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Electrical Power System Training - Analysis, Coordination, System Studies

Contact us Today for a FREE quotation to deliver this course at your company's location.

https://www.electricityforum.com/onsite-training-rfq

Our 24-hour (4 Days) Power System Engineering Course is actually a series of three power system analysis, protection coordination and modeling and calculations courses, which is designed to help both junior and experienced electrical engineers understand electrical power systems as they apply to industrial, commercial and institutional buildings and facilities that are production-oriented. This course will address issues such as short circuit studies, voltage drop calculations, electrical equipment ratings and selection criteria, and power systems grounding. **NOTE: Course Includes FULL Demo Power System Analysis Software License.**

Course #1 - Power System Analysis And Design

Power System Analysis And Design starts with sound design. A proper functioning electric power distribution system is vital to safety, maintenance, troubleshooting and the efficient operation of a modern industrial plant. The power distribution system includes high voltage utility tie circuit breakers, main transformers, medium voltage switchgear, distribution

transformers, motor control centers, electric motors, variable speed drives, etc. This course is designed to address all aspects of industrial power distribution systems, including system planning, equipment selection, specification and application, system grounding, protection and conformity with electrical code requirements, etc. Typical one-line and relaying diagrams will be discussed for various applications.

The Power System Design part of the course Will Teach Students How To:

- Identify And Correct Electrical Problems Related To Over And Undervoltage
- Describe Proper Voltage Requirements To Ensure Appropriate Utilization Of Plant Equipment
- Perform Per-Unit Calculations
- Define Short Circuit Calculations And Methods
- Develop The Procedures For Selecting Medium Voltage NEMA Class E2 Motor Starters

Course #2 - Power System Protection And Coordination

The Power System Protection And Coordination section of the course will provide a practical and comprehensive description of the principles and concepts of analysis, application and operation of protection schemes for various power system elements such as feeders, transformers, motors, buses, generators, etc. The Power Systems Coordination course makes extensive use of in-class curve drawing exercises and actual case histories to familiarize trainees with the art of power systems coordination. Selection of time/current characteristics, protection, selectivity and deriving protective device settings consistent with National Electric Code and ANSI Standard requirements are emphasized in this course. This course covers the subject of power system protection from a practical perspective, and includes important functional aspects such as testing and coordination of protection systems. This course is designed for individuals who are involved with industries and utilities which depend on proper system protection for operational efficiency and minimizing damage to equipment.

The Power System Protection And Coordination Engineering Training Course:

- Will Reduce Unnecessary Downtime!
- Provide Recommended Settings For Adjustable Trip Circuit Breakers And Relays.
- Will Increase Coordination (Selectivity) Between Devices.
- Identifiy Deficiencies In System Protection.
- Will Provide Recommended Solutions To Help Correct Your Problem Areas.
- Reviews And Discusions On The Use Of System Devices With Respect To National Electric Code Requirements, And Appropriate ANSI/IEEE Standards

Course #3 - Power System Modeling and Calculations

Our Power System Modeling and Calculations engineering course will provide students with an in-depth review of fault analysis problems in industrial, commercial and institutional power systems and provide the means for solving such problems, and discusses the impact of short-circuit fault currents on equipment selection. The course also highlights the differences in the computational approaches recommended in IEEE and IEC standards. A commercially available software program for performing fault analysis will be used by the presenter to solve example problems.

The Power System Modeling and Calculations Training course will analyze all aspects related to the:

- Electrical Power Flow During Normal Operation
- Optimization Of Electrical Power Flow And Sizing
- Electrical Power Flow During Abnormal Operation, As Described Below.
- Transients Status Of The Electric Power System
- Dynamic Loads Behavior And How They Affect The Power System
- Special Investigation Of The Electromagnetic Field
- Harmonics Generated Into The Power System Caused By Switching Or None Linear Magnetic Core Saturation
- Special Case Of Resonance Or Traveler Waves In Correlation To The Grounding

System

These three Electrical Engineering Courses will demonstrate electrical engineering software Simulation and Calculations engineering course will provide students with an in-depth review of fault analysis problems in industrial, commercial and institutional power systems and provide the means for solving such problems, and discusses the impact of short-circuit fault currents on equipment selection.

WHO SHOULD ATTEND

This Power System Analysis, Protection Coordination and Modeling and Calculations course is designed for utility, industrial, commercial and institutional power system electrical engineering personnel, electrical consulting engineers, as well as electrical design engineers, who are responsible for the reliable design, engineering and operation and of industrial, commercial and insitutional electric power distribution systems. Plant, facility, and corporate electrical engineers dealing with one or more company distribution systems and consulting and utility engineers dealing with clients' systems. Consultants, architect-engineers will also find this course very beneficial.

COURSE OUTLINE

DAY ONE

1: POWER SYSTEM FUNDAMENTALS

- Three-Phase Vs. Single-Phase Systems
- Balanced Three-Phase Loads
- Unbalanced Three-Phase Loads
- Effects Of Frequency, Single And Three-Phase Balanced Loads And Unbalanced Power Loads

- 3 Group Exercises

2: SYSTEM DESIGN CONSIDERATIONS

- Analytical Approach Of A Power System Design
- Standards And Codes
- Major Loads
- Spare Capacity And Calculations
- Static And Dynamic Loads, E.G. Electrical Motors
- Separating Static And Dynamic Loads
- Major Equipment And Components
- Design Requirements
- Design Considerations
- Configuration Options

3: POWER SYSTEM SUBSTATION CONFIGURATION

- Functions Of A Substation, Design Considerations, Radial, Loop, And Selective Systems, And One-Line Diagrams.

4. VOLTAGE CONSIDERATIONS

- System Voltage Classes And Terminology, And Transformers Connections And Voltage Regulation.
- Effects Of Voltage Variation And Motor Voltage Unbalance.
- 2 Group Exercises

5. MODELING AN ELECTRICAL SYSTEM

- Modeling Methods, One-Line Diagram, Data Collection And Modeling.

- EasyPower Software Demonstration And 1 Group Exercise

DAY TWO

1. LINE AND MOTOR STARTING VOLTAGE DROP CALCULATIONS

- Factors Affecting Voltage Drop, Voltage Drop Formulas And Calculations Procedures.
- Effects On Plant Equipment And Methods Of Motor Starting.
- EasyPower Software Demonstration And 6 Group Exercises

2. POWER FACTOR CORRECTION

- Power Factor Fundamentals, Power Factor Correction Sources, Benefits Of Power Factor Correction, Capacitor Bank Locations, And Capacitor Bank Concerns.
- Capacitor Ratings And Power Factor Correction Calculation Procedures.
- EasyPower Software Demonstration And 2 Group Exercises

3. SHORT CIRCUIT STUDIES

- Terminology And Theory
- Types Of Faults
- Symmetrical And Asymmetrical Currents
- Balanced Fault Calculations
- Purposes Of Fault Calculations, Effects Of Short Circuits, Fault Current Sources, Machine Reactance Modeling, And Fault Current Characteristics.
- Types Of Faults/Magnitudes And Fault Calculation Procedures.
- EasyPower Software Demonstration And 2 Group Exercises

DAY THREE

1. LOW VOLTAGE EQUIPMENT RATINGS AND SELECTION

- Introduction, Low Voltage Fuses, And Molded Case Circuit Breakers.
- Busway And Conductors.
- EasyPower Software Demonstration And 6 Group Exercises

2. SWITCHGEAR RATINGS AND SELECTION CRITERIA

- Introduction And Low Voltage Power Circuit Breakers.
- Power Fuses, Load Interrupters, And Medium Voltage Power Circuit Breakers.
- EasyPower Software Demonstration And 3 Group Exercises

3. OVERCURRENT COORDINATION FUNDAMENTALS

- General Procedures, Data Requirements.
- EasyPower Software Demonstration And 2 Group Exercises On Coordination Scaling Factors. (2)

4. FUSE CHARACTERISTICS

- Low Voltage Fuse Characteristics.
- Power Fuse Characteristics.
- EasyPower Software Demonstration And Exercises On Plotting Fuse TCC Curves. (3)

5. LOW VOLTAGE CIRCUIT BREAKER CHARACTERISTICS

- Molded Case Circuit Breaker (MCCB) Characteristics.
- Low Voltage Power Circuit Breaker (LVPCB) Characteristics.
- EasyPower Software Demonstration And 1 Group Exercise On Plotting Electronic Trip Unit TCC Curves.
- EasyPower Software Demonstration And 1 Group Exercise On Plotting MCCB TCC Curves.

6. TIME OVERCURRENT RELAY CHARACTERISTICS

- Theory Of Operation And Relay Characteristics.
- Time/Current Coordination Intervals, Instantaneous Relay Trip Settings, Relay Coordination.
- EasyPower Software Demonstration And 2 Group Exercises On Plotting Relay TCC Curves.

7. CONDUCTOR AND BUS SELECTION & PROTECTION

- Low Voltage And Medium Voltage Conductor Protection Fundamentals.
- Cable Damage Criteria
- Low And Medium Voltage
- Tie Line Protection
- EasyPower Software Demonstration And 2 Group Exercises On Conductor Protection.
- EasyPower Software Demonstration And 1 Group Exercise On Tie Line Protection.

8. TRANSFORMER SELECTION & PROTECTION

- Transformer Protection
- Overload Protection
- Phase And Ground Fault Protection
- Primary Fuse Protection
- Primary Breaker Protection

- Transformer Protection Characteristics, Transformer Data, And Basic Transformer Protection.
- Factors Affecting Transformer Protection.
- EasyPower Software Demonstration And 2 Group Exercises On Transformer Protection

DAY FOUR

1. AC INDUCTION MOTOR SELECTION & PROTECTION

- NEC And ANSI/IEEE Standards
- Motor TCC Curves
- MCP Low Voltage Protection
- NEMA Class E2 Controllers
- Thermal Overload Protection
- Thermal Locked Rotor Protection
- Phase And Ground Fault Protection
- Miscellaneous Protection (Undervoltage, Single-Phasing, Etc.)
- Industry Motor Standards, Motor Nameplates
- ANSI/IEEE Device Numbers And Functions
- Motor TCC Curves
- Medium Voltage Motor Protection.
- EasyPower Software Demonstration And 2 Group Exercises On Motor Protection

2. ARC FLASH STUDIES AND SOFTWARE SIMULATION

- IEEE 1584 Versus NFPA 70E
- Bolted Fault Versus Arching Fault
- Example Of An ARC Flash Calculation, With Different Scenarios
- Interpretation Of The Results Of The ARC Flash Calculations
- Active And Passive Methods Of Determining ARC Flash Mitigation

3: TOOLS FOR SELECTION AND CONFIGURATION

- Available Power System Design Software:
- Category, Classification And Level Of Trust
- Requirements Of The Software Design Tool
- Standards Incorporated In Software Tool
- Data Validation For Modeling A Power System
- Output Validation Of A Simulation Using Software Tools

4: OTHER STUDIES AND SOFTWARE SIMULATIONS AVAILABLE

- Ground Grid Modeling
- Transient Stability Analysis
- Harmonics Analysis
- Optimal Capacitor Placement
- Switching Management
- Reliability Studies

COURSE TIMETABLE:

All days:
Start: 8:00 a.m.
Coffee Break: 10:00 a.m.
Lunch: 12:00 noon (included with course)
Restart: 1:15 p.m.
Finish: 4:30 p.m.

Contact us Today for a FREE quotation to deliver this course at your company’s location.

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