed in sequence. Simple calculations related to Decibel, DBm and dBr performed.	**Decibel, DBm and dBr** • The Bel, the Decibel, simple calculation with dB and reading with dB scales

Required tools/equipment:
Safety:

Sub module 4: Basic Electrical Principle
Duration: 62 hrs (26 hrs theory and 36hrs practical)

Task No.1: Develop the concept of electricity. **Time :4**hrs**Theory:**4hrs**Practical:**hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instructions. 2. Define electricity. 3. Describe history of electricity 4. Enlist importance of electricity. 5. Enlist types of electricity. 6. Enlist uses of electricity. 7. Enlist sources of electricity. 8. Define current/voltage/resistance 9. Keep records.	**Condition (Given):** Classroom , books, manual and handout **Task (What):** Develop the concept of electricity **Standards (How well):** The concept of electricity defined. Principles of electricity described. Importance of electricity enlisted. Type of electricity enlisted. Sources of electricity enlisted.	➢ Functional definition of electricity ➢ Originations of electricity ➢ Types of electricity ➢ Uses of electricity ➢ Sources of electricity ➢ Concept of current, voltage and resistance ➢ Units of current ➢ Units of voltage ➢ Units of resistance

Required tools/equipment:
Safety:

Task No: 2.Calculate current/voltage/resistance. **Time :7**hrs**Theory:** 2 hrs**Practical:** 5 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define Resistance. 2. Explain unit, symbol of resistance. 3. Discuss laws of resistance. 4. Define resistivity, its unit and symbol. 5. Describe resistance connection. 6. Discuss effect of temperature on resistance. 7. Discuss about voltage divider. 8. Place the color code chart of Resistor on display. 9. Check the colour stripes of the resistor and make the values out of it. 10. Place the multimeter knob at appropriate Ohms value. 11. Check the value in meter and compare with observed color coded value. 12. Keep records.	**Condition (Given)** Classroom , books, manual and handout **Task (What)** Calculate/Identify resistance and resistivity. **Standard (How Well)** All the steps followed in sequence. Current, voltage & resistance calculated. Resistance and resistivity identified.	**Resistance and Resistivity** • Concept of current, voltage and resistance • Unit of current, voltage and resistance • Statement of Ohm's law • Resistance and resistively of materials • Laws of resistance (R = ϱl/A), • Effect of temperature on resistance • Resistors in series / parallel • Voltage divider • Color codes in resistance

Required tools/equipment:
Safety:

Task no: 3.Plot graph for AC and DC signal. **Time:2**hrs**Theory:**1hrs**Practical:** 1 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define A.C. and DC. 2. Define frequency and waveform. 3. Differentiate between AC and DC. 4. Plot graph for AC and DC signal. 5. Keep records.	**Condition (Given)** Classroom, books, manual, necessary tools, equipment and materials. **Task (What)** Plot graph for AC and DC signal. **Standard (How Well)** All the steps followed in sequence. Graph for AC & DC signal plotted.	**Electrical signals** • A.C and D.C Signals • frequency • Waveform • graphical presentation • Procedure • Safety precautions

Required tools/equipment:
Safety:

Task No: 4. State/ apply Ohm's law.

Time:3hrs**Theory:** 1hrs**Practical:** 2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. State Ohm's law. 2. Discuss among current, voltage and resistance according to ohm's law. 3. Give application of ohm's law. 4. Solve different Numerical using this law. 5. Keep records.	**Condition (Given)** Classroom , books, manual and handout **Task (What)** State Ohm's law **Standard (How Well)** All the steps followed in sequence. Ohm's law stated. Numerical problems solved.	**Ohm's Law** • Ohms Law • Relation among current, voltage and resistance • Numerical problems

Required tools/equipment:
Safety:

Task No: 5.State/ apply Kirchhoff's law. **Time:**3hrs **Theory:** 1 hrs **Practical:** 2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. State Kirchhoff's law. 2. Compare ohm's and Kirchhoff's law. 3. Discuss series, parallel and combined circuits. 4. Explain application of this law. 5. Calculate numerical problems of networks. 6. Keep records.	**Condition (Given)** Classroom , books, manual and handout **Task (What)** State Kirchhoff's law. **Standard (How Well)** All the steps followed in sequence. Kirchhoff's law stated Numerical problems calculated.	**Kirchoff's Law** • Current Law • Voltage Law • Series, Parallel and combined circuits and calculations

Required tools/equipment:
Safety:

Task No: 6. Perform electrical measurements. **Time :**4hrs**Theory:**1hrs**Practical:** 3hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Check current. 2. Check Voltage. 3. Check capacitor. 4. Check resistor. 5. Explain the measuring device for different electrical parameters. 6. Discuss their connection in the circuits. 7. Describe electrical quantity and their unit. 8. Keep records.	**Condition (Given)** Workshop, necessary tools, instruments and materials **Task (What)** Measure current/voltage/resistance. **Standard (How Well)** Current, voltage and resistance measuring devices identified. Current, voltage and resistance devices handled. Current, voltage and resistance measured.	**Measurement devices** • Voltmeter • Ammeter • Ohm meter • Electrical quantity and their units. • Procedure • Safety precautions

Required tools/equipment:
Safety:

Task No: 7. Calculate electrical power and energy. **Time :**4hrs**Theory:**2hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define power and energy. 2. Discuss unit and symbol of power and energy. 3. Find the relation among power, current voltage and resistance. 4. Calculate numerical problems. 5. Explain Impedance matching. 6. State and explain maximum power transfer theorem. 7. Keep records.	**Condition (Given)** Classroom , books, manual and handout **Task (What)** Calculate electrical power and energy. **Standard (How Well)** All the steps followed in sequence. Maximum power transfer theorem sated. Electrical power and energy calculated.	**Electrical power and Energy** • Definition and unit of power and Energy • Relation P = VI • Numerical problems • Impedance matching • Maximum power transfer theorem • Procedure

Required tools/equipment:
Safety:

Task No. 8. Explain cell and its types.

Time:3hrs**Theory:**1hrs**Practical:** 2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define cell and its symbol. 2. Differentiate between cell and battery. 3. Discuss series and parallel connection of cell. 4. Describe internal resistance. 5. Identify part of a cell. 6. Enlist types of cell. 7. Differentiate between emf and pd. 8. Keep records.	**Condition (Given)** Classroom , books, manual, handout and drawing of cell **Task (What)** Explain cell and its types. **Standard (How Well)** The principle of cell applied. Cells and its symbols identified.	**Cell** • Definition • Principle • Different between cell and battery • Parts of cells • Types of cell • Application • Symbols • Different between emf and pd • Combinations (series and parallel) • Internal resistance calculations. • Procedure

Required tools/equipment:
Safety:

Time:2hrs **Theory:** 1 hrs **Practical:** 1hrs

Task No: 9. Illustrate types and feature of different electrical components.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Enlist types of components. 2. Explain construction and features of components. 3. Measure the component practically using bridges. 4. Keep records.	**Condition (Given)** Classroom , books, manual, handout and electrical components **Task (What)** Illustrate types and feature of different components. **Standard (How Well)** All the steps followed in sequence. Types and feature of different components illustrated.	**Features of components** • Types • Construction and features of components like switches, fuses, socket breakers, resistors, capacitors and inductors.

Required tools/equipment:
Safety:

Task No: 10. Apply the principle of AC and DC bridges.

Time:6hrs**Theory:** 3hrs**Practical:** 3hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define electrical bridges. 2. Describe the application of bridges. 3. Explain the working principle of different bridges. 4. Calculate numerical problems. 5. Keep records.	**<u>Condition (Given)</u>** Classroom, books, manuals, handout and calculator **<u>Task (What)</u>** Apply the principle of AC and DC bridges. **<u>Standard (How Well)</u>** All the steps followed in sequence. The principle of AC and DC bridges applied Numerical problems calculated.	**Concept on AC and DC bridge** • Wheatstone bridge • Double Kelvin bridge • Wein bridge • Hay's bridge • De-sauty bridge and calculations • Procedure

Required tools/equipment:
Safety:

Time:2hrs**Theory:**1hrs**Practical:**1hrs

Task No: 11.Explain electrostatic charge and its field.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define charge, its symbol and unit. 2. Define point charge. 3. State Coulomb's Law. 4. Describe electrical field. 5. Discuss about permittivity and polarization.	**Condition (Given)** Classroom, books,manuals and handout **Task (What)** Explain electrostatic charge and its field. **Standard (How Well)** All the steps followed in sequence. Electrostatic Charge and its field explained. Symbols and unit identified.	**Electrostatic Charge and its field** • Concept of charge • Point charge • Force between charges (coulomb's law) • Electrical field • Permittivity • Polarization

Required tools/equipment:
Safety:

Time:3hrs**Theory:**1hrs**Practical:**2hrs

Task No: 12.Apply the principle of Capacitors.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define capacitor and its symbol. 2. Explain Principle of capacitor. 3. Describe Capacitance and its unit 4. Define dielectric constant. 5. Clarify mutual capacitance in a pair of conductors. 6. Give concept of series and parallel connection. 7. Discuss charging and discharging of capacitor. 8. Define RC time constant. 9. Explain color coding in capacitors. 10. Keep records.	**Condition (Given)** Classroom, books,manuals and handout **Task (What)** Apply the principle of capacitors. **Standard (How Well)** All the steps followed in sequence. The principle of capacitors applied.	**Capacitors** • Principles, capacitance • dielectric constant (ε) • Mutual capacitance in a pair of conductors • Series and parallel connections of capacitors • charging and discharging of capacitors • RC time constant • Color coding in capacitors • Procedure

Required tools/equipment:

Safety:

Task No: 13.Apply the principle of Inductor.

Time: 2 hrs **Theory:** 1 hrs **Practical:** 1 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define inductor and inductance. 2. Discuss its principle, symbol and unit. 3. Explain series and parallel connection of inductors. 4. Enlist application of inductor. 5. Keep records.	**Condition (Given)** Classroom, books, manuals and calculator. **Task (What)** Apply the principle of inductor. **Standard (How Well)** All the steps followed in sequence. The principle of inductor applied. Symbols and unit identified.	**Inductance** • Definition • Principle • Inductors in series and parallel • Unit • Symbols • Procedure

Required tools/equipment:
Safety:

Task No: 14.Develop the concept of magnetism /electromagnetism.

Time:4hrs**Theory:**1 hrs**Practical:** 3hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define magnet. 2. Discuss its poles and lines of force. 3. Explain electric field around a current carrying conductor. 4. Define electromagnetism. 5. Enlist electromagnetic terminologies. 6. Define permeability and mutual inductance. 7. State and explain Lenz's law.	**Condition (Given)** Classroom, books,manuals and handout **Task (What)** Develop the concept of magnetism /electromagnetism. **Standard (How Well)** All the steps followed in sequence. The concept of magnetism and electromagnetism developed.	**Magnetism/electromagnetism** • Permanent magnets • Lines of forces • Magnetic poles • Magnetic force • Electric field around a current carrying conductor electromagnetic terminologies • Permeability • Inductance • Mutual inductance • Lenz's law

Required tools/equipment:
Safety:

Time:6hrs**Theory:**2hrs**Practical:**4hrs

Task No: 15.Familiarize with AC signal and circuits.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define AC signal. 2. Describe amplitude, RMS, p-p and instantaneous value. 3. Draw simple AC circuit. 4. Define impedance and reactance. 5. Explain vectorically about AC signal. 6. Discuss phase and phase relationship. 7. Describe lead and lag concept. 8. Discuss R, L, C circuit with necessary calculations. 9. Explain power in AC circuits. 10. Discuss inductance in Ac circuits. 11. Keep records.	**Condition (Given)** Classroom, books, manuals and calculator. **Task (What)** Familiarize with AC signal and circuits. **Standard (How Well)** All the steps followed in sequence. AC signals familiarized. Simple Ac circuit drawn. .	**A.C Signals** • Waveforms • Amplitude • RMS value • P-P value • instantaneous value • Frequency • Simple A.C Circuit • Impedance • Reactance • vector representation • Phase relationship • lead and lag concept • R, L, C circuits • power in AC circuits ▪ Active, reactive and apparent power • Inductance in AC circuit.

Required tools/equipment:
Safety:

Task No. 16.Apply the principle of Filters. **Time:** **3**hrs**Theory:** 1 hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define Filter. 2. Discuss the application of filter. 3. Enlist types of filter. 4. Explain the types with circuit diagram. 5. Describe 3 dB cutoff points. 6. Keep records.	**Condition (Given)** Classroom, books, manuals and calculator. **Task (What)** Apply the principle of Filters. **Standard (How Well)** All the steps followed in sequence. The principle of filters applied.	**Filters** • Definition • Types • Application low, high, band pass and band stop filters • 3 db cutoff point • Procedure

Required tools/equipment:
Safety:

Task No. 17.Apply the principle of Transformers. **Time:** 4 hrs **Theory:** 2 hrs **Practical:** 2 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Describe basic principle of transformer. 2. Enlist its types. 3. Explain construction and winding of transformer. 4. Perform voltage and current calculations. 5. Define auto transformer. 6. Discuss losses and efficiency of auto transformer. 7. Clarify 3 phase transformer. 8. Keep records.	**Condition (Given)** Classroom, books manuals and drawing of transformers **Task (What)** Apply the principle of Transformers. **Standard (How Well)** All the steps followed in sequence. Transformers with principle, construction and types described. The principle of Transformer applied.	**Transformers** • Basic principles • Types • construction • winding • voltage and current calculations • losses and efficiency Auto transformer • 3 phase transformer • Procedure

Required tools/equipment:
Safety:

Sub module 5: Basic Electronics Principle
Duration: 47hrs (17hrs theory and 30hrs practical)

Task No: 1. Develop the concept of electronics.

Time :4hrs**Theory:** 4hrs**Practical:**hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define electronics. 2. Discuss its application. 3. Identify atomic structure and structure of elements. 4. Define electrons, free electron and valence electron. 5. Describe passive components with its types.	**Condition (Given)** Classroom, books, manuals and handout. **Task (What)** Develop the concept of electronics. **Standard (How Well)** All the steps followed in sequence. The concept of electronics developed. Atomic structure and structure of elements identified.	**Introduction to Electronics** • Definition, application • Atomic structure and structure of elements. • Electrons, valence Electrons, free electron • Electronic components (Passive and active)

Required tools/equipment:
Safety:

Task No: 2. Apply the principle of semiconductor physics.

Time : 3hrs **Theory:** 2 hrs **Practical:** 1 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define semiconductor. 2. Discuss its properties. 3. Describe effect of temperature on semiconductor. 4. Describe the differences among metal, insulator and semiconductor. 5. Enlist types of semiconductor. 6. Clarify majority and minority carriers. 7. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** State/ Apply the principle of semiconductor physics. **Standard (How Well)** All the steps followed in sequence. The principle of semiconductor physicsstated and applied.	**Semiconductor Physics** • Definition, properties • Semiconductor material • Effect of temperature on semiconductor • Metals, insulators and semiconductor • Intrinsic and Extrinsic semiconductor • Majority and minority carriers • Procedure

Required tools/equipment:
Safety:

Task No: 3. applysemiconductor diode. **Time :3**hrs**Theory:** 1hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define pn diode. 2. Discuss its symbol and application. 3. Describe pn junction in forward and reverse bias. 4. Define zener diode. 5. Describe its symbol, principle and application. 6. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** Identify/apply semiconductor diode. **Standard (How Well)** All the steps followed in sequence. Semiconductor diodeidentified and applied.	**Semiconductor Diode** • Pn junction (Semiconductor or Crystal diode) • Pn junction with forward and reverse bias • Zener diode • Procedure

Required tools/equipment:
Safety:

Task No: 4. apply special purpose diode. **Time :3**hrs**Theory:** 1hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define LED. 2. Discuss its application, symbol and advantages. 3. Define symbol, working principle and application of different diodes. 4. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** Identify/apply special purpose diode. **Standard (How Well)** All the steps followed in sequence. Special purpose identified and applied.	**Special purpose Diode** • LED, application, advantages • Photo diode • Warrantor diode • Tunnel diode • Shickley diode • Procedure

Required tools/equipment:
Safety:

Task No: 5. Create rectifier circuits.

Time: 6hrs **Theory:** 2 hrs **Practical:** 4hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define rectifier. 2. Discuss use of diodes in rectifier. 3. Enlist types of rectifier with circuit diagram. 4. Calculate different parameters. 5. Describe ripple factor and waveform. 6. Compare among different rectifiers. 7. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** Create rectifier circuits. **Standard (How Well)** All the steps followed in sequence. Different rectifiers compared. Rectifier circuits created.	**Rectifier** • Definition • Use of diodes in rectifiers • Types • Calculation of different parameters • Wave form, ripple factor • Comparison of rectifiers • Procedure

Required tools/equipment:
Safety:

Task No: 6 Draw filter circuit.

Time :4hrs**Theory:** 1 hrs**Practical:** 3hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define filter. 2. Discuss its application. 3. Enlist its types. 4. Describe different types of filter with circuit diagram. 5. Keep records.	**Condition (Given)** Classroom, lab, books, manuals calculator and necessary drawing instruments **Task (What)** Identify/ Draw filter circuit. **Standard (How Well)** All the steps followed in sequence. The diagram of filter circuit drawn.	**Filter Circuits** • Introduction • Types (Capacitor, choke input & pi filters) • Procedure

Required tools/equipment:
Safety:

Task No: 7. Apply the principle of transistors. **Time :** 6hrs **Theory:** 2 hrs **Practical:** 4hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define transistor. 2. Discuss its symbol, terminals & application. 3. Describe structure of transistor. 4. Enlist types of transistor. 5. Describe transistor as an amplifier. 6. Draw circuit diagram of transistor connection. 7. Calculate different current in transistor connection. 8. Define biasing and explain about it. 9. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** State/apply the principle of transistors. **Standard (How Well)** The principle of transistors stated and applied. Circuit diagram of transistor connection drawn. Different current in transistor connection calculated.	**Transistors** • Introduction, symbol • Transistor terminals • Structure • Transistor as an amplifier • Transistor connection • Relation between different current in transistors, alpha, beta • Transistor biasing

Required tools/equipment:
Safety:

Task No: 8. Apply the feedback in amplifiers.

Time :3hrs**Theory:** 1 hrs**Practical:** 2 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define amplifier. 2. Discuss concept of feedback in amplifier. 3. Enlist types of feedback. 4. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** Apply the feedback in amplifiers. **Standard (How Well)** All the steps followed in sequence. The feedback in amplifiers applied.	**Feedback in amplifiers** • Concept of feedback in amplifier • Types of feedback

Required tools/equipment:
Safety:

Task No: 9. apply the oscillator principle. **Time :** 5 hrs **Theory:** 1 hrs **Practical:** 4 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define oscillator. 2. Discuss its application. 3. Classify types of oscillator. 4. Describe different oscillators with circuit diagram. 5. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** State/apply the oscillator principle. **Standard (How Well)** All the steps followed in sequence. The oscillator principle stated and applied.	**Oscillator** • Introduction • Importance • Principle • Classification • LC, RC, Crystal, Wien bridge oscillator

Required tools/equipment:
Safety:

Task No: 10. apply digital electronics theorems.

Time :10hrs**Theory:** 2 hrs**Practical:** 8hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define digital electronics and circuits. 2. Explain different number system. 3. Convert number from one system to another. 4. Define logic gates. 5. Enlist its types, symbol and truth table. 6. Explain Boolean algebra. 7. State and verify Boolean theorems. 8. State and prove De Morgan's theorem. 9. Keep records.	**Condition (Given)** Classroom, lab, books, manuals and calculator **Task (What)** State /apply digital electronics theorems. **Standard (How Well)** Boolean algebra identified and applied. Boolean theorems stated and applied De Morgan's theorem stated and applied.	**Digital Electronics** • Introduction • Digital circuit • Number system • Number conversion • Logic gates • Types of logic gates • Boolean algebra • Boolean theorem • De Morgan's theorems

Required tools/equipment:
Safety:

Sub module 6: Basic Telecommunication
Duration: 28hrs (16hrs theory and 12hrs practical)

Task No: 1. Familiarize with telecommunication network. **Time :6**hrs**Theory:**4hrs**Practical:** 2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define terminologies used in telecommunication. 2. Discuss the development of telephone. 3. Describe the elements of communication system. 4. Describe telecommunication network . 5. Describe optical telecommunication network. 6. Discuss briefly telecommunication transmission & switching system. 7. Discuss about telecommunication traffic.	**Condition (Given)** Classroom, manual, books and telecommunication network field **Task (What)** Familiarize with telecommunication network **Standard (How Well)** Telecommunication network familiarized.	**Basic Telecommunication** • Terminologies used in telecommunication Signal, System, Frequency, Bandwidth, Wavelength, Noise, Interference, Crosstalk, Echo • The Development of Telephone • Elements of a Communication System • Telecommunication Network • Optical telecommunication network • Introduction to telecommunication Transmission • Switching System • Introduction to telecommunication traffic

Required tools/equipment:
Safety:

Task No: 2. Aply telecommunication transmission principle.

Time :6hrs**Theory:**4hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define transmission system. 2. Describe the differences between analog and digital system. 3. Define modulation. 4. Describe different types of modulation. 5. Discuss about PCM. 6. Define multiplexing. 7. Describe types of multiplexing. 8. Define modulation and demodulation. 9. Keep records.	**Condition (Given)** Classroom, books, handout and catalogue **Task (What)** State/apply telecommunication transmission principle. **Standard (How Well)** All the steps followed in sequence. Telecommunication transmission principle stated and applied.	**Transmission Principle** • Analog & Digital Signal • Modulation • Need for modulation • Types of modulation (AM, FM, ASK, FSK, PSK, QAM) • Pulse Code Modulation (PCM) • Multiplexing • Types of Multiplexing • Introduction to Demodulation &Demultiplexing

Required tools/equipment:
Safety:

Time:4hrs**Theory:**2hrs**Practical:**2hrs

Task No: 3. Develop the block diagramof cellular mobile communication.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Explain brief introduction of wireless system. 2. Discuss concept of cellular mobile communication 3. Clarify the concept with block diagram. 4. Keep records.	**Condition (Given)** Classroom, books, handout and catalogue **Task (What)** Develop the concept of cellular mobile communication. **Standard (How Well)** All the steps followed in sequence. The concept of cellular mobile communication developed.	**Introduction of cellular mobile communication** • Introduction • Concept of cellular communication

Required tools/equipment:
Safety:

Time:4hrs**Theory:**2hrs**Practical:**2hrs

Task No: 4. Familiarize with Global System of Mobile (GSM).

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define terminology used in GSM system. 2. Discuss GSM with network diagram. 3. Describe GSM system architecture 4. Describe roaming, hand off and frequency reuse.	**Condition (Given)** Classroom, books, handout and catalogue **Task (What)** Familiarize Global System of Mobile (GSM) **Standard (How Well)** All the steps followed in sequence. Global System of Mobile (GSM) familiarized.	**Global system for Mobile (GSM)** • Introduction • GSM Network diagram • GSM system architecture • Terminologies used in GSM o HLR, VLR, AUC o SIM • Concept about o Hand off o Frequency reuse concept o Roaming

Required tools/equipment:
Safety:

Time:4hrs**Theory:** 2 hrs**Practical:**2hrs

Task No: 5. **Familiarize with Code Division Multiple Access (CDMA).**

Steps	Terminal performance Objectives	Related Technical Knowledge
5. Define terminology used in CDMA system. 6. Discuss CDMA with network diagram. 7. Describe CDMA system architecture 8. Describe roaming and hand off.	**Condition (Given)** Classroom, books, handout and catalogue **Task (What)** Familiarize Code Division Multiple Access (CDMA) **Standard (How Well)** All the steps followed in sequence. Code Division Multiple Access (CDMA)familiarized.	**Code Division Multiple Access (CDMA)** • Introduction • CDMA Network diagram • CDMAsystem architecture • Terminologies used in CDMA o HLR, VLR, AUC o RUIM • Concept about o Hand off o Roaming

Required tools/equipment:
Safety:

Task No: 6. Familiarize with Internet /IP network. **Time:4**hrs**Theory:** 2 hrs**Practical:** 2 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
9. Define internet , intranet. 10. Define terminology used in Internet. 11. Define IP address, IPv4 and IPv6. 12. Define modem, router, hub, switch	**Condition (Given)** Classroom, books, handout and catalogue **Task (What)** Familiarize Internet, modems, routers, switches, hubs and IP address. **Standard (How Well)** Internet familiarized.	**Internet and IP network** • Internet • Inranet • IP address • Modems, routers, switches, hubs

Required tools/equipment:
Safety:

Sub module 6: Basic Optics & Optical Fiber Communication
Duration: 41hrs (16hrs theory and 25hrs practical)

Task no: 1. Develop the concept of light. **Time:**2hrs**Theory:**1hrs**Practical:**1 hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define light rays. 2. Discuss properties of light and its path. 3. Describe light is a form of energy. 4. Define images and shadows.	**Condition (Given)** Classroom, lab, books manual and handout **Task (What)** Develop the concept of light. **Standard (How Well)** All the steps followed in sequence. The concept of light developed.	**Light rays** • Introduction • Properties of light • Light path • Light as an energy • Images, shadows

Required tools/equipment:
Safety:

Task no: 2. Apply law ofreflection/refraction/medium.

Time:4hrs**Theory:**2hrs**Practical:**2hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define Reflection. 2. Discuss laws of reflection. 3. Define consecutive reflection. 4. State law of refraction and mediums. 5. Identify images in plane, concave and convex mirror. 6. Keep records.	**Condition (Given)** Classroom, lab, books manual handout and calculator **Task (What)** State law of reflection/refraction/medium. **Standard (How Well)** All the steps followed in sequence. The laws of reflection, refraction and mediums stated.	**Reflection of light** • Laws of reflection • Image in plane mirror • Consecutive reflection • Distance of images • Images in concave and convex mirror

Required tools/equipment:
Safety:

Time:6hrs**Theory:**2hrs**Practical:**4hrs

Task No: 3. Apply Snell's law.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define refraction. 2. Describe laws of refraction 3. State Snell's law. 4. Enlist types of mediums. 5. Describe refraction in different media. 6. Describe refractive index and its calculations. 7. Discuss about real and apparent depth.	**Condition (Given)** Classroom, lab, books manual handout and calculator **Task (What)** State/apply Snell's law. Calculate refractive index. **Standard (How Well)** All the steps followed in sequence. Snell's law stated and applied. Refractive index calculated.	**Refraction of light, Snell's law** • Laws of refraction • Snell's law (μ = sini/sinr) • Types of mediums (denser and rarer) • Refraction in different media like water, glass, air etc • Refractive index and its calculations • Real and apparent depth

Required tools/equipment:
Safety:

Task No: 4. Differentiate between reflection and total internal reflection.

Time:3hrs**Theory:** 1hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define total internal reflection. 2. Describe the differences between reflection and total internal reflection. 3. Define critical angle. 4. Keep records.	**Condition (Given)** Classroom, lab, books manual handout and calculator **Task (What)** Differentiate between reflection and total internal reflection. **Standard (How Well)** All the steps followed in sequence. Reflection and total internal reflection diffentiated.	**Total internal Reflection critical angle** • Concept of total internal reflection • Different between reflection and total internal reflection. • Definition of critical angle

Required tools/equipment:
Safety:

Time:3hrs**Theory:**1hrs**Practical:**2hrs

Task No: 5. Apply the wave theory of light.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define dispersion. 2. Describe phenomenon of dispersion. 3. Describe wave theory of light. 4. Describe its significance. 5. Keep records.	**Condition (Given)** Classroom, lab, books manual handout and calculator **Task (What)** State the wave theory of light. **Standard (How Well)** All the steps followed in sequence. The wave theory of light stated.	**Dispersion and wave theory of light** • Phenomenon of dispersion • Wave theory of light and its significance

Required tools/equipment:
Safety:

Task No: 6. Illustrate physical optics and interference.

Time:3hrs**Theory:** 1hr**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define optical path. 2. Define interference of light. 3. Describe the phenomenon of interference. 4. Keep records.	**Condition (Given)** Classroom, lab, books, manual and handout **Task (What)** Discuss physical optics and Interference. **Standard (How Well)** All the steps followed in sequence. Physical optics and interference discussed.	**Physical Optics and interference** • Optical path • Phenomenon of interference

Required tools/equipment:
Safety:

Task No: 7. Differentiate between diffraction and polarization.

Time:3hrs**Theory:** 1hrs**Practical:** 2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define diffraction and polarization. 2. Describe the differences between diffraction and polarization. 3. Describe the phenomenon of polarization. 4. Describe Brewster's law. 5. Keep records.	**Condition (Given)** Classroom, lab, books, manual and handout **Task (What)** Differentiate between diffraction and polarization. **Standard (How Well)** All the steps followed in sequence. Diffraction and polarization differentiated.	**Diffraction and polarization** • Concept of diffraction • Difference between interference and diffraction • Phenomenon of polarization • Brewsters' angle

Required tools/equipment:
Safety:

Task No: 8. Develop the concept of optical fiber communication.

Time:6hrs**Theory:**4hrs**Practical:**2hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Describe in brief bout optical fiber 2. Enlist the advantageous of optical fiber over copper cable. 3. Discuss the structure and characteristics of optical fiber. 4. Give concept of light propagation through fibers 5. Enlist types of Fibers (Step index, graded index, single & multimode fiber etc.) 6. Describe the signal degradation in Fiber 7. Describe in brief about optical sources (LED, LASER) 8. Describe in brief about photo detector(photo diode, 9. Identify areas of application of optical fiber.	**Condition (Given)** Classroom, books, manual and field **Task (What)** Develop the concept of optical fiber. **Standard (How Well)** All the steps followed in sequence. The concept of optical fiber developed.	**Optical fiber** • Introduction to optical fiber communication • Structure and characteristics of optical fiber • Light propagation through fibers • Types of fibers ▪Step index ▪Graded index ▪Single & multimode fiber • Signal degradation in fiber: Attenuation, dispersion • Optical source ▪LED ▪Laser • Areas of application • Public network application ▪ Military ▪Industry ▪Telecommunication ▪LAN, WAN, MAN

Required tools/equipment:
Safety:

Time:7hrs**Theory:** 2 hrs**Practical:**5hrs

Task No: 9.Identify optical cable, splice photodiode/detector, Light source (LED, LASER) and Connector

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, equipment & material. 3. Find optical cable. 4. Identify core and cladding. 5. Prepare cable. 6. Identify connector. 7. Identify LED/LASER 8. Identify phtotodiode/detector 9. See the splicing method. 10. Restore tools.	**Condition (Given)** Classroom, books, manual and field **Task (What)** Identify optical cable, splice photodiode/detector, Light source (LED, LASER) and Connector. **Standard (How Well)** All the steps followed in sequence. Optical cable, splice, LED, LASER, Photodiode and connector identified.	• Identification of optical cable, its core and cladding • Optical connector • Familiarize with optical splice method • Basic concept of LED • Basic concept of LASER • Basic concept of Photodiode

Required tools/equipment:
Safety:

Task No: 10. Familiarize with optical network. **Time:4**hrs**Theory:**1hrs**Practical:** 3 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, equipment & material. 3. Identify optical network components. 4. Connect optical network. 5. Restore tools.	**Condition (Given)** Classroom, books, manual and field **Task (What)** Familiarize with optical network. **Standard (How Well)** All the steps followed in sequence. Optical network familiarized.	• Optical network component • Optical network diagram. • Optical network maintenance. • Connection procedure of optical network.

Required tools/equipment:
Safety:

Sub module 8: Computer Fundamentals
Duration: 28hrs (9 hrs theory & 19hrs practical)

Task No: 1. Discuss evolution of computer. **Time :2**hrs**Theory:**1 hr**Practical:**1 hr

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define computer. 2. Discuss history of computer. 3. Explain the elements of communication system. 4. Describe different generation of computers.	**Condition (Given)** Classroom/computer lab, books and handout **Task (What)** Discuss evolution of computer. Identify various types of computers **Standard (How Well)** All the steps followed in sequence. Evolution of computer with definition, history and generation discussed. Various types of computer identified.	**Evolution of Computers** • History of computer • Generation of computer

Required tools/equipment:
Safety:

Task No: 2. Illustrate computer architecture and peripheral devices.

Time : 4 hrs **Theory:** 2 hrs **Practical:** 2 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Discuss architecture of PC with their configuration. 2. Discuss input, output & peripheral devices. 3. Define software. 4. Enlist the types of software. 5. Discuss installation process of software in PC.	**Condition (Given)** Classroom/computer lab, books and handout **Task (What)** Illustrate computer Architecture. **Standard (How Well)** All the steps followed in sequence. Computer architecture with devices, software and installation explained.	**Computer architecture** • Personal Computer Configuration & Processors • Media, Devices and Peripherals • Software and their Classification • Personal computer installation

Required tools/equipment:
Safety:

Task no: 3. Install operating system.

Time:5hrs**Theory:**1hrs**Practical:** 4 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Define operating system. 2. Discuss its importance. 3. Enlist types of operating system. 4. Install any operating system in PC.	**Condition (Given)** Classroom/computer lab, books and handout **Task (What)** Explain/apply operating system. **Standard (How Well)** All the steps followed in sequence. Operating system explained and applied.	**Operation system** • Introduction to Operating System • Importance of Operating System • Types of Operating System • Installation Procedure • Partition/Formatting

Required tools/equipment:
Safety:

Task No: 4.Apply basic computer operating skills **Time:** 13hrs**Theory:** 3hrs**Practical:**10hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Press Button of casing to start computer. 3. Check the switch of monitor. 4. See different icon in computer. 5. Click mouse left key in start menu. 6. Follow the hand out to perform different job. 7. Practice for windows package. 8. Click start button to open office like word. 9. Follow hand out for Word , Excel, Power point etc. 10. Save documents before closing computer. 11. Shut down the computer. 12. Switch off the power. 13. Keep records.	**Condition (Given)** Classroom/computer lab, books and handout **Task (What)** Apply basic computer operating skills **Standard (How Well)** All the steps followed in sequence. Basic computer operating skills applied.	• Starting and shutting down computer • Basic windows package (Windows XP, Windows 7, Windows 8 and latest version) • Office Package (Word, Excel, PowerPointetc)

Required tools/equipment:
Safety:

Task No: 5. **Apply computer network topology.** **Time:4**hrs**Theory:** 2 hrs**Practical:** 2 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
13. Define computer network terminology 14. Define Physical topology 15. Define Logical topology	**Condition (Given)** Classroom, books, handout and catalogue **Task (What)** Familiarize computer network topology , types of topology **Standard (How Well)** computer network topologies	• Computer network terminology • Bus topology • Star topology • Ring topology • Mesh topology • Tree topology

Required tools/equipment:
Safety:

Module 2: Outside/ External Plant

Module description

This specialized moduleis designed to provide knowledge and skills onoutside plant network of telecommunication systemincludingAerial line construction, Underground line construction, Subscriber installation, fault localization & maintenance and Main Distribution Frame /Maintenance Control Centre (MDF/MCC) as the sub modules.

Sub modules:

1. Aerial Line Construction
2. Underground Line Construction
3. Subscriber Line Installation& fault localization & Maintenance
4. Installation of Frames (MDF/Cabinet/MSAN)

Sub module 1: Aerial NetworkInstrallation
Duration: 190 hrs (29hrs theory& 161hrs practical)

Task No: 1. Draw network diagram of external plant. **Time :6**hrs**Theory:**3hrs**Practical:**3hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Enlist telecommunication symbols. 3. Identify different symbols. 4. Collect necessary drawing instruments. 5. Find drawing sheet. 6. Fix drawing sheet on drawing board. 7. Draw boarder lines. 8. Draw different telecommunication symbols. 9. Draw Primary network diagram. 10. Draw secondary network diagram. 11. Draw jointing diagram. 12. Draw polling diagram. 13. Draw whole network diagram. 14. Remove the drawing from drawing board. 15. Restore tools, instruments and materials. 16. Keep records.	**Condition (Given)** Classroom, books, manual, drawing room, drawing instrument and materials **Task (What)** Draw network diagram of external plant. **Standard (How Well)** Structure and standards of external plant network identified Primary network identified. Map of external plant network drawn	**Outside plant network** • Introduction to external cable network • Introduction to primary and secondary network • Symbols used in telephone network • Drawing & Reading of external plant network • Introduction to MDF, cabinet, exchange and DP • Safety procedure & equipment • Fundamental planning • Telephone demand forecast

Required tools/equipment: Drawing board, Cello tape, Templates, Eraser, T-Square etc.
Safety:

Time :4hrs**Theory:**1 hr**Practical:** 3hrs

Task No: 2. Read/interpret diagram of secondary (Aerial) network.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Read diagram of secondary network. 2. List considerations to be followed in secondary network. 3. Define aerial network. 4. Identify standards for aerial network 5. Describe sag & tension. 6. Keep records.	**Condition (Given)** Classroom, books, manual, drawing room, drawing instrument and materials **Task (What)** Read/interpret diagram of secondary (Aerial) network **Standard (How Well)** Structure of secondary cable (Aerial) network identified. Diagram of secondary (Aerial) network read and interpreted	**Secondary cable network construction** • Considerations • Standards for aerial line construction • Sag and tension

Required tools/equipment:
Safety:

Task No : 3. Carryout poling work.

Time:8hrs**Theory:**2 hrs**Practical:**6hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study poling diagram. 4. Select pole. 5. Define purpose pole. 6. Enlist their types. 7. Identify soil type. 8. Dig the hole to required depth. 9. Insert bottom part of pole into the hole. 10. Align the pole vertically to the ground. 11. Refill 1/3 part of hole with soil. 12. Compact the soil. 13. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Carryout poling work. **Standard (How Well)** All the steps followed in sequence Polling work carried out as per standard.	**Construction of pole line** • Poles& their types • Position of poles • Planning of pole Routes • Where to erect the pole • Digging of pole poles • Shape of pole hole • Tools used for pole digging • Erecting procedure of the pole • Filling depth

Required tools/equipment: Digger, Gal, Sowel, Rope etc.
Safety: Erect pole with attention. Use safety sign board before erecting.

Task No: 4. Install Stay & Push Brace.

Time:9hrs**Theory:** 3 hrs**Practical:**6hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study poling diagram. 4. Select the pole to be supported by stay or push braced. 5. Dig the hole for stay. 6. Select the contact point of the pole for push braced. 7. Insert the stay into the hole. 8. Refill the hole with soil to cover the stay plate. 9. Connect the outer end of stay wire to the pole. 10. Check the strength of stay wire or push brace by shaking the pole and push brace. 11. Classify types of stay. 12. Enlist the materials used for stay configuration. 13. Describe Ericsson method. 14. Describe types for pole strengthening. 15. Step out the procedure for push brace (Strut) construction. 16. Restore tools, equipment and materials. 17. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Install Stay & Push Brace. **Standard (How Well)** All the steps followed in sequence Stay & Push Brace installed as per standard.	**Stay and push brace** • Stay & Push brace Definition • Importance of Stays and Push braces • Stay Configuration • Classification of Stays • Materials used for Stay constructions • Method (Ericsson) • Stay erecting procedure • Pole strengthening method ▪ Ericsson method ▪ French method • Safety precautions

Required tools/equipment: Eriband tool, Hammer, Metal Cutter etc.
Safety: Press tightly with tightner to stay wire. Use safety sign board.

Task No: 5. Install different pole accessories. **Time :8**hrs**Theory:**2hr**Practical:**6hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study polling diagram. 4. Select the pole to be fitted with accessories. 5. Mark the position for fixes the accessories. 6. Bind the box. 7. Fix the accessories by Erriband tool. 8. Tight the joint. 9. Check joint. 10. Restore tools, equipment and materials. 11. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Install different pole accessories. **Standard (How Well)** All the steps followed in sequence Different pole accessories installed and affixed as per standard.	**Accessories fitting** • Tools required for accessories fitting • Types of pole accessories • Fitting procedure • Safety precautions

Required tools/equipment: Eriband tool, Hammer, Metal cutter etc.
Safety: Use the steel band carefully.

Task no: 6. Install distribution point.

Time:5hrs**Theory:** 1 hr**Practical:**4hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study jointing diagram. 4. Collect necessary tools and equipment. 5. Obtain DP as per requirement. 6. Cut the steel band. 7. Fit DP in pole with Eriband tool. 8. Place bridle ring below DP at left and right position. 9. Collect necessary tools and equipment. 10. Check the list. 11. Restore tools, equipment and materials. 12. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Install Distribution point. **Standard (How Well)** All the steps followed in sequence Distribution point installedas per standard.	• Different types of DP (Protective, non-protective, tail, without etc) • Fitting procedure • Termination of cable in DP

Required tools/equipment: Eriband tool, Hammer, Eriband Scissor etc.
Safety: Fit the DP carefully and tight it.

Task No: 7. Perform aerial cable pulling. **Time :38**hrs**Theory:**2hrs**Practical:** 36hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study poling and jointing diagram. 4. Select the route. 5. Identify the type of cable to be pulled. 6. Hang the roller in the pole accessories. 7. Lay the cable on the ground to the required length. 8. Place cable on the roller. 9. Pull cable from the first pole using Simera. 10. Cut messenger at required length. 11. Tilt Messenger wire with pole accessories. 12. Check sag visually on each span. 13. Clamp cable messenger with anchoring eye or suspension clamp or pin type bracket. 14. Remove roller and simera. 15. Restore tools, equipment and materials. 16. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform aerial cable pulling. **Standard (How Well)** All the steps followed in sequence Aerial cable pulling performed as per standard.	**Aerial cable pulling** • Introduction • Structure aerial cable • Choice of pole Accessories • Aerial cable handling • Aerial cabling in Existing pole route

Required tools/equipment: Simera, Roller, Cable Cutter, Wrench of different sizes, Ropes etc.
Safety: While pulling, keep simera properly, bind messenger wire tightly in pole accessories.

Task no: 8. Perform aerial copper cable Splicing/Enclosing.

Time:40hrs**Theory:**4hrs**Practical:** 36hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study jointing diagram. 4. Identify cable pairs, Basic Colour code &colour code for unit and group binders. 5. Enlist materials & tools required for splicing. 6. Cut the cable with sheath cutter. 7. Bind the cables in 10 pair bundles. 8. Group binds the binders of required pairs. 9. Hang up closure to messenger wire. 10. Join the cable using U-Y connector. 11. Close the closure. 12. Check the continuity. 13. Restore tools, equipment and materials. 14. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform aerial cable copper Splicing & Enclosing. **Standard (How Well)** All the steps followed in sequence Aerial cable Splicing &enclosing performed as per standard.	**Splicing and Enclosing** **Splicing** • Introduction • Requirement of splice • Identification of cable pairs • Aerial Cable Colour Code • Cable information and coding • Basic Colour Code for 10 Pairs • Colour code for unit and Group Binder • Aerial Cable Splicing • UY Connector & their application • Aerial cable splicing application • Materials & tools required for Splicing • Splicing Procedure **Enclosing** • Considerations • Types of Aerial Joints Closing • Enclosing Procedure **Branch splice** • Definition • Procedure for Branch Splice

Required tools/equipment: Cable cutter, Sheath cutter, Side cutter, Crimping tool etc.
Safety: Take precaution while opening sheath.

Task no: 9. Perform Optical Fibre cable Splicing/Enclosing. **Time:40**hrs**Theory:** 4 hrs**Practical:** 36 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study jointing diagram. 4. Identifyfibre strand, Basic Colour code &colour code for tubes. 5. Enlist materials & tools required for splicing. 6. Cut the cable with sheath cutter. 7. Strip the fibre coating. 8. Insert the fibre protection sleeve tube at one end. 9. Clean the fibre with alcohol. The fibre must be squeaky clean. 10. Cut the fibre strand with cleaver. 11. Join the fibre using fusion splicer. 12. Heat shrink the fibre protection sleeve. 13. Arrange the fibre in the closure. 14. Close the closure. 15. Restore tools, equipment and materials. 16. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform optical fibre stripping, fibre cleaning, fibre cleaving and Splicing & Enclosing. **Standard (How Well)** All the steps followed in sequence Optical Fibre cable Splicing & enclosing performed as per standard.	**Splicing and Enclosing** **Splicing** • Introduction • Requirement of stripping • Requirement of cleaving • Requirement of splice • Optical FibreColour Code identification • Cable information and coding • Colour code for tube • Fibre Protection Sleeve application • Arc Fusion splicer application • Materials & tools required for Splicing • Splicing Procedure **Enclosing** • Considerations • Enclosing Procedure **Branch splice** • Definition • Procedure for Branch Splice

Required tools/equipment: Cable cutter, Sheath cutter, Side cutter, Crimping tool etc.
Safety: Take precaution while opening sheath.

Task No: 10. Install earthing line for aerial network.

Time:12hrs**Theory:**2hr**Practical:** 10hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools, instruments and materials. 3. Study polling diagram. 4. Find the pole for earthing. 5. Dig the Earthing place of required depth. 6. Solder the copper plate with Copper wire by gas welding. 7. Place the copper plate in vertical position. 8. Pour the salt and coal mix over it in two layers with soil (earth). 9. Clamp the end of copper wire with the connector shoe. 10. Screw the connector with copper wire on the pole. 11. Restore tools, equipment and materials. 12. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Install Earthing line for Aerial Network **Standard (How Well)** All the steps followed in sequence. Earthing line install as per standard.	**Earthing of aerial network** • Introduction • Objectives of Earthing • Value of earth resistance • Materials used for earthing • Procedure • Safety precautions

Required tools/equipment: Hammer, Multimeter etc.
Safety: Check after connection.

Time:8hrs**Theory:** 1 hr**Practical:**7hrs

Task No: 11.Perform loop resistance/ Insulation resistance testing of network.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Study jointing &polling diagram. 3. Collect necessary testing device. 4. Raise the ladder in pole having DP. 5. Open the cabinet. 6. Start to check the insulation & loop resistance between DP and cabinet. 7. Fill the value in the chart sheet. 8. Collect the tools & equipment. 9. Check the list. 10. Restore tools, equipment and materials. 11. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform loop resistance/ Insulation resistance testing of network. **Standard (How Well)** All the steps followed in sequence. Perform loop resistance/ Insulation resistance testing of network as per standard.	**Loop resistance & insulation resistance** • Definition • Procedure for testing • Safety precautions

Required tools/equipment: Megger, Multimeter etc.
Safety: Beware about short circuit.

Time:12hrs**Theory:**4hr**Practical:**8hrs

Task No: 12.Perform OTDR testing of optical cable

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary testing device. 3. Enlist the required materials. 4. Cut the optical cable. 5. Test the optical cable. 6. Keep the record.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform OTDR testing of optical cable **Standard (How Well)** All the steps followed in sequence. OTDR testing as per standard.	• Procedure of OTDR testing.

Required tools/equipment: Megger, Multimeter etc.
Safety:

Sub module 2: Underground Network Installation

Duration: 137hrs (21 hours theory & 116hrs practical)

Task No: 1. Observe primary Network. **Time:5**hrs**Theory:** 2hrs**Practical:** 3 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary drawing instruments. 3. Find drawing sheet. 4. Fix drawing sheet on drawing board. 5. Draw boarder lines. 6. Draw telecom symbols. 7. Draw primary network. 8. Study Network diagram. 9. Clean the drawing paper. 10. Remove the drawing from drawing board. 11. Restore tools, equipment and materials. 12. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Observe primary network **Standard (How Well)** Primary network observed.	**Underground network construction** • Introduction • Primary network • Underground line application • Underground cable Construction • Civil network planning • Primary network planning • Safety precaution

Required tools/equipment: Drawing board, Templates, Eraser and pencil etc.
Safety:

Task No: 2. Perform underground copper cable laying. **Time:24**hrs**Theory:** 3hrs**Practical:** 21 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Study diagram. 3. Collect necessary tools and equipments. 4. Find cables of required pairs. 5. Select the condition of ducts. 6. Find required sub-duct coils. 7. Select the condition of ducts. 8. Use hose pipe. 9. Pull the sub-duct using the machine. 10. Use hose pipe and cable supporter. 11. Spread the cable. 12. Pull the cable using the machine. 13. Check the condition of cable laying. 14. Restore tools, equipment and materials. 15. Keep records. 16. Restore tools, equipment and materials. 17. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform underground cable laying. **Standard (How Well)** All the steps followed in sequence Underground cable laying performed as per drawing.	**Underground Cable laying** • Introduction • Underground cable handling • Preparation for cable laying • Selection of duct • Safety precautions • Preparation of materials and tools • Roding and duct cleaning • Passing test • Handling of cable drum • Cable pulling • Fault finding diagram

Required tools/equipment: Wench machine, Cable cutter, fish rods, hose pipe, cable supporter, rope etc.
Safety: Handle Duct & Cable Properly

Time:59hrs**Theory:**11hrs**Practical:** 48hrs

Task No: 3. Install different frames and perform cable termination in Cabinet /MDF/ONU/MSAN.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Fix the frame of MDF. 3. Drill for cabinet, affix it with nut and bolt. 4. Drill for ONU, affix it with nut at wall. 5. Drill for MSAN, affix it with nut at wall 6. Open the cable sheath. 7. Bind the cable in a cable group. 8. Divide the cables in a group. 9. Group the cable terminate by top position till last position in group of 10 pairs. 10. Fix the tag. 11. Punch the cables as per the specified in drawing. 12. Restore tools, equipment and materials. 13. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Install different frames and perform cable termination in Cabinet / MDF /ONU /MSAN. **Standard (How Well)** All the steps followed in sequence. Cable termination in cabinet, , MDF, ONU, MSAN performed with installing tag, their coding and jumpering.	**Termination of cable pairs in cabinet** • Introduction • Removal of cabinet body • Tools, used for Krone-cabinet termination • Removal and re-termination of wire • Instruction for sealing cable entries • Earthing of cabinet, ONU, MSAN • Cable termination in MDF • Cable termination in Cabinet • Cable termination in ONU • Cable termination in MSAN • Fuses used in MDF • Fuses used in ONU • Fuses used in MSAN

Required tools/equipment: MDF frame and tag, Cabinet frame and tags, ONU frame and tags, MSAN frames and tags, Insertion tool, Side cutter, Templates etc.
Safety: Termination should be tight.

Time:28hrs**Theory:** 4 hrs**Practical:** 24hrs

Task No: 4. Perform splicing and enclosing of copper underground cable network.

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Study network diagram. 3. Collect necessary tools and equipment. 4. Open sheath of cable. 5. Bind the cable with binder. 6. Keep the cable in cable head. 7. Place modular connector. 8. Press with hydraulic pressure. 9. Bind with cotton tape. 10. Use desiccant silica. 11. Cover with canister. 12. Bind with tape. 13. Cover with sleeve. 14. Heat the sleeve. 15. Check the connection. 16. Restore tools, equipment and materials. 17. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform splicing and enclosing of underground cable network. **Standard (How Well)** All the steps followed in sequence. Splicing and enclosing of underground cable network performed as per standard.	**Splicing & Enclosing** • Underground cable splicing • Description of 3M type modular connectors • Application of the connector • Colour coding of primary cable • Basic colour code for 10 pairs • Colour code for units and group binders • Colour code of 300, 600, 900, 1200, 1800 pairs cables • Underground cable splicing application • Enclosing • Importance • Enclosure types • Selection of enclosure • RAYCHEM XAGA 250 SERIES • RAYCHEM XAGA 550 SERIES • Procedure for primary splicing and closing

Required tools/equipment: Cable cutter, Splicing set, Sheath cutter, Plier, Heater etc.
Safety: Beaware while heating.

Task No:5. Perform underground optical cable laying

Time:18hrs**Theory:**2hrs**Practical:** 16hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Study network diagram. 3. Collect necessary tools and equipment. 4. Find necessary cable 5. Find the condition of selected sub-duct. 6. Couple the subducts at necessary locations. 7. Lay the fibre using blowing machine. 8. Restore tools, equipment and materials. 9. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform optical fibre blowing at sub-duct for underground network. **Standard (How Well)** All the steps followed in sequence. Optical fibre laying performed as per standard.	**Underground Fibre laying** • Introduction • Underground optical fibre handling • Preparation for cable laying • Selection of proper sub-duct. • Preparation of materials and tools • Blowing procedure • Subduct cleaning procedure. • Passing test • Handling of cable drum.

Required tools/equipment: .Blower machine, cable jet machine etc.
Safety: Beware while the pressurised air is blowing

Task no: 6. Perform splicing and enclosing of underground optical cable network.

Time:28hrs**Theory:** 4 hrs**Practical:** 24hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
17. Receive instruction. 18. Collect necessary tools, instruments and materials. 19. Study jointing diagram. 20. Identifyfibre strand, Basic Colour code &colour code for tubes. 21. Enlist materials & tools required for splicing. 22. Cut the cable with sheath cutter. 23. Strip the fibre coating. 24. Insert the fibre protection sleeve tube at one end. 25. Clean the fibre with alcohol. The fibre must be squeaky clean. 26. Cut the fibre strand with cleaver. 27. Join the fibre using fusion splicer. 28. Heat shrink the fibre protection sleeve. 29. Arrange the fibre in the closure. 30. Close the closure. 31. Restore tools, equipment and materials. 32. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform splicing and enclosing of underground optical cable network. **Standard (How Well)** All the steps followed in sequence Optical Fibre cable Splicing & enclosing performed as per standard.	**Splicing and Enclosing** **Splicing** • Introduction • Requirement of stripping • Requirement of cleaving • Requirement of splice • Optical FibreColour Code identification • Cable information and coding • Colour code for tube • Fibre Protection Sleeve application • Arc Fusion splicer application • Materials & tools required for Splicing • Splicing Procedure **Enclosing** • Considerations • Enclosing Procedure **Branch splice** • Definition • Procedure for Branch Splice

Required tools/equipment: Cable cutter, Sheath cutter, Side cutter, Crimping tool etc.
Safety: Take precaution while opening sheath.

Sub module 3:Subscriber Line Installation, Fault Localization and Maintenance
Duration: 75 hrs (11hrs theory& 64hrs practical)

Task No: 1. Install subscriber line, ADSL line. **Time:8**hrs**Theory:** 2 hrs**Practical:** 6hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Locate the subscriber premises. 3. Sketch the location on survey form with primary, secondary pair etc. 4. Measure the drop wire from DP to subscriber premises. 5. Estimate the required accessories. 6. Open DP box. 7. Connect drop wire in DP. 8. Tight the screw. 9. Connect the primary pair supplied at the secondary pair in tag at cabinet with insertion tool. 10. Restore tools, equipment and materials. 11. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Install/ maintain subscriber line. **Standard (How Well)** All the steps followed in sequence. Subscriber line installed/ maintained as per standard.	**Subscriber line installation** • Drop wire (concept only) • Drop wire installation Procedure • Drop wire maintenance • Repairing cable pairs • Procedure for jumper in Krone cabinet

Required tools/equipment: Crimping tool for drop wire connector, Screw driver, Cutter etc.
Safety: Use proper tools.

Task No: 2. Perform indoor cable networking.

Time:18hrs**Theory:**2 hrs**Practical:** 16hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Study network diagram. 3. Survey the site. 4. Take measurement. 5. Extend cables. 6. Use clips in half meter distant. 7. Place listic. 8. Check labeling. 9. Cut in angle at corner. 10. Place cable in listic. 11. Cover with listic. 12. Identify Flat cable. 13. Remove outer jacket of flat wire. 14. Keep conductor in RJ 11 jack. 15. Press with RJ11 crimping tool. 16. Use splitter for ADSL and PSTN line 17. Restore tools, equipment and materials. 18. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform indoor cable networking**.** **Standard (How Well)** All the steps followed in sequence. Indoor cable networkingperformedas per drawing including RJ11 connection and Splitter connection.	**Indoor cable networking** • Introduction • Different types of indoor Networking like listic, clip, pipe & conceal wiring • Rozzet& RJ 11 Jack connection • Splitter connection • Procedure

Required tools/equipment: RJ 11 crimping tool, side cutter, plier etc.
Safety: cable should not scratch.

Task No: 3. Diagnose/ verify/ repair/ maintain network faults.

Time :17hrs**Theory:**3hrs**Practical:**14hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction from MCC. 2. Collect necessary devices and tools. 3. Handle megger. 4. Handle Cable tester. 5. Handle C-meter. 6. Handle multimeter. 7. Check continuity. 8. Check dial tone. 9. Check capacitance. 10. Diagnose fault. 11. Repair fault. 12. Restore tools, equipment and materials. 13. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Diagnose/ verify/ repair/ maintain faults. **Standard (How Well)** All the steps followed in sequence. Faults diagnosed, verified, repaired and maintained.	**Fault repair & maintenance** • Concept of MCC • Definition of fault • Procedure of collecting fault records up to Cabinet from MCC. • Occurrence of fault • Check procedure • Use of megger, Cable tester (Tone tester), C-meter, multimeter and other measuring instruments • Practical work • Project work

Required tools/equipment:megger, C-meter, Multimeter, Tone tester etc.
Safety:

Task No: 4. Perform Maintenance of subscriber line, ADSL line.

Time :23hrs**Theory:**2 hrs**Practical:**21hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
1. Receive instruction. 2. Collect necessary tools & equipment. 3. Receive fault records from MCC. 4. Check the specified secondary pair at cabinet. 5. Check the specified pair at DP. 6. Check continuity. 7. Check dial tone. 8. Check capacitance. 9. Diagnose fault. 10. Repair dropwire faults. 11. Check modem for ADSL line. 12. Setup modem. 13. Handle ADSL testing machines as DA 280, XG2041 etc. 14. Restore tools, equipment and materials. 15. Keep records.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Maintain/ repairsubscriber line, ADSL line, configure ADSL modem, handle DA 280, handle XG2041. **Standard (How Well)** All the steps followed in sequence. Subscriber line and ADSL line maintained and repaired	• Different types of faults at subscriber line • Different types of faults at ADSL line • Procedure of collecting fault records and clearing fault records from/to MCC. • Use of XG2041 , DA 280 • Configuration parameters of modem • Configuration of modem at computer. • Safety precautions

Required tools/equipment: Soldering rod, wire, paste, Screw driver set, plier etc.
Safety: Use proper tools.

Task No: 5. Performinformation receive/dispatch through maintenance control center (MCC)

Time :25 hrs**Theory:** 2 hrs**Practical:** 23 hrs

Steps	Terminal performance Objectives	Related Technical Knowledge
Receive instruction. 2. Collect necessary tools & equipment. 3. Use code for information dispatch. 4. Receive information. 5. Dispatch for further change. 6. Keep record.	**Condition (Given)** Classroom, site, necessary tools equipment and materials **Task (What)** Perform information receive/dispatch through maintenance control center (MCC) **Standard (How Well)** All the steps followed in sequence. Information Clearly received/dispatched through MCC	• Different code for MCC

Required tools/equipment: Soldering rod, wire, paste, Screw driver set, plier etc.
Safety: Use proper code.

Sub module: 4 : Entrepreneurship Development

Total: 40 hrs

Theory: 18 hrs

Practical: 22 hrs

Course description

This course is designed to impart the knowledge and skills necessary for micro enterprise or a business unit of self-employment startup. The entire course intends to introduce enterprise, finding suitable business ideas and developing business idea to formulation of business plan.

Course objectives

After completion of this course, students will be able to:
1. Understand concept of enterprise and self-employment
2. Explore suitable business idea matching to self
3. Learn to prepare business plan
4. Learn to keep preliminary business record

S.N.	Task statements	Related technical knowledge	Time (hrs)		
			T	P	Tot.
1.	State the concept of business/enterprises	• Introduction to business/enterprise • Classification of business/enterprises • Overview of MSMEs(Micro, Small and Medium Enterprises) in Nepal • Cost & Benefits of self-employment/salaried job	4		4
2.	Grow entrepreneurial attitudes	• Wheel of success • Risk taking attitude	3		3
3.	Generate viable business ideas	• Business idea generation • Evaluation of business ideas	1	2	3
4.	Prepare business plan	• Concept of market and marketing • Description of product or service • Selection of business location • Estimation of market share • Promotional measures • Required fixed assets and cost • Required raw materials and costs • Operation process flow • Required human resource and cost • Office overhead and utilities • Working capital estimation and calculation of total finance required	9	18	27

S.N.	Task statements	Related technical knowledge	Time (hrs)		
			T	P	Tot.
		• Product costing and pricing • Cost benefit analysis (BEP, ROI) • Information collection method and guidelines • Individual business plan preparation and presentation			
5.	Prepare basic business records	• Day book • Payable & receivable account	1	2	3
		Total:	**18**	**22**	**40**

Textbook:

क) प्रशिक्षकहरुकालागिनिर्मित निर्देशिकातथा प्रशिक्षण सामग्री, प्राविधिकशिक्षातथाव्यावसायिकतालीम परिषद्,

२०६९

Reference book:

OJT for Outside/External Plant Technician

Overview of OJT

On-the-Job Training is an individual training approach designed to train the trainees to practice certain tasks while working in the job. It creates appropriate working environment for the teaching learning activities. During the OJT the training will be relevant as the trainees are being trained in a real work setting. The aim of the OJT is to provide the trainees the maximum experience & exposure of "The World of Work".

Objectives of OJT

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

1. 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
2. To gain world of work experiences
3. To acquire skills and knowledge newly developed in the related field of occupation
4. To make trainees familiar with the future occupation/ job they are going to hold
5. To provide trainees with supporting skills and knowledge necessary for the related occupation
6. To make trainees familiar with the day to day administrative / managerial activities applicable in their related occupation.

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 Evaluation

The OJT will be evaluated by:

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

The marks distribution for the OJT evaluation of the trainees will be as follows:

S.N.	Evaluators	Marks Distribution	
		Full Marks	Percentage
1.	Related supervisor of the employer agency	**120**	**75%**
2.	Related instructor of the training institute	**40**	**25%**
Total		**160**	**100%**

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External Plant Manual, Published by Nepal Telecom.

Aerial Network Construction Manual,Published by Nepal Telecom.

Underground Network Construction Manual,Published by Nepal Telecom.

Subscriber Installation Manual,Published by Nepal Telecom.

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Entrepreneur's Handbook, Technonet Asia, 1981

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Issue No. **Regd. No.**

Sample

LBC

Laxmi Button and Handicraft Institute, Bansbari, Kathmandu.

(प्राविधिकशिक्षातथाव्यावसायिकतालीम परिषद्, सानोठिमी, भक्तपुरबाट सम्बन्धनप्राप्त)
(Affiliated to the Council for Technical Education and Vocational Training, Sanothimi, Bhaktapur)

PHOTO (Graduate)

प्रमाण-पत्र
CERTIFICATE

जिल्लाकाठमाण्डौं काठमाण्डौंमा.वि.स./न.पा/उ.मा.न.पा./मा.न.पा.वडा नं. ५ बस्ने श्री सगरमाथा गण्डकी को छोरा/छोरी श्री/श्रीमती/सुश्री एभरेष्ट लुम्बिनीले वि.सं. २०७०, असोज देखि वि.सं. २०७०फाल्गुण सम्म सञ्चालित"टेलिकम्युनिकेसन आउटसाइड/एक्सटर्नल प्लाण्ट टेक्निसियन"विषयक९४३ घण्टाअवधिको तालीम सफलतापूर्वक सम्पन्न गरेको प्रमाणित गरिन्छ ।

This is to certify that **Ms. Everest Lumbini** son/daughter of **Mr. SagarmathaGandaki** a resident of **Kathmandu Metropolitan City-5 of Kathmandu** district has successfully completed training of **"Telecommunication Outside/External Plant Technician"of 943 hours duration** conducted from **September 2013**to**February 2014.**

Passhupati Krishna *Dharma Guru*

Date of issue: February 10, 2014 **(Course Coordinator)** **(Principal)**