UNIT ONE- Basic Math and Electricity

1. Electrical System Components
2. The Distribution System
3. Basic Mathematics
4. Electrical Circuits
5. Trigonometry and Vectors

This is the first of three self study modules. Students will receive a hard-copy workbook and test online at their own pace. This module is made up of 5 lessons covering the needed basics of math and electricity.

UNIT TWO - Fundamentals of Alternating Current

1. Alternating Current and Circuits Containing Resistance
2. Inductance in Alternating Current Circuits and Resistance and Impedance in Series Circuits
3. Capacitors are not only fun, they're Important Too!
5. AC Parallel Circuits and Series-Parallel Circuits
6. Three Phase Systems
7. AC Instruments and Meters
8. Alternating Current Generators
9. Transformers
10. Transformer Connections and Special Applications

This is the second of three self study modules. Students will receive a hard-copy workbook and test online at their own pace. This module is made up of 10 lessons covering the needed fundamentals of alternating currents.

UNIT THREE- Substation Operation and Maintenance

1. Substations and Switchyards
2. Safety in Substations and Switchyards
3. Power Transformers
4. Circuit Breakers
5. Relaying and Substation Infrastructure

This substation mechanical maintenance specialist course will cover in detail typical maintenance tasks needed to keep substation equipment healthy, maximize lifespan, and minimize failures. Some examination of typical preventative maintenance programs including transformer oil testing, temperature maintenance of transformers, circuit breaker mechanisms, characteristics of gas insulated switchgear and electrical busses. There will be a data application section that shows how various types of substation data can be used to predict failures so costly failures are avoided and reliability of the grid is increased.
LAB A Introductory - 3 Days

DC Circuits Review
AC Circuits Review
Electrical Measurements Equipment
Electrical Measurements
P-Polyphase Vectors
Power:
  Real Power
  Reactive Power
  Apparent Power
  Power Factor
Phase Sequence
Three Phase Connections
Lab Exercises:
  Phase Sequence Determination
  Three Phase Connections
  Phase Angle Determinations
LAB B Advanced - 5 Days

Insulation
Laboratory Training Exercises:
   Insulation Resistance Tests
   Power Factor Tests
   Dielectric Strength Tests

Transformers
Transformer Testing:
   Winding Resistance
   Insulation Resistance
   Polarity
   Insulation Power Factor
   Transformer Turns Ratio
   Combustible Gas
   Safety Factors

Tests on a Power Transformer

Circuit Breakers
Circuit Breaker Tests:
   Insulation Resistance
   Power Factor Testing
   Timing
   Contact Resistance
   Safety Factors

Tests on an Oil Circuit Breaker

Stand-By Batteries
Demonstration on Batteries

Lightening Arrestors

Substation Maintenance Safety Techniques

Substation Drawings:
   Substation Standard Device Numbers
   Substation Standard Device Symbols
   Single Line Diagram
   Three Line Diagram
   Schematic Diagram
   Wiring Diagrams

Training Exercise:
   Relay Logic Circuits
   Substation Drawing Exercise