Training Program:

Fundamentals of Electrical Power System

Introduction:

The aim of this course is on the building blocks of electrical engineering, the fundamentals of electrical design and integrating electrical engineering into the other disciplines within an organization. The course will start by reviewing basic electrical circuits and electrical laws. The candidates will be exposed to the basic principles of electrical generation, transmission and distribution. The interesting area of electrical measurements as applied to single phase and three phase systems will then be reviewed. The candidates will be exposed to earthing with a strong focus on safety issues. Transformers will then be examined with an emphasis on power transformers as used in the electrical distribution industry. Topics such as power system components in terms of isolators, fuses and circuit breakers will also be covered.

Who Should Attend?

Electrical contractors, new electrical engineers and technicians, non-electrical engineers and technicians, non-electrical personnel who want to understand the broader picture, plant and facility engineers, administration staff, civil, mechanical, chemical, mining engineers, technologists and technicians

Course Objectives:

By the end of this course delegates will be able to:

- The basics of electrical power engineering
- Basic electrical design rules
- Practical steps in selection, installation and commissioning of electrical systems
- How to work more effectively with electrical engineering professionals

- How to apply the local electrical codes effectively
- The role that electrical power plays within your organization

Accreditation:

BTS attendance certificate will be issued to all attendees completing a minimum of 80% of the total course duration.

Course Outline

Overview of the Electric Power Systems

- Units and electrical quantities, Voltage, current, resistance, power, energy, frequency
- Inductance and capacitance, Ohmâ€™s law, RMS and average values
- Single and three phase systems, Power factor

Electrical Generation, Transmission & Distribution

- Various forms of energy, Energy conversion, Modern power station, Coal-fired power plant
- Hydro and nuclear, Impact on environment, Solar, wind, geothermal
- Transmission of electricity, Distribution, Power demand and tariffs, Power factor, HVDC

Electrical Distribution

- Power source, Typical electrical power system, Electrical distribution systems
- Substations, Step down transmission, Distribution substation
- Distribution feeder circuits, Switches and circuit breakers
- Industrial and residential customers, Types: radial, loop, network
- Network reliability, Power transformers and distribution boards

Electrical Measurements & Applications

- Electrical parameters â€“ W/VA/VAr, Measuring, Power and energy measurement
- Smart metering, Measuring voltages, currents and resistance

Earthing

- Need for earthing, Direct and indirect shocks, Touch and step potential
- Types of earthing, System and protective earthing, Isolation
- Earth conductors and electrodes, Measurement of earth resistance
- Lightning protection, Bonding connection

Transformers

- Magnetic fields, Electromagnetic fields, Transformer operation, Step down and step up
- Construction, Single and polyphase transformers, Cooling, Oils and coolants
- Efficiency, Tap changers, Voltage regulation, Earthing of transformers

Isolators, Fuses and Circuit Breakers

- Isolation, Electrical faults, Fuses, Isolation, switching, tripping, Circuit breakers
- Components of circuit breakers, Medium voltage circuit breakers

Electrical Rotating Machines â€“ AC & DC

- Basic principles, Machines, DC motor operation, Speed, flux and armature voltage
- Speed control, Single phase AC motors, 3-phase induction motor
- Synchronous machines, Torque versus speed, Efficiency and power factor

Electrical Lighting & Illumination

- Incandescent lamps, High intensity discharge lamps, Mercury vapour
- Metal halide lamps, Fluorescent lamps, Compact fluorescent lamps
- LEDs, Luminaire concepts, Energy efficiency

Electrical Heating in Industry

- Principles of heating, Electrical heating, Resistance heating
- Welding, Electric arc furnaces, Induction heating

Power Electronics & Applications

- Semi conductor devices, Motor controllers, Rectifiers

- AC motors and soft starting, Variable speed drives

Power Quality

- Power quality problems, Voltage variations, Overvoltage and undervoltages
- Voltage imbalances, Voltage and frequency variations
- Interruptions and surges, Lightning and harmonics, Harmonic compensation

Power Systems Protection

- Incipient and solid faults, Need for protection, Overloads, Overvoltage and overcurrent
- Fuses, circuit breakers, Relays, Protection of equipment

Electrical Safety & National Electrical Codes

The Electrical Engineer/Technologist/Technician

Load Forecasting, Planning & Project Evaluation