Journeyman Metering Electrician

Program Duration: 4 Years (48 months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

Process	Hours
Meter Shop Safety	120
Single Phase Shop Testing	320
Poly Phase Shop Testing	640
Wiring- Field/Shop	
- Secondary	1200
- Primary	240
Field Testing/Programming	
- Large Service/Co-Generation/Tie Line	1280
- In Service Checks	960
Field Metering	
- Solar and Battery Installations	800
- Troubleshooting/Exchanges	800
- New Sets	640
- Service work	720
Meter Dispatching	40
Trade Schools	40
Transformer School (NVE Lines Internal)	40
Cross Training	
- Substations	40
- Telecommunications	40
- Lines	80

Total OJT Hour Recommended 8000

*Note- Service work includes; Move ins, Move Outs, Special Tests, Power checks, Evidence of Tampering and other misc. order types.

Course Plan

First Six Months

Familiarize apprentices by reviewing math courses focused on algebra, geometry, trigonometry, and expose them to basic electric and utility safety practices include tools and their proper use and care.

Second Six Months

Acquaint apprentices with D/C electrical principles, A/C circuitry and electromagnetism, both of which are essential for the successful operation of induction meters used mainly on residential and some commercial/industrial customers.

Third Six Months

Self-contained metering and their proper installation are also taught during this period. Familiarization with electrical components and grid designs, including residential NET metering system, troubleshooting and customer billing concerns are covered.

Fourth Six Months

Use of different electrical test equipment, including proper care, is covered. Apprentices will learn about instrument rated meters and the associated devices

in these circuits. Polyphase systems and transformer operation are also covered.

Fifth Six Months

Continue to learn about instrument transformers and polyphase meter applications and testing. Apprentices will learn about demand, load conservation, totalizing and power quality, which leads to advanced calculation of electric power.

Sixth Six Months

Apprentices will attend transformer school with Lines. They will learn about service installations, transmission and distribution equipment and the distribution of electric power from the grid. They will also be introduced to system protection and associated devices.

Seventh Six Month

Telemetering, solid-state electronics and the smart grids are covered. Apprentices will be familiarized with meter computer programs for reading and programing. Schematic and Blueprint reading will be covered for troubleshooting meter circuits.

Eighth Six Months

During this section standards and tariffs a covered. The apprentice will review all material specific to metering, this will include running a full schedule under the supervision of a Journeyman Metering Electrician daily in preparation for the top out test.

First Six Months-

Trade Safety: Getting Started (ICS) 10

Working Safely with Electricity (ICS) 10

Safety in Meter Work (NUS) 6

Safety in Sub/Switch Yards (NUS) 6

Electricians Tools (ICS) 10

General Review (of Math) (ICS) 8

Fractions, Percents, Proportions, and Angles (ICS) 8

Intro to Algebra (ICS) 10

Practical Trigonometry (ICS) 10

Chapter 1 Handbook for Electricity Metering 4

Total= 82 Hours

Second Six Months-

Math for Metering 2 (NUS) 6

Nature of Electricity (ICS) 8

Circuit Analysis and OHM's Law (ICS) 10

Capacitors and Inductors (ISC) 10

Magnetism and Electromagnetism (ICS) 8

Conductors, Insulators, and Batteries (ICS) 8

DC Motors and Generator Theory (ICS) 8

Alternating Current (ICS) 8

Alternating Current Circuits (ICS) 8

Total= 74 Hours

Third Six Months-

Inductors in AC Circuits (ICS) 8

Capacitors in AC Circuits (ICS) 8

Transformers (ICS) 8

Alternators (ICS) 8

Electrical Energy Distribution (ICS) 10

Self-Contained Meters, Constants, Internal Wiring and Socket Checks (Internal) 40

(HITT Reference Book, Meter Manuals, Pocket Guide to Electric Metering)

Troubleshooting Techniques (NUS) 6

Net Metering (Internal) 10

Customer Relations and High Bill Complaints (NUS) 6

Total= 104 Hours

Fourth Six Months-

Energy Diversion (NUS) 6

Basic Test Equipment (ICS) 8

Working with Multimeters (ICS) 10

Using Electrical Test Equipment (NUS) 6

Instrument-Rated Meters, Constants, Internal Wiring and Socket Checks (Internal) 40

(HITT Reference Book, Meter Manuals, Pocket Guide to Electric Metering)

Installation Checks and Inspections (NUS) 6

Polyphase Systems 1 (NUS) 6

Polyphase Systems 2 (NUS) 6

Transformer Operation (ICS) 10

Total= 98 Hours

Fifth Six Months-

Instrument Transformers (ICS) 10

Polyphase Transformer Rated Applications (NUS) 6

Principles of Accuracy Testing (NUS) 6

Polyphase Transformer Rated Meter Testing (NUS) 6

Demand Meter Concepts (NUS) 6

Conservation and Load Management (NVE) 3

Reactive Metering Concepts (NUS) 6

Power Quality (NUS) 6

Totalizing (NVE) 3

Electric Power Measurements A (ICS) 10

Electric Power Measurements B (ICS) 10

Total= 72 Hours

Sixth Six Months-

Service Installations (NUS) 6

Transformer School (NVE Lines) 40

Transmission (NUS) 6

Distribution (NUS) 6

Local Distribution of Electrical Power (ICS) 10

System Protection and Monitoring (NUS) 6

Relays 1 (NUS) 6

Total= 80 Hours

Seventh Six Months-

Telemetering (ICS) 10

Switchgear (ICS) 10

Reading Electrical Schematics (ICS) 10

Electrical Blueprint Reading (ICS) 10

Advanced Metering (Meter Trade School) 40

Chapters 5-8 (Handbook for Electricity Metering 12

(Solid State Electronics, Service Switch, Communications, The Smart Grid)

Total= 92 Hours

Eight Six Month-

NV Energy Standards/Rules 20

(RPI-G, RPI-2, RPI-4, RPI-15, RPM-, RE-3, Tariffs)

Advanced Electrical Safety (ICS) 10

Review (Top Out) 30

Total= 60 Hours

First Six Months-

Trade Safety: Getting Started (ICS) 10

This unit covers general trade safety. Topics covered in this unit include; Names of the agencies that make and enforce safety regulations and explain an employee's responsibilities under those regulations, Lists the hazards associated with chemicals and describe how to avoid those hazards, lists several electrical shock hazards and the techniques used to prevent shocks, lists the steps in a lockout/tagout procedure, the importance of machine guarding and names several types of machine guards, covers the four classes of fire and how to extinguish each of them, describes the proper technique used to lift a heavy load, how to avoid hand injuries when using hand and power tools, covers how job analysis and the science of ergonomics are used to improve the workplace and the importance of personal protective equipment and name several types of PPE.

Working Safely with Electricity (ICS) 10

This unit covers Electrician Categories and Classifications; Electrical Safety Standards and Codes, including OSHA, NEC, and NESC; Materials Standards; Listing and Labeling by Testing Laboratories; Electric Shock; Safety Precautions; First Aid for Electric Shock; Protective Clothing.

Safety in Meter Work (NUS) 6

This unit will cover major safety concerns associated with meter work and explain how safety hazards can be minimized. It examines single phase and polyphase self-contained meter installations, pointing out where hazards exist. Also discussed are safety practices associated with working instrument rated cabinets and hazards related to open current transformer secondaries, bypasses, replacing and installing self-contained meters.

Safety in Sub/Switch Yards (NUS) 6

Safety in T&D Maintenance covers basic safety considerations involved in performing maintenance work on transmission and distribution systems. Specific electrical shock hazards and how to avoid them are discussed. It describes hazards that may be encountered in overhead, underground, and substation and switchyard maintenance work

Electricians Tools (ICS) 10

This unit covers Electricians' Equipment: Basic Hand Tools; Wire-Working Tools; Conduit-Working Tools; Power Tools; Knowledge as a Tool with Basic Introduction to the Metric System; Units of Electricity; Static Electricity; Electric Current, Measuring Instruments, and the Symbols and Terminology Used by Electricians. Special Notes: • This updated course replaces, Electricians' Tools, course 4401. • This study unit is primarily appropriate for residential and commercial electricians or electrical contractors.

General Review (of Math) (ICS) 8

This unit covers checking the results of addition, subtraction, multiplication, and division, using shortcuts when multiplying and dividing, how to factor, find prime factors, and least common multiples. It also covers how to interpret circle graphs and solve advanced word problems.

Fractions, Percents, Proportions, and Angles (ICS) 8

This unit covers the terms: fraction, proper fraction, improper fraction, lowest common denominator, percent, ratio, and proportion, explains how to add, subtract, multiply, and divide fractions and decimals. Covers changing fractions to decimals, decimals to fractions, solve problems involving percent. Explains how to use a protractor to measure angles, lay out templates for checking angles, and how to use a calculator to solve percent problems and to convert fractions to decimals.

Intro to Algebra (ICS) 10

This unit covers terms: term, constant, coefficient, exponent, monomial, trinomial, and polynomial. Explains how to identify and combine like terms in an expression, Multiply and divide terms containing exponents, remove parentheses from an expression and simplify the expression and how to perform basic arithmetic operations with signed terms.

Practical Trigonometry (ICS) 10

This unit covers trigonometric functions and uses a calculator to perform them, the use of trigonometric tables, how to solve right triangles for angular and side dimensions and how to apply the laws of sines and cosines in solving oblique triangles.

Handbook to Electricity Metering (Chapter 1 & 2) 4

This section is an introduction to electric metering, covers the responsibilities and knowledge a Metering Electrician will have and covers key terms and definitions that will be used throughout the apprenticeship.

Total= 82 Hours

Second Six Months-

Math for Metering 2 (NUS) 6

Math for Metering 2 explains how sine waves can be drawn as X-Y graphs, and how they can be represented as phasors and phasor diagrams. It explains the relationships between the sides of right triangles, and how right triangles can be used to represent voltage, current, and power factor to solve metering problems.

Nature of Electricity (ICS) 8

This unit explains the operation of a simple circuit. Defines the terms: conductor, insulator, and resistor. Demonstrates that unlike charges attract and like charges repel. Lists the dangers and benefits of static electricity. Defines the terms: volt, ampere, and ohm. Describes common notations and prefixes used to identify electrical and electronic values. Identifies carbon resistors,

potentiometers, and rheostats, and explains how they work. Identify the common electrical symbols used in schematic diagrams. Explains the difference between a series and parallel circuit.

Circuit Analysis and OHM's Law (ICS) 10

This unit covers how to find the total resistance in series, parallel, and series-parallel circuits. How to use Ohm's law to calculate the current, voltage, or resistance in circuits. Calculate the amount of power supplied and dissipated in a DC circuit. List the steps for finding current, voltage, and resistance with a digital or analog meter.

Capacitors and Inductors (ISC) 10

This unit the student will learn how to explain how a capacitor holds a charge. Describe common types of capacitors. Identify common capacitor ratings. Calculate the total capacitance of a circuit containing capacitors in series or in parallel. Calculate the time constant of a resistance-capacitance or RC circuit. Explain how inductors are constructed. Describe the system used to rate inductors. Describe how an inductor regulates the flow of current in a DC circuit. Calculate the total inductance of series or parallel connected inductors. Calculate the time constant for a resistance-inductance or RL circuit.

Magnetism and Electromagnetism (ICS) 8

This unit the student will learn how to identify the north and south poles of permanent magnets and electromagnets. Name magnetic and nonmagnetic materials. Describe how to magnetize a piece of steel by induction. Explain the difference between simple, compound, and closed magnetic circuits. Locate the direction of magnetic lines of force around a conductor (if the direction of current is known). Use the right-hand rule to locate the poles of a solenoid. Describe the operation of simple electromagnetic relays, buzzers, and stepping switches. Explain how a DC motor operates. Give a simplified explanation for generator action and motor action with electromagnetic induction.

Conductors, Insulators, and Batteries (ICS) 8

This unit the student will learn how to describe the various types of conductors and discuss their conductivity. Explain the American Wire Gage System of sizing copper conductors. Determine the size of conductor needed for an application. Identify the various types of insulating materials and their temperature ratings. Explain the difference between a dry cell and a storage battery. How to connect cells together to obtain more voltage, more current, or more of both voltage and current.

Describe the proper safety precautions used when working with storage batteries. Describe how to properly clean and care for storage batteries. Discuss the instruments used for testing storage batteries. Explain how NiCad, lithium, and other types of special batteries operate, and describe their ratings.

DC Motors and Generator Theory (ICS) 8

This unit the student will learn how to identify a series-, shunt-, and compound-wound motor and discuss their application. Explain how a permanent-magnet and stepper motor operate. List the steps to reversing a DC motor's direction. Discuss how the speed of a DC motor can be controlled. Explain the basic principle for generating a direct current. Name the factors that affect the strength of the induced voltage. Describe the purpose of a commutator and brush assembly. Discuss the difference between the field connections of series-, shunt-, and compound-wound machines. Give the reason for shifting brushes. Discuss the use of commutating poles and compensating windings for better generator operation. List the various types of machine losses.

Alternating Current (ICS) 8

This unit the student will learn how to draw a graph of an AC voltage and describe how AC voltage is created. Explain AC cycle terms: "alternation," "peak," "positive," and "negative." Define the time-period of an AC voltage as expressed in degrees. List the characteristic values of an AC cycle and describe the relationship between values. Define phase angle and describe how it relates to reactive circuits. Calculate power for single-phase and three-phase circuits. Describe how a 240 VAC single-phase circuit operates. Illustrate the phase relationship of three-phase wave forms. Determine real power by reading a power factor meter. Describe delta and wye three-phase circuit connections.

Alternating Current Circuits (ICS) 8

This unit the student will learn how to identify electric circuits in terms of their circuit characteristics. List several circuit characteristics that are used to describe a circuit for a particular load application. Connect electrical components in series and parallel circuits. Control loads from one or two switch points. Describe how delta- and wye-connected three phase circuits are different. Explain how grounding a circuit increases its safety. Recognize the difference between control circuits and power circuits.

Total= 74 Hours

1st year Total: 156 Hours

Third Six Months-

Inductors in AC Circuits (ICS) 8

This unit the student will learn how to explain how an inductor is made and how it operates in a DC and AC circuit. Describe inductive reactance and impedance, and how AC frequency affects inductance. Use Ohm's law in an AC circuit that includes an inductor. Calculate the impedance of a series RL circuit. Calculate the impedance of a parallel RL circuit.

Capacitors in AC Circuits (ICS) 8

This unit the student will learn; how to describe how a capacitor stores a charge and how series connected, and parallel connected capacitance values are calculated. Discuss capacitive reactance and use Ohm's Law in AC circuits that contain a capacitor. Calculate the impedance of a series RC circuit. Explain how changing the frequency of an AC signal changes capacitive reactance.

Transformers (ICS) 8

This unit the student will learn; what the main components of a transformer are. Tell how mutual inductance makes it possible to change an AC voltage from one value to another when using a transformer. Determine the turns ratio of a transformer when the primary and secondary voltages are known. Calculate primary or secondary voltages or current when either one of these and the turns ratio are known. Explain why transformers are laminated. Connect three single-phase transformers for three-phase operation. Calculate line current (if phase current is known) in delta-connected transformers. Explain the operating principles of an auto transformer.

Alternators (ICS) 8

This unit the student will learn; how single- and three-phase alternators operate. List and describe the major components of an alternator. Discuss alternator ratings in terms of power, voltage, speed, and temperature. State the steps required for starting, stopping, and operating alternators. Describe the similarities and differences of the three main types of alternators.

Electrical Energy Distribution (ICS) 10

This study unit explains the difference between feeder and branch circuits. Describe the different types of systems available for distributing power within a plant. Recognize and identify utilization equipment. Discuss the use of transformers in energy distribution. Identify by name and describe the uses of various types of raceways. Distinguish between panel boards and switchboards. Describe the electrical system of a power utility. Describe how electricity is generated at a power station or utility.

Self-Contained Meters, Constants, Internal Wiring and Socket Checks (Internal) 40

(HITT Reference Book, Meter Manuals, Pocket Guide to Electric Metering)

The apprentices will learn; How the meter is internally wired, the service types, service equipment and socket checks for new sets and exchanges associated with self-contain meters. How to read the meter and calculate instantaneous usage. The apprentice should be familiar with 1s, 2s,12s Network, 12s Delta, 15s, and 16s meters at the end of this section.

Troubleshooting Techniques (NUS) 6

This study unit covers how to troubleshoot meters which have been reported to be giving inaccurate readings. It describes how successive investigative steps can identify and resolve these problems, at the meter installation.

Net Metering (Internal) 10

This unit covers PV and ESD installations and the metering requirements associated with them. The apprentice will learn the differences in residential system designs: AC coupled, DC coupled and combined installations and how to read associated one-line drawings. They will learn to calculate received, delivered and net energy values and discuss ways of explaining how systems work for customers' billing.

Customer Relations and High Bill Complaints (NUS) 6

This unit examines common situations encountered when dealing with customer complaints (usually related to high bills). Emphasis is placed on communication techniques used during problem resolution and on common causes of a bill being higher than normal. Typical high bill complaints are used as examples and attention is focused on how to leave the customer satisfied.

Total= 104 Hours

Fourth Six Months-

Energy Diversion (NUS) 6

This unit examines methods that residential and commercial customers have used to steal electrical service. The unit starts with some basic techniques and moves on to more complex forms of diversion that might go undetected without close examination. Emphasis is on detection techniques and verification procedures.

Basic Test Equipment (ICS) 8

This unit covers how to use the multimeter (also known as a volt-ohm-milliammeter or VOM). Define the terms voltage, current and resistance, and explain their relationship in a circuit. Discuss how voltage, current and resistance is measured with a multimeter. Identify the schematic symbols used to represent various reactive devices. Describe the major features of analog and digital VOMs. Explain how to use both analog and digital VOMs to measure voltage, resistance and current in a circuit. Learn about the special probes used with a digital VOM. Discuss the important safety precautions you must take when using a multimeter.

Working with Multimeters (ICS) 10

Students will be able to: Define the terms voltage, current and resistance, and explain their relationship in a circuit. Discuss how voltage, current and resistance are measured with a multimeter. Discuss some of the most important safety precautions to take when working with a multimeter. Describe the purpose of a continuity test. Perform tests for short circuits. Perform resistance tests on resistors, switches and transformers. Measure current by using a direct series connection. Measure the output voltage of a DC power supply.

Using Electrical Test Equipment (NUS) 6

This unit explains the purpose and operation of voltage testers, multimeters, clamp-on ammeters, and megohmmeters to measure current, voltage, and resistance. Safety precautions are emphasized throughout. Demonstrates how to perform voltage, current, and resistance measurements using the test equipment discussed.

Instrument-Rated Meters, Constants, Internal Wiring and Socket Checks (Internal) 40

(HITT Reference Book, Meter Manuals, Pocket Guide to Electric Metering)

The apprentices will learn; How the meter is internally wired, the service types, service equipment and installation checks for new sets and exchanges associated with these meters. How to read the meter and calculate instantaneous usage. How to perform Inservice Check and field tests. The apprentice should be familiar with 3s, 4s, 5s, 6s, 8s, and 9s meters at the end of this section.

Installation Checks and Inspections (NUS) 6

This unit covers: How to use common test equipment to verify the correct wiring of a meter installation. Describes how to check circuit continuity on a meter installation with a connected customer load. How to check the accuracy and balance of a polyphase, transformer-rated meter installation.

Polyphase Systems 1 (NUS) 6

This unit explains what polyphase systems are, and the differences between wye and delta systems. Illustrates various transformer bank connections using phasor diagrams. Shows examples of polyphase transformer banks and their external connections.

Polyphase Systems 2 (NUS) 6

Polyphase Systems 2 discusses when and where various meters are used. Blondel's theorem is introduced and used to show how a polyphase system is accurately metered. Explains how balanced and unbalanced polyphase systems are metered.

Transformer Operation (ICS) 10

This unit covers Calculations Pertaining to Transformer Operation; Phasor Diagrams; Equivalent Circuits; Losses; Efficiency; Three-Phase Transformer Connections; Harmonic Currents and Voltages; Parallel Operation of Transformers; Phase Transformation; Regulation of Voltage with Tap Changers and Separate Units; Operation of Autotransformers and Three- Winding Transformers; Testing of Transformers.

Total= 98 Hours

2nd Year Total: 202 Hours

Fifth Six Months-

Instrument Transformers (ICS) 10

This unit covers Fundamentals of Current and Potential Transformers; Types of Instrument Transformers; Instrument Transformer Construction Standards, such as Ratings and Insulation Classes; Instrument Transformer Performance Standards as to Burden, Accuracy, and Correction Factors; Practical Application of Instrument Transformers regarding Grounding, Rating, Connections, and Burden; Polarity and Accuracy Testing of Instrument Transformers Utilizing Various Methods and Procedures.

Polyphase Transformer Rated Applications (NUS) 6

This unit examines transformer-rated installations and discusses where and why instrument transformers are used. Instrument transformer basics are reviewed, their polyphase connections are shown, and common polyphase transformer-rated installations are examined. Installation procedures are discussed, with close attention to transformer polarity markings. Explains how to size, select, and verify in the field, correct CTs and VTs for a given job.

Principles of Accuracy Testing (NUS) 6

This unit details the basic theory and principles of watthour meter accuracy testing. Covers typical test equipment and how that test equipment is connected to simulate in-service operating conditions for accuracy testing. Describes how to interpret test results. Shows test connection diagrams for typical watthour meters.

Polyphase Transformer Rated Meter Testing (NUS) 6

This study unit demonstrates field tests to verify the accuracy of four-wire transformer-rated meters. Demonstrates how to isolate the meter and make test connections to a test switch. It also shows how to calibrate a typical polyphase four-wire transformer-rated meter.

Demand Meter Concepts (NUS) 6

This study unit discusses the need for demand metering and basic demand metering concepts. Shows examples of power demand by various types of customers. Examines mechanical, thermal,

and solid-state types of demand registers and explains the principles of demand registration for each type.

Conservation and Load Management (NVE) 3

Defines what conservation and load management are and the purpose of their implementation. Covers typical programs used with an emphasis on how they relate to electric metering. Time-of-use, load management systems and associated devices are discussed. Including isolation relay installations.

Reactive Metering Concepts (NUS) 6

This study unit uses the power triangle to illustrate the relationships between active power, apparent power, and reactive power. The concept of metering reactive power is explained. Explains how a phase-shifting device can be used to produce the phase relationships needed to meter reactive power with conventional kWh meters.

Power Quality (NUS) 6

This study unit describes what power quality is, discusses basic power quality issues and how they affect customers, and looks at what a utility can do to solve power quality problems. Covers installation of PMI, Eagle and Revolution power monitoring equipment.

Totalizing (NVE) 3

This class describes totalized billing and examines the effects for customers when this billing method is applied. Introduces common totalizing practices and equipment used.

Electric Power Measurements A (ICS) 10

This study unit examines Components of Watthour Meters; Current, Voltage, and Power in AC Circuits; Types of Circuits and Their Measurements; Adjustments and Compensation of Meters; Use of Current and Potential Transformers; Register Constants and Multipliers; Meter Mountings and Service Connection Diagrams.

Electric Power Measurements B (ICS) 10

This study unit examines Watthour Meter Testing and Adjustments; Types of Testing; Testing Methods; Demand Metering; Mechanical Demand Registers; Pulse Devices; Thermal Watt Demand Meters; Measurement of Reactive Power and Apparent Power; Nonsinusoidal Waveforms; Control of Resistance Loads by SCRS; Waveform Analysis, Effect of Nonsinusoidal Waveforms on Measurements.

Total= 72 Hours

Sixth Six Months-

Service Installations (NUS) 6

This study unit explains how to make single-phase and three-phase service connections. It demonstrates how to make residential service connections from underground and from overhead services. Also shows how to make three-phase connections, how to install a parallel service, and how to replace a three-phase service without interrupting the customer.

Transformer School (NVE Lines) 40

This course is designed to expand the apprentice's knowledge of transformer operation. The apprentice will learn the companies' standard applications for transformer hookups, how to parallel connections, how primary connections affect secondary connections.

Transmission (NUS) 6

This study unit describes the purpose of the transmission portion of a T&D system. It describes the key components of a transmission line: conductors, insulators, and structures. Covers the basic tasks involved in constructing and inspecting a transmission line.

Distribution (NUS) 6

This study unit describes how distribution systems are laid out, and their component parts. It shows how to recognize transformers, voltage regulators, and capacitors, and explains in general terms how each works. It introduces the process of sectionalizing and demonstrates how protective devices protect the system from damage, and its customers from outages.

Local Distribution of Electrical Power (ICS) 10

This study unit covers Characteristics of Electric Loads; Primary Distribution Circuits; Distribution Transformers; Secondary Distribution Circuits; Voltage Regulation; Protection Provided by Circuit Breakers; Primary Fuse Cutouts; Secondary Fuses; Lightning Arresters; Construction of Overhead Distribution Lines; Construction of Poles; Conductors; Splices; Guys; Cost Consideration; Economical Design.

System Protection and Monitoring (NUS) 6

This study unit explains the principles of protection and monitoring in a transmission and distribution system. It explains the role of protective devices, system grounds, and monitoring and control equipment. Techniques for installing or replacing ground rods, arresters, and fuse links are presented. It also describes how monitoring and control equipment is typically used in a transmission and distribution system.

Relays 1 (NUS) 6

This study unit explains the basic principles of protective relays and introduces directional and non-directional relays. It begins with the basic theory of protective relays, commonly used types of relays, and a brief explanation of how these relays are used.

Total= 80 Hours

3rd Year total: 152 Hours

Seventh Six Months-

Telemetering (ICS) 10

This study unit covers definitions and classifications of telemetering including analog, frequency, impulse and digital telemetering systems. It also covers transmission of data signals, telemetering channels, computations and the use of telemetering in control and electric power systems.

Switchgear (ICS) 10

This study unit covers how to identify equipment used to safely monitor and control electrical power, understand how different types of circuit breakers interrupt electrical current, interpret diagrams that describe the flow of electrical power through a grid system, interpret ratings, explain the operating principles, and how to identify the component parts of various types of switchgear. How to maintain electrical distribution equipment and use SCADA and other types of digital communications to control power distribution.

Reading Electrical Schematics (ICS) 10

Students Learn: Electrical Diagrams; Meaning of Schematic Diagrams; Schematic Diagrams of Basic Electric Equipment and Connections, such as Types of Circuits; Sources of DC Power; Sources of AC Power; Transformers; Rectifiers; Motors; Measuring Devices; Protection and Control Devices; Schematic Diagrams of Lighting Circuits and Various Types of Motor Control Circuits; Typical Schematics Used in Generating Systems, Transmission Systems, and Distribution Systems.

Electrical Blueprint Reading (ICS) 10

Students Learn: In this study unit, you'll learn to read several different types of electrical blueprints. Reading and understanding the information that appears on a blueprint will be emphasized, not the design details of a particular project. Engineers and designers use blueprints to present design information in a variety of ways. The general principles for preparing blueprints will also be covered. The skills you learn can be applied to reading blueprints for residential, commercial, manufacturing, and electric utility projects.

Advanced Metering (Meter Trade School) 40

This gives the apprentice an opportunity to see and discuss advanced metering applications with other utilities, emphasis on metering for Generation and Transmission of electrical power.

Chapters 5-8 (Handbook for Electricity Metering 12

(Solid State Electronics, Service Switch, Communications, The Smart Grid)

Total= 92 Hours

Eight Six Month-

NV Energy Standards/Rules 20

(RPI-G, RPI-2, RPI-4, RPI-15, RPM-, RE-3, Tariffs)

This section is designed to solidify knowledge on up-to-date company standards and rules for electric service. Once complete, the apprentice should have a clear understanding of their role in applying and inspecting these standards.

Advanced Electrical Safety (ICS) 10

Review of electrical safety hazards and practices. First Aide and fire hazards. Grounding, hazardous location and safety clearances. Arc flash and blast hazard review and lockout and tagout review.

Review (Top Out Test) 30

Total= 60 Hours

4th Year Total: 152 Hours

Program Total= 662 Hours