International Research, Education and Training Center NGO (R/C 80550594)
Rahvusvaheline teadus-, haridus- ja koolituskeskus MTÜ
Non-Profit Organization / Mittetulundusühing

TRAINING PROGRAM

FOR ELECTRICAL AND ELECTRONIC ENGINEERING

EHVE-ELECTRICAL HIGH VOLTAGE ENGINEERING-01
EMVE-ELECTRICAL MEDIUM VOLTAGE ENGINEERING-02
ELVE-ELECTRICAL LOW VOLTAGE ENGINEERING-03

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01010 Electrical Circuits Fundamentals

Course Description

The Fundamentals of Electric Circuits course provides the participants with an understanding of the concepts and techniques in the characterization of electrical circuits and their components. This course introduces the participants to the basic concepts of current, voltage, power, electromagnetism, basic lows and theorems for the analysis of electric circuits. Pulse-response and resonance are also covered.

Course Objectives

Understanding fundamental circuit analysis techniques
Being familiar with circuit equivalence and modeling
Being able to develop physical insight and intuition for problem solving
Learning how to different simulators

Who Should Attend?

- ✓ Maintenance supervisors
- ✓ Plant engineers
- ✓ Electricians
- ✓ Plant mechanics
- ✓ Service technicians
- ✓ Contractors
- ✓ Energy auditors
- ✓ Layout professionals

Course Details/Schedule

Day 1

- Units and notation, basic electric quantities
- Electric signals and circuits
- Kirchhoff's laws
- Circuit elements and sources
- Resistance, series and parallel combinations
- Basic resistive circuits
- Practical sources and loading
- Introduction to digital circuits simulators

Day 2

- Circuit solution by inspection

- Nodal analysis
- Loop analysis
- The superposition principle
- Source transformations
- One-ports
- Circuit theorems
- Circuit theorem applications

Day 3

- Power calculations (using computer programs)
- Dependent sources
- Circuit analysis with dependent sources
- The ideal transformer
- Amplifier concepts (using computer programs)
- The operational amplifier, the Op amp rule
- Summing and difference amplifiers

Day 4

- Instrumentation amplifiers and I-V converters
- V-I converters, current amps (using computer programs)
- Capacitance and inductance
- Natural response
- Response to DC and AC forcing functions
- Basic RC and RL circuits
- Transients in First-Order networks
- RC circuits using Op amps (using computer programs)
- Sinusoids and phasors

Day 5

- AC responses of the basic elements
- Time-domain analysis of first-order AC circuits
- Phasor algebra
- Phasor algebra applications
- AC impedance
- Frequency-domain analysis
- AC circuits using Op Amps (using computer programs)
- AC power and maximum power transfer

01011 Electrical Circuits and Wiring Systems

Course Description

This course introduces the care and use of tools and materials used in electrical installations as well as the requirements of the National Electrical Code. Topics include lighting, overcurrent protection, conductors, branch circuits, condelectrical, and safety and electrical blueprint reading. Upon completion, participants should be able to properly install conduits, wiring, and electrical distribution equipment associated with basic electrical installations

Course Objectives

Understanding the basic electrical theories
Being familiar with the codes and standards related to residential wiring
Understanding electrical plans
Learning how to use electrical installation tools
Learning how to use materials and equipment in electrical installations

Who Should Attend?

- ✓ Engineers
- ✓ Electricians
- ✓ Technicians
- ✓ Contractors
- ✓ Anyone aspire to increase his capabilities in this area

Course Details/Schedule

Day 1

- Review of electrical theory
- Circuit elements
- Electrical power and energy
- Codes and standards

Day 2

- Blueprint reading of electrical plans
- Tools, materials and equipment used in electrical installations
- Electrical connections
- Types of connections

Day 3

- Services
- Service entrance
- Roughing in services
- Service panels
- Service drops

Day 4

- Wiring methods using non-metallic sheathed cable
- Wiring methods using armored flexible cable
- Wiring methods using conduit
- Switches and switching circuits
- Introduction to “Low Voltage” systems

Day 5

- Large appliances
- Multiple family dwelling
- Electrical design
- Estimating electrical wiring

01012 Electrical Troubleshooting and Faults

Course Description

The primary goal of this course is to teach participants how to protect themselves and others from injuries coming, directly or indirectly, from electricity. Learning common-sense electrical troubleshooting techniques will help them to achieve this goal as well as keeping facilities and equipment up and running. This course covers the basic electrical and electronics including fundamentals of electrical principles and electrical practices and electricity problems.

Course Objectives

Learning how to use electrical installation tools
Being able to read control system schematics
Learning how to recognize the elements and operations of circuits
Being familiar with the types of faults
Understanding the types of controls and their operation
Practicing hands-on troubleshooting

Who Should Attend?

- ✓ Engineers
- ✓ Electricians
- ✓ Technicians
- ✓ Contractors
- ✓ Anyone aspire to increase his capabilities in this area

Course Details/Schedule

Day 1

- Electrical theory, atoms and elements and compounds
- Electric charges and electron flow
- The importance of electrical safety and safe electrical practices
- Electrical references and tools needed for electric troubleshooting.

Day 2

- Color codes encountered as an electrician
- Capacitive circuits, inductive circuits, and resistive circuits
- Insulators and conductors
- Metering and explain the types of meters
- Analog and digital meters

Day 3

- Ghost voltage
- Reading measurements
- Circuit conductors, connections, and protection
- Ohms law and power formula
- What are series circuits and parallel circuits

Day 4

- Magnetism and electromagnetism
- The difference between solenoids and transformers
- Current draw
- Temperature compensation
- Transformer taps / connections

Day 5

Electric motors in industry

- What circuit elements and what are complex circuits
- Load power requirements and power sources
- High and low voltage and voltage stabilizers and transient voltage
- Electrical requirements for control, protection, monitoring, and improper phase sequencing

01013 Harmonics in Electric Power Systems: Effects and Prevention

Course Description

Problems of harmonics in industrial plants are considered among the biggest issues in industrial distribution systems. This course will introduce the concept of harmonics production and their effects on different equipment supported with practical examples. Understanding harmonic recommendation IEEE 519 will be presented. AC drives, PWM and Inverters will be covered in details. Effect of equipment loading on harmonic currents and total harmonic current distortion will be illustrated with examples using SOLV software. Harmonics mitigation techniques; reactors, commutation reactors, special reactors passive L-C filters, phase shifting, phase staggering, active filters, hybrid active/passive filters and active front ends will also be covered. As a practical part of the course, local site measurements using harmonic measurement equipment will also be done.

Course Objectives

Gaining background about harmonics in industrial distribution
Being familiar with sources of harmonics and AC drive types
Understanding line notching and inter-harmonics
Identifying relationship between harmonic currents and power factors
Understanding harmonics effects on complete range of equipment
Being familiar with resonance in AC drives and pfc equipment
Understanding PWM, DC, AC load commutated inverter and AC cycloconverters

Who Should Attend?

- ✓ Plant Engineers
- ✓ Operations Engineers
- ✓ Electrical Maintenance Engineers
- ✓ Instrument and Control Engineers
- ✓ Electrical Technicians
- ✓ Electrical Inspectors
- ✓ Electrical Maintenance Supervisor

Course Details/Schedule

Day 1

- Introduction and background into harmonics with some examples of problems
- The production of harmonics (single phase and three phase systems)
- Line notching, inter-harmonics etal
- The relationship between harmonic currents and power factors (displacement power)

- Effects of harmonics on complete range of equipment.
- Resonance with example of real life application in Dubai (AC drives and pfc equipmentz)

Day 2

- Sources of harmonics and AC drive types
- PWM, DC, AC load commutated inverter and AC cycloconverters
- Question and answer session.
- Effect of equipment loading on harmonic currents and total harmonic current distortion
- Effect of source kVA, impedance and subtransient reactance (Xd") on harmonics
- Illustrating Examples using SOLV software

Day 3

- Harmonic mitigation techniques (for three wire and four 3 phase distribution systems and for standard 3 phase systems)
- Reactors (AC line and DC bus), commutation reactors, special reactors (Lineator wide spectrum and duplex reactors)
- Passive L-C filters, phase shifting (multi-pulse), phase staggering (quasi-multi-pulse), active filters, hybrid active/passive filters and active front ends (sinusoidal rectifiers)
- Question and answer session
- Understanding harmonic recommendation IEEE 519 (1992)

Day 4

- Simple harmonic calculation summary
- Example of harmonic calculation software (SOLV) and sample calculations
- Harmonic survey techniques and safety issues
- Local site measurements using harmonic measurement equipment

Day 5

- Information required from vendors (e.g. drive suppliers) to solve harmonics problems
- Question and answer session.
- Conclusion

01014 Transformers: Basics, Maintenance, and Diagnostics

Course Description

Installation of high voltage distribution and transmission equipment has increased significantly over the years due to ongoing global demand for power. As a result, the need to ensure the reliability of operation of power systems is paramount. Power transformers are among the most important and most expensive components of power systems, their failure can impose extraordinarily high costs on plants, factories and utilities of all descriptions. This course provides knowledge on both the theory and operation of Power Transformers. The course will develop and enhance an understanding of what is involved in the maintenance of these essential components of the power systems, through the tips and tricks learnt and developed by some of the World's pre-eminent electrical engineers

Course Objectives

Gaining a thorough understanding of the operating characteristics of transformers
Being familiar with the different tests required for the various types of transformers
Learning the maintenance and troubleshooting activities
Being familiar with the various methods used to repair and refurbish transformers
Being able to maximize the efficiency, reliability, and longevity of transformers
Understanding the calculations and sizing techniques used for transformers
Learning how to select transformers to best fit with their purpose

Who Should Attend?

- ✓ Technicians
- ✓ Maintenance personnel
- ✓ Electricians
- ✓ Electrical supervisors
- ✓ Project engineers
- ✓ Engineers of all disciplines
- ✓ Other technical individuals

Course Details/Schedule

Day 1

- Transformer Theory and Fundamentals
- Alternating current system
- Magnitude of voltage
- Inductive circuit
- Electricity magnetism

- Magnetic material
- Electricity and magnetism terms
- Transformer principle
- Permeability and magnetizing characteristics
- Hysteresis loop
- Transformer inrush currents
- Phasor diagram of transformer
- Three phase vector
- Transformer rating
- Transformer impedance
- Three phase transformer

Day 2

- Transformer Types and Classifications
- Power transformers
- Distribution transformers
- Phase-shifting transformers
- Rectifier transformers
- Dry-type transformer
- Instrument transformers
- Step-voltage regulators
- Air cooled oil- immersed
- Temperature limits

Day 3

- Maintenance and Operation of Transformers
- Transformer operation and maintenance
- Transformers in services
- Transformer inspection
- Tap changer maintenance
- Parallel operation

Day 4

- Transformer Testing
- DC winding resistance test
- Winding insulation test
- Polarity test
- No load test
- Short circuit test
- Impedance test

- Moisture in transformer
- Measurement of moisture content
- Treatment of moisture
- Oil Dielectric testing

Day 5

- Transformer Protection
- Need for earthing
- Earthing methods
- Types of faults
- Deferential protection
- Over current protection
- Restricted earth fault protection

01016 Electric Power Distribution Systems Design and Installation

Course Description

This course is designed to provide basic knowledge in a power utility company. In this course, participants will become familiar with the components of the power distribution systems and the way in which the system delivers power to customers. The course also addresses the ways in which distribution systems are designed to serve various types of customer loads. It highlights management aspects of modern transmission and distribution systems as well. It also provides necessary information and practice for such activities

Course Objectives

Understanding distribution system basics
Getting familiar with distribution system components
Being able to identify issues related to a distribution system projects

Who Should Attend?

- ✓ Engineers
- ✓ Electricians
- ✓ Technicians
- ✓ Contractors
- ✓ Those involved in the design, implementation and management of an electrical distribution systems

Course Details/Schedule

Day 1

- Power system structure
- Transmission and Distribution (T&D) systems
- Place in power system structure
- T&D components
- Substations: main components
- Power transformers
- Switching equipment
- Substation bus system

Day 2

- Instrument transformers

- Overvoltage protection
- Equipment installation options
- Substations: auxiliary and control systems
- Relay protection
- Metering systems
- Auxiliary AC/DC power systems
- Station alarm and remote control systems

Day 3

- Substations: engineering aspects
- Reliability analysis
- Typical substation switching systems
- Insulation coordination
- Substation safety and fire protection
- Substation design issues
- Substation insulator's performance improvement

Day 4

- Power lines
- Mission and main types of power lines
- Aerial lines
- Underground cable lines
- Reactive power and voltage regulation
- Reactive power regulation
- Voltage regulation
- Low voltage distribution systems
- Grounding and lightning protection

Day 5

- Basics of T&D project management
- Scope
- Estimating/Scheduling
- Procurement process
- Risk management
- Project communications
- Project baseline and control
- Implementation tips

01017 Electrical Design of Overhead Power Transmission Lines and Installation

Course Description

Transmission lines and sub-stations play an important role in the electrical power systems and exercise a vital influence on the reliability of services. Transmission lines are in continuous operation, therefore it is important to have a good design with perfect construction. It should facilitate easy maintenance without or with minimum interruptions. They require high flexibility to cope up with already existing control systems, available space and limited downtime. In this course, participants will learn the constructional features, maintenance and routine testing of the transmission lines

Course Objectives

Understanding the basic theories of electrical transmission lines
Being familiar with the codes and standards of sub-stations and transmission lines
Learning the technical configurations, and design practices of sub-stations and transmission lines
Being familiar with construction and maintenance operations for sub-stations and transmission lines

Who Should Attend?

- ✓ Plant engineers
- ✓ Electrical maintenance
- ✓ Service technicians
- ✓ Contractors
- ✓ Energy auditors
- ✓ Anyone who is invloved in planning, installing, and configuring electrical transmission lines

Course Details/Schedule

Day 1

- Overview
- Environmental effects
- Electric field effects
- Corona and magnetic field
- Audible noise
- Insulation of cables
- Insulation design

- Insulator types
- Cable materials
- Line types and characteristics
- Insulator types and characteristics
- Connectors and vibration dampers

Day 2

- Sag-tension calculations
- Calculation of span
- Conductor sagging
- Conductor termination and clipping
- Wind-induced motions
- Tower grounding
- Underground transmission and distribution
- Various types of towers and functions
- Force analysis on transmission line structures and tower foundations
- Line protection relays

Day 3

- Failure modes of transmission lines
- Repair and maintenance of transmission lines
- Safe working procedures and safety rules
- Site grading design
- Substation grade types
- Drainage and erosion protection
- Foundations
- Slab on grade
- Design techniques
- Bus configurations
- Types of common configurations

Day 4

- Insulation and Insulation protection
- Clearances
- Surge arresters
- Bus conductor
- Electrical power bus
- Rigid and hollow bus
- Grounding and Need for grounding
- Personal safety

Day 5

- Hazardous potentials during faults
- Ground grid
- Earth resistivity
- Soil and electrode
- Principle equipment
- Transformers
- Circuit breakers
- Switches
- Ancillary equipment
- Substation auxiliary systems

01018 Electrical Grounding, Surge and Lightning Protection

Course Description

Poor grounding practice can be the cause of continual and intermittent difficult-to-diagnose problems in a facility. The aim of this course is to increase awareness of and importance of correct earthing practices to ensure safety of personnel plant and equipment and at the same time to understand the codes that govern the designs and installations.

Course Objectives

Identifying safety hazards created by ineffective grounding systems
Understandig the effect of connecting grounded and bonded systems
Being familiar with the different earthing systems, principal design considerations and methods of lightning protection systems
Understanding how to protect personnel, plant and equipment during an earth fault or lightning strike
Being familiar with the requirments to design, install, test, and maintain correct earthing and lightning protection systems

Who Should Attend?

Building service designers
Design engineers
Field technicians
Electricians
Plant engineers
Power system protection and control engineers
Project engineers

Course Details/Schedule

Day 1

- What are Grounding and Bonding?
- Ungrounded system
- The solidly (or directly) earthed neutral
- The unearthed neutral, or high impedance-earthed neutral
- Resistance earthing
- Reactance earthing
- Petersen coil earthing
- Unearthed or impedance-earthed neutral (IT system)
- Directly earthed neutral (TT system)

- Connecting the exposed conductive parts to the neutral (TNC – TNS systems)

Day 2

- Equipment grounding
- Shock hazard
- Grounding of equipment
- Operation of protective devices
- Thermal capability
- Touch Potential during ground faults
- Induced voltage problem
- Sensing of ground faults
- Equipotential bonding
- Multiple earthing connections
- Surge protection earthing
- Practical: safe touch voltage and sizing of earthing conductors

Day 3

- Lightning and surge protection
- The incidence and probability of a lightning strike
- Methods of lightning protection
- What is static electricity?
- Generation of charge
- Dangers of static build up
- Assessment of risks and planning
- Bonding of different ground systems as a means of surge proofing
- Surges and surge protection
- Surge protection of electronic equipment
- Achieving graded surge protection

01019 Power Distribution Systems. Smart Grid

Course Description

The course provides a comprehensive understanding of the emerging Smart Grid "Intelligent Power System." The course will review all aspects of the Smart Grid including definition, major components, important features and practical examples of this new technology. The main goal of the course is to present concepts and topics that are related to smart grid technologies and to explore research opportunities.

Course Objectives

Understanding the concepts and principles of Smart Grid
Performing evaluation of the energy efficiency of smart grid technologies
Understanding the impacts of renewable resources to the grid
Understanding the main issues of smart grid development
Visualizing how Smart Grid will transform the current electricity grid to a reliable and sustainable modern energy system
Evaluating the trade-off between economics and reliability of an electric power system
Using modern engineering tools and techniques

Who Should Attend?

Electrical engineers
Novice engineers
Plant engineers
Electricians
Maintenance supervisors
Service technicians
Contractors
Energy auditors
Staff in planning, maintenance, protection, control and analysis of utilities & industrial electrical networks
General audience

Course Details/Schedule

Day 1

- Introduction
- Renewable Energy and Storage
- Smart Supply: Integrating Renewable & Distributed Generation (Microgrids)
- Plug-in Hybrid and Electric Vehicles (PHEVs)
- Policies & Standards

Day 2

- Smart Infrastructure, Smart Prices, Smart Devices
- Smart Customers, Demand Response
- Smart Metering and Demand-Side Integration
- Electric End-Use Energy Efficiency

Day 3

- Demand Side Planning
- Distribution Management Systems
- Distribution Automation Equipment
- Power System Protection in Smart Grid
- Electricity Markets with Smart Grids
- Challenges in Smart Grid Technology

Day 4

- Communication Technologies for the Smart Grid
- Cybersecurity in Smart Grid

Day 5

- Smart Grid Applications,
- Modeling and Analysis
- Smart Homes / Smart Buildings
- Smart Lighting
- Laboratory Visits

01020 Maintenance and Troubleshooting of UPS Systems

Course Description

Supplying reliable electric power for critical systems is an essential part of modern industrial installations. Electrical engineers in any industry or other large facilities in diverse areas such as commercial buildings, transportation systems such as railways, airports etc. are bound to come across AC or DC uninterrupted power supply systems. In this course, participants will learn about various options of UPS systems, the principle of operation and the main energy source in most of the modern UPS installations, the battery, and their importance.

Course Objectives

Understanding the UPS systems and power conditioners
Understanding the basic building blocks common to all UPS systems
Having a knowledge of the construction and operation of the major types of industrial UPS systems
Identifying the hazards and safe work practices related to UPS systems and batteries
Being familiar with basic troubleshooting techniques for UPS systems
Learning how to implement preventive maintenance practices including quarterly and annual testing

Who Should Attend?

- ✓ Electricians
- ✓ Maintenance technicians
- ✓ Maintenance managers and supervisors
- ✓ Plant and building engineers
- ✓ Building managers and superintendents
- ✓ Plant and facility managers
- ✓ Risk managers
- ✓ All emergency personnel
- ✓ Any person needing an understanding of UPS systems

Course Details/Schedule

Day 1

- Electrical and electronic fundamentals
- Semiconductor switches
- Rectifiers
- Uncontrolled rectifier
- Fully-controlled rectifier

- Three Phase Rectifier

Day 2

- H-Bridge Inverter
- Basic operation
- Single leg inverter
- Synthesis of a Sinusoidal Output by PWM
- Half bridge inverter
- Full bridge inverter implementation
- Three phase inverter
- UPS systems basics
- Application of UPS systems
- Types of UPS systems

Day 3

- Off Line UPS
- On Line UPS
- Line interactive UPS
- UPS components
- UPS batteries
- Use of stationary batteries
- Classification of charging system
- Classification of batteries
- Environmental conditions
- Charging
- Battery sizing

Day 4

- UPS I/ O sections
- Monitoring systems
- UPS interface
- UPS static switches
- UPS maintenance
- UPS system testing and commissioning
- UPS Operation and troubleshooting

Day 5

- UPS grounding and neutral configuration
- Background information on system earthing arrangements

- Applications in UPS installations
- UPS Harmonics
- UPS harmonics reduction filters

01021 Electric Motors and Variable Speed Drives

Course Description

This course is designed to give information about electrical motors and drivers. The trainees will learn both the theory and the hands on experience in this course and will be able to select the right motor for their applications at the design stage or figure out the problems at the maintenance operations

Course Objectives

Learning different types of electrical motors
Understanding the need for drivers
Learning different methods of motor control
Understanding the service and maintenance requirements for electric motors and drivers

Who Should Attend?

- ✓ Electrical technicians and engineers
- ✓ Service personnel and managers
- ✓ Anyone who would like to use an electrical motor or service it

Course Details/Schedule

Day 1

- Different types of electric motors
- DC motors
- AC motors
- Stepper motors
- Servo motors
- Piezo motors

Day 2

- Usage of electrical motors
- Motor drivers
- Selection of motor drivers
- PWM drive
- Explanation of system response

Day 3

- Feedback systems
- Encoders
- Current feedback
- Basic control methods
- P, PID controller theory

Day 4

- Applications of motor control
- Generation of control signals
- Measurement of feedback signals

Day 5

- Control method applications
- P controller application
- PI controller application
- PID controller application

01022 Electrical Distribution Principles and Applications

Course Description

This course covers the fundamental principles of electrical engineering in sufficient depth to enhance skills for fault finding and maintaining. Components such as motors, relays, sensors are covered with a view to be able to speedily diagnose a failed component, identify the operating specifications, locate a replacement part and fit a new one. Upon completion of this course the participants will feel an increased level of confidence to fault find and repair systems

Course Objectives

Understanding maintenance purposes and types
Learning inspection and testing methods
A better understanding of the updated electrical condition monitoring
Being familiar with troubleshooting procedure and testing equipment
Learning how to read electrical drawings
Having a refreshed awareness of electrical safety concerns

Who Should Attend?

- ✓ Maintenance supervisors
- ✓ Electrical Engineers
- ✓ Electricians
- ✓ Service technicians

Course Details/Schedule

Day 1

- Introduction
- Maintenance and test procedures
- Electrical equipment maintenance schedules
- Basic principles in using a drawing and meter in troubleshooting circuits
- Checks for circuit continuity with disconnected supply
- Checks for circuit continuity with live supply

Day 2

- Testing devices
- Maintenance of particular types of electrical equipment
- Test voltages for commissioning and maintenance
- Insulation resistance monitoring

- Online monitoring of transformers
- Understanding cable thermal behavior after installation

Day 3

- Earthing systems
- Equipment earthing
- System earthing
- Touch and step voltage
- Electric shock and sensitive earth leakage protection
- Sensitive earth leakage protection

Day 4

- Risk assessment principals
- How to assess the risks in your workplace?
- How to conduct risk assessment?
- Principles of generators
- Preventative maintenance
- Fault analysis for generator control circuit

Day 5

- Motors, motor controller, motor starters fundamentals, maintenance and troubleshooting
- Circuit breaker fundamentals, maintenance, service, testing and troubleshooting
- Transformer fundamentals, maintenance, testing and troubleshooting
- Preventative maintenance
- UPS fundamentals
- Battery discharge test

01023 Power Compensation Control Strategy and Modelling

Course Description

Advances in power electronics industry led to rapid development of power electronics controllers for fast reactive power control. The aim of the course is to introduce these advancements for power system support as well as the advantages and disadvantages of different types or reactive power compensation systems.

Course Objectives

Enhancing participants' knowledge in power compensation
Learning about power compensation devices
Understanding voltage control
Improving transmission security
Understanding the effect of reactive compensation devices

Who Should Attend?

- ✓ Electrical engineers
- ✓ Anyone who works in electrical operation
- ✓ Staff in planning, maintenance, protection, control and analysis of utilities & industrial electrical networks

Course Details/Schedule

Day 1

- Active power transmission using elementary models
- Reactive power transmission using elementary models
- Reactive compensation of loads
- Introduction to voltage stability—definitions
- Time frames for voltage instability, scenarios
- Case studies/Example problems

Day 2

- Transmission line parameters
- Transmission line theory (simplified—lossless case)
- Transmission line compensation
- Case Studies/Example problems

Day 3

- Harmonic generation (ASDs, etc.)
- System response characteristics
- Effect of reactive compensation devices
- Effect of harmonics on equipment
- Harmonic filter design
- Harmonic standards
- Case studies/Example problems

Day 4

- Planning/operating criteria, margins
- Methods to remove transmission limitations and improve security
- Series compensation
- Shunt compensation
- Static var systems
- Thyristor controlled series compensation
- STATCOM and other voltage sourced converter devices
- Case Studies/Example problems

Day 5

- Component loads as function of voltage and time
- Aggregated loads and distribution feeders
- Generators and excitation systems
- Prime movers, prime mover controls, and automatic generation control
- Case Studies/Example Problems
- P-V and V-Q curves
- Power flow methods and extensions
- Voltage stability indices, on-line voltage security assessment
- Optimal power flow
- Dynamic analysis
- DC links

01024 Supervisory Control and Data Acquisition-SCADA systems

Course Description

SCADA stands for Supervisory Control and Data Acquisition. As the name indicates, it is not a full control system, but rather focuses on the supervisory level. As such, it is a purely software package that is positioned on top of hardware to which it is interfaced, in general via Programmable Logic Controllers (PLCs), or other commercial hardware modules. This extensive course covers the essentials of SCADA and PLC systems, which are often used in close association with each other. A selection of case studies are used to illustrate the key concepts with examples of real world working SCADA and PLC systems in the water, electrical and processing industries

Course Objectives

Being familiar with the fundamentals of SCADA systems
Learning tricks and tips in installation of SCADA systems
Understanding SCADA network security issues
Learning how to troubleshoot SCADA systems
Understanding PLC hardware and installation criteria
Being able to write medium level PLC programs

Who Should Attend?

- ✓ Electrical Engineers
- ✓ Electrical Supervisors
- ✓ Electricians
- ✓ Service technicians
- ✓ Those who are new to PLCs

Course Details/Schedule

Day 1

- Introduction and definitions
- SCADA needs and applications
- SCADA system components
- Data collection, logging and processing
- Computers in process control
- Supervisory control and data acquisition (SCADA)
- Programmable logic control hers (PLC)

Day 2

- Distributed control
- Integrated control systems
- Smart sensors and transmitters
- Final control elements
- Single and multi loop controllers
- Microprocessor based indicators and recorders

Day 3

- Networks
- Workstations
- Remote processing units
- Host / guest computers
- Transmission system

Day 4

- DCS software
- Setting up DCS
- DCS configurations
- DCS models
- DCS operations

Day 5

- Media techniques and devices
- Human / machine interface
- Engineering considerations in the design of SCADA system
- Case studies and applications

01025 Partial Discharge Detectors & Testing

Course Description

Partial Discharge (PD), as its name would suggest, is an electrical discharge that occurs across a portion of the insulation between two conducting electrodes, without completely bridging the gap. PD's are caused when there is a discontinuity in the insulation system and as a general 'rule-of-thumb' PD will occur in systems operating at voltages of 3000V and above (although it should be noted that PD can occur at lower voltages than this). Partial discharges can occur in voids in solid insulation (paper, polymer etc), along the interfaces of multi-layer solid insulation systems, in gas bubbles in liquid insulation or around an electrode in a gas (corona discharge). Partial Discharge activity can initiate under normal working conditions in high voltage equipment where the insulation condition has deteriorated with age, has been aged prematurely by thermal or electrical over-stressing or due to improper installation (this leads to 'infant mortality'). PD can often be observed with the commissioning of new equipment due to improper installation, poor design and/or workmanship (this is seen particularly in cable joints and terminations which are made-up on site). It is known that poor workmanship can lead to 'infant mortality' of MV/HV networks with a disproportionate percentage of insulation failures being observed within the first 1-3 years of service compared to the rest of the service life of the cables/plant

Course Objectives

Understanding the basics of stator winding insulation systems and why they deteriorate
Understanding basic PD theory
Understanding how PD detection devices work
Interpreting the test data collected and relate the data to specific failure mechanisms, to enable you to plan maintenance

Who Should Attend?

- ✓ Engineers working in HV department, in transmission and distribution
- ✓ Maintenance engineers working in HV equipments
- ✓ Senior technicians working in HV equipments

Course Details/Schedule

Day 1

- Introduction to Partial Discharge and Diagnostics for High Voltage Equipment
- Equipment failure mechanisms
- Conventional and unconventional test techniques
- On-line and Off-line methods

- How to test different items of plant

Day 2

- Deployment of PD Testing in Asset Management Programs
- Ageing population problem
- Focus plant replacements/avoid unplanned outage
- Increasing failure rate or problem with a particular plant type
- Troubleshooting and failure investigations
- Safety (mostly with cable terminations & sealing ends/outdoor HV plant)
- Quality Assurance

Day 3

- Partial Discharge Testing and Diagnostics for MV and HV Cables
- Introduction to test methodologies
- PD Location methods
- Assessing criticality
- Case studies

Day 4

- PD Testing and Diagnostics for MV Switchgear
- Introduction to test methodologies
- PD Location methods
- Assessing criticality
- Case studies

Day 5

- Partial Discharge Testing and Diagnostics for Motors and Generators
- Introduction to Online PD Testing of HV Motors & Generators
- Recognising Phase-Resolved PD (PRPD) Patterns
- Assessing criticality
- Case studies

01026 Reactive Power Management and Power Factor Correction

Course Description

The reactive power management in power system is a major issue in optimal power system operation. Reactive power management mainly affect the system voltage level and the system losses. The scope of this course is to enable the participants to have an in-depth understanding of the applications, overall theory and essential issues relevant to daily operation and maintenance of reactive power management and power factor correction.

Course Objectives

Being able to identify the Compensation equipment
Understanding the fundamental theory of PF and voltage correction
Understanding the Objectives of reactive power compensation
Understanding the switching transient & over voltage
Learning how to Protect the power capacitor
Understanding the Economic justification of capacitor in distribution system
Understanding the VAR optimization in distribution system
Understanding the Load flow study in transmission sys

Who Should Attend?

- ✓ Engineers
- ✓ Technicians
- ✓ Electricians
- ✓ Electricity companies officers
- ✓ Any person needing an understanding of power management systems

Course Details/Schedule

Day 1

- Introduction
- Real and Reactive Power
- Calculating the Power
- Factor for a System
- Typical Power Factor for System Components
- Reactive Power Compensation Devices
- Capacitor Banks
- Synchronous Condensers
- Shunt Reactors
- Calculating the Optimum Size of Power Compensation Devices

- Payback Period for Compensation Devices

Day 2

- Capacitor Banks Types
- IEEE Standards for Capacitor Banks
- Manufacturer Tolerances
- Voltage Rating
- KVAR Rating
- Series and Parallel Groups
- Protection of Capacitor Banks over Current Protection
- Over voltage Protection
- Short Circuit Protection
- Unbalance Protection
- Back to Back Switching

Day 3

- Harmonics
- What are Harmonics
- Sources of Harmonics
- Effect of Harmonics on Capacitor Banks
- Protecting Capacitor Banks against Excessive Harmonic Voltages and Current
- Power Factor Correction and Voltage
- Optimum Location of Capacitor Banks
- Calculating Voltage Rise due to Placement of Capacitor Banks
- Issues in Starting Motors using Capacitor Start
- Avoiding Harmful Residual Voltages

Day 4

- Microprocessors and Capacitor Bank Controllers
- Voltage Relays
- NO-VAR Controllers
- Micro-processor Schemes
- Distribution Systems
- Selecting the Parameters of a Distribution System
- Calculating Voltage Drops in a Distribution System
- Voltage Regulation in Distribution Systems using
- Load Tap Changers
- Capacitor Banks
- Synchronous Motors

Day 5

- Static Compensation Equipment
- Static VAR Compensators
- FACTS
- UPFC Devices
- Comparison between the Various Static Compensation Devices
- VAR optimization in transmission system
- Capacitor Control and Testing
- Capacitor control
- Microprocessor based capacitor bank controller
- Regulations for distribution systems
- Power capacitor standards and testing
- Testing Standards
- Testing Procedures

01027 Theory and Application of Industrial Electronics

Course Description

The explosive advancement and proliferation of technology innovation in the science of electronics is changing the ways we live our lives and there is a growing need for well trained tech support and service personnel. In this course, participants will gain an understanding of common industrial electronics concepts, components, and application as well as a broad range of electronic devices and components, how they operate, how they are typically used, and how to effectively troubleshoot them

Course Objectives

Understanding how to use electrical laws and concepts to troubleshoot electronic systems
Improving logical troubleshooting abilities
Learning how to test industrial electronic components
Being familiar with hazards and dangers involved with industrial electronics systems
Learning how to utilize industrial electronics test equipment
Understanding terms, components, and common circuits used in industrial electronics field

Who Should Attend?

- ✓ Technicians
- ✓ Maintenance personnel
- ✓ Electricians
- ✓ Electrical supervisors
- ✓ Project engineers
- ✓ Plant Engineers
- ✓ Engineers of all disciplines
- ✓ Other technical individuals

Course Details/Schedule

Day 1

- Basic formula and usage of Ohms law
- Typical electrical signal systems
- Electrical relays & time delay circuits
- Practical: solving & checking ohms law problems
- Practical: using ohms law to troubleshoot basic circuits
- Practical: experimenting with low voltage signal systems
- Practical: constructing a time-delay relay circuit

Day 2

- Typical motor control circuits
- Capacitive and inductive filters
- Phase shift and power factor
- Oscilloscope basics
- Practical: motor control circuit labs
- Practical: capacitive and inductive filter experiments
- Practical: Oscilloscope labs / demonstrations

Day 3

- Diodes and transistors
- Basic transistor switch and amplifier circuits
- Field effect transistors & MOSFET's
- Photo-transistors & light emitting diodes (LED's)
- Fiber-optic basics
- Basic oscillators
- Practical: experiment with, troubleshoot, and test diode and transistor circuits
- Practical: experiment with basic optical and fiber-optic systems
- Practical: experiment with basic oscillators

Day 4

- Silicon controlled rectifiers (SCR's)
- Triacs
- Typical SCR & Triac circuits
- Integrated circuits (IC's / Chips)
- Operational amplifier basics
- Basic operational amplifier circuits
- Practical: Construct, experiment with, and troubleshoot basic SCR and TRIAC circuits
- Practical: experiment with basic Op-Amp circuits

Day 5

- Digital basics
- Basic logic gates
- Basic digital circuits
- Practical: experiment with, and troubleshoot basic digital logic gates and circuits
- Electronic troubleshooting methods, tips, and tricks

01028 Overhead Lines, Maintenance and Construction

Course Description

The course provides an in-depth overview on the Performance and Maintenance of overhead lines. The basic idea of such a comprehensive course is to provide all attendees with an opportunity to firstly gain a clear understanding on all aspects related to the operations and maintenance of overhead lines to learn the practical applications thereof by using the most effective practices.

Course Objectives

Identifying various maintenance solutions to improve system reliability
Understanding transfer capability of Transmission overhead line
Learning practical line performance and maintenance procedures
Understanding the impact that incorrect practices have on the performance

Who Should Attend?

- ✓ Operation and maintenance managers
- ✓ Engineers
- ✓ Technicians
- ✓ Electrical Utility staff working in system planning, operations or research areas
- ✓ Anyone wishing to become Overhead Linesman in the Electrical Distribution Sector

Course Details/Schedule

Day 1

- Introduction
- Challenges facing modern day utilities
- Evolution of maintenance practices
- Dead line maintenance

Day 2

- Live line maintenance
- Servitude, vegetation & environmental management
- General substation maintenance
- Maintenance of power transformers

Day 3

- Maintenance of circuit breakers
- Maintenance of isolators
- Maintenance of earthing links
- Maintenance of generic high voltage components for both overhead lines

Day 4

- Maintenance of generic high voltage components for substations – Insulators
- Maintenance of secondary plant
- Equipment Maintenance
- Various maintenance solutions
- EMF

Day 5

- Application of overhead lines surge arresters for improving overhead line performance
- Overhead Line Inspections
- Overhead Line Audits
- Emergency interactive solutions

01029 Construction & Design of Overhead Transmission Lines

Course Description

The course provides an in-depth overview of all the relevant aspects of overhead lines design, construction and also development and planning. The basic purpose of such a comprehensive course is to give all attendees the opportunity to firstly to gain a clear understanding of overhead line construction and learn the practical aspects of design technology, using the most effective design tools.

Course Objectives

Understanding the overhead Line Construction
Understanding power system planning
Learning the tower design
Learning the modern line design practices on the highest internationally recognised level

Who Should Attend?

- ✓ Engineers
- ✓ Technicians
- ✓ Anyone wishing to become Overhead Linesman in the Electrical Distribution Sector.

Course Details/Schedule

Day 1

- Introduction
- Power System Planning
- Power Transfer Capability
- Environmental Impact
- Land Survey

Day 2

- Electrical Design
- Earthing
- Insulation Co-ordination
- Electromagnetic Fields

Day 3

- Insulation Design
- Ground Wire
- Lightning Protection
- Line Components – Tower Design
- Line Components – Foundation Design

Day 4

- Mechanical Design and Hardware
- Mechanical Oscillation
- Conductor Optimisation
- Communication over Power Lines
- Line Construction

Day 5

- Insulation Selection
- Line Design Tools
- Structural Design
- Electrical Towers Construction
- Electrical Tower Test

01030 Cable Termination & Wire Connectors

Course Description

Splices and terminations, which are always a vital part of any cable system, become more susceptible to failure at higher voltages. Whether splicing or terminating is accomplished by the use of hand-applied tapes, a filled or molded device, heat-shrinkable tubing, or a prefabricated device, care should be exercised during the application. Poor workmanship or improper choice of materials could jeopardize the reliability of the entire system. This course covers distribution underground cable accessories from low to high voltage cable from various manufacturers. The course is designed according to the type of cable and cable accessories utilized by participants' companies.

Course Objectives

Identifying the causes of splice and termination failures
Utilizing a DC high potential tester for performing dielectric strength tests on assembled splices
Preparing cable for splicing utilizing hand tools, abrasives and solvents
Installing taped, cold shrink and molded elbow terminations

Who Should Attend?

- ✓ Engineers
- ✓ Electricians
- ✓ Supervisors
- ✓ Those involved in the installation, maintenance, splicing and terminating of Low-High voltage cable systems

Course Details/Schedule

Day 1

- Introduction
- Medium Voltage Splicing and Termination
- Types of High Voltage Cables
- High Voltage Cable Components
- Cable Preparation
- Safety Procedures
- Hand Tools
- Abrasives and Solvents
- Supplies and Materials
- Cable Preparation Procedures

Day 2

- Terminations
- Modular
- Molded
- Tape Systems
- Shrink Technologies
- Other
- Cable Installation and Handling
- Environmental Protection
- Light, Power and Ventilation
- Housekeeping E. Cable Handling
- Direct Bury
- Duct and Tray Installation
- Causes of Cable Failures

Day 3

- Cable Splicing and Terminating Technologies and Standards
- Splicing Technology
- Modular
- Molded
- Tape Systems
- Shrink Technologies
- Other
- Cable Splicing
- Molded Splice
- Cable Preparation
- Review Splicing Instructions
- Molded Splicing Installation
- Taped Splice
- Cable Preparation
- Review Splicing Instructions
- Taped Splicing Installation

Day 4

- Heat Shrink Splice
- Cable Preparation
- Review Splicing Instructions
- Heat Shrink Splicing Installation
- Cable Terminations
- Cold Shrink Termination

- Cable Preparation
- Review Termination Instructions
- Cold Shrink Termination

Day 5

- Elbow Termination
- Cable Preparation
- Review Termination Instructions
- Elbow Termination Installation
- Cable Testing Methods
- Insulation Resistance
- DC Hipot
- Very Low Frequency Testing
- Partial Discharge Testing
- Power Factor Testing

01031 Load Flow or Power Flow Analysis

Course Description

The planning and operation of electrical networks is based on a sound knowledge about load flow calculation methods and fault analysis techniques. The increasing amount of distributed power generation units requires particular investigations of power quality. This course teaches the methods of load flow and fault current calculation with practical examples and computations.

Course Objectives

Optimizing component or circuit loading
Developing practical bus voltage profiles
Identifying real and reactive power flow
Developing equipment specification guidelines

Who Should Attend?

- ✓ Engineers
- ✓ Electricians
- ✓ Supervisors
- ✓ Anyone aspire to increase his capabilities in this area

Course Details/Schedule

Day 1

- Introduction
- Power Flow Analysis
- Fault Current Analysis
- Network Models
- Lines and Cables
- Transformers
- Shunt Elements
- Loads
- Generators

Day 2

- Active and Reactive Power Flows
- Transmission Lines
- In-phase Transformers
- Phase-Shifting Transformer

- Unified Power Flow Equations
- Basic Power Flow Problem
- Basic Bus Types
- Equality and Inequality Constraints

Day 3

- Solution of the Power Flow Problem
- Solution by Gauss-Seidel Iteration
- Newton-Raphson Methods
- Fault Analysis
- Transients on a transmission line
- Short circuit of a synchronous machine
- Classification and Definitions of Power System Stability
- Dynamics in Power Systems
- Power System Stability
- Synchronous Machine Models
- Design and Operating Principle
- Stationary Operation
- Dynamic Operation

Day 4

- The Swing Equation
- Power Swings in a Simple System
- Small Signal Analysis
- Methods to Improve System Stability
- Oscillations in Multi-Machine Systems
- Voltage Stability
- Mechanisms of Voltage Instability
- Analysis of Voltage Stability
- Control of Electric Power Systems
- Control of Active Power and Frequency
- Control of Reactive Power and Voltage
- Supervisory Control of Electric Power Systems

Day 5

- Protections in Electric Power Systems
- Design of Protections
- Distance Protections
- General Principles
- Automatic Re-Closure

- Out of Step Protections
- System Protections

01032 Design and Optimization of Overhead Transmission Lines

66&11 kV OHTL Design Using PLS-CADD (10 Days)

Course Description

The purpose of this course is to teach you how to use the PLS-CADD computer program. This computer lab course includes background theory and hands-on computer modeling. Lectures will present the basic concepts, and computer exercises will illustrate them. Numerous case studies will provide a range of real-life examples.

Course Objectives

Apply and gain a good working knowledge on 66&11 kV OHTL design using PLSCADD.
Recognize terrain modeling covering the various aspects including organizing. project files, viewing commands, opening of windows and viewing of phases and sags.
Prepare a terrain model, generate and edit features codes data and import XYZ terrain models.
Create alignments, profiles and side profiles, multiple alignment options, TIN terrain models and break lines.
Identify where to get conductor data and the design criteria to limit the Aeolian vibration
Determine conductor design and modeling and identify the various conductor types, permanent deformation from overloading and creep, effects of high temperature on creep and strength reduction, aluminum in ACSR conductors, conductor model in PLS-CADD 4 and stress strain charts.
Illustrate structural design of poles, towers and frames of different materials and apply structures modeling by allowable spans, sag and tension calculation and optimum structure spotting.

Who Should Attend?

Structural engineers
Consulting engineers
Design and drafting technicians
Construction engineers

Course Details/Schedule

Day 1

Integrated and computerized aspects of line design
PLS-CADD system
PLS transmission structure programs
The specific functions of PLS-CADD

Day 2

List the three dimensional engineering model
Terrain modeling covering the various aspects
The necessary data needed for terrain modeling
Perform proper surveying techniques

Day 3

Prepare a terrain model
Generate and edit features codes data
Import XYZ terrain models
Create alignments side profiles

Day 4

Multiple alignment options
TIN terrain models and break lines
Differentiate XYZ and user-defined data
Filter XYZ data

Day 5

Attach DXF and bitmaps to plan
Generate, edit or import PFL terrain models
Illustrate line routing and design
Conductor design and modeling

Day 6

The various conductor types
Permanent deformation from overloading and creep
Effects of high temperature on creep and strength reduction
Aluminum in ACSR conductors

Day 7

Conductor model in PLS-CADD 4
Stress strain charts
Get conductor data
Design criteria to limit the Aeolian vibration.

Day 8

Temperature, ampacity and line thermal rating

Constructions documents
Structural design of poles, towers and frames of different materials
Apply structures modeling by allowable spans

Day 9

Sag and tension calculation and optimum structure spotting.
Complete and detailed profile and plan drawings,
Modeling existing lines, assessment and refurbishing, automatic optimum spotting

Day 10

Steel latticed tower analysis and design.
Apply hands-on training
Implement the design principle using PLS-CADD software

01033 High Voltage Electrical Safety

Course Description

High voltage electrical systems can be challenging projects to experiment with due to the risks involved in working with them. Electrical energy might be at voltages high enough to inflict harm on living things. Operators of such equipment require to be well trained in all aspects of High Voltage Safety. This course is designed to bring candidates up to a competency level to operate and maintain instruments of high voltage.

Course Objectives

Understanding the working of the various specialized components & equipment used in High Voltage installations.
Operating, maintaining & troubleshooting High Voltage installations safely & efficiently.
Review High Voltage Safety Rules
Understanding operational procedures

Who Should Attend?

- ✓ Electrical Engineers
- ✓ Maintenance engineers
- ✓ Technicians
- ✓ Personnel experienced in carrying out routine switching duties associated with the safe operation of electrical power

Course Details/Schedule

Day 1

- Introduction to high voltage power plant
- Safety features
- Maintenance and repair of high voltage switch gear
- Isolating components of high voltage system

Day 2

- Selecting suitable apparatus
- Testing high voltage apparatus
- Insulation resistance testing
- Polarization index
- Remedial action during faults in high voltage system

Day 3

- Code of Safe Working Practices and PPE
- Risks & hazards associated with High Voltage
- High voltage alternators safety features
- Earthing and key interlocks

Day 4

- High Voltage Variable Frequency Drive
- 110 Volt DC for control of High Voltage Switchgear
- High Voltage switch gear, SF 6, Vacuum circuit breakers and contactors, construction, operation, maintenance and tests
- Fault levels at different locations

Day 5

- Protection system topology
- PT, CT and IDMTL
- Non relay operated protection
- Generator, Motor and Transformer protection

01034 Instrumentation, Controls and Electrical Systems for Facilities Engineers

Course Description

This course provides an overview of electrical power generation and distribution, process and safety systems instrumentation, and control strategies and configurations. The focus is on application and integration into the process and control of upstream and midstream oil and gas facilities.

Course Objectives

Defining fundamentals parameters for electrical power usage and generation such as voltage levels
Using safe practices such as hazardous area definition and circuit protection
Defining what to measure, why measure a parameter and how to measure
Determining and using the many control strategies and equipment
Identifying equipment and instrument characteristics
Defining and integrating components into systems
Developing electrical power demand (load) lists, one-line diagrams, and the selecting and integrating power distribution systems

Who Should Attend?

- ✓ Engineers
- ✓ Technicians
- ✓ System operators
- ✓ Anyone who aspires to increase his capabilities in instrumentation, control, and electrical systems in oil and gas facilities

Course Details/Schedule

Day 1

- Key electrical power considerations and fundamentals
- Voltage levels and power type selection and application
- Purchased power considerations including generation efficiency, redundant sources, transmission grid parameters, and cost considerations

Day 2

- Electric power distribution, systems loads
- Internal grid layout, major distribution equipment and cabling
- Power users definition and integration into the power distribution system

Day 3

- Electrical system safety
- Process systems operations and the key characteristics
- Measurement needs, as well as techniques to measure and control

Day 4

- Control modes and their applications, communications requirements, and the operator
- Interrelationships between process, equipment, instruments and controls
- Field (facility) control and monitoring systems such as pressure and level indicators and controllers

Day 5

- Field (facility) safety monitoring and response systems
- System-wide considerations including communications, local control, remote control, and data management and use

01035 Distributed Control Systems DCS Programming Essentials

Course Description

With the rapid advances in process automation technologies, modern plants today are operated from control rooms that may be quite far from the equipment being operated, depending on the size of the plant. Equipment is started, stopped, and controlled by personnel on computers communicating with field control stations, to which all I/O connections are made. Such control systems in the past were largely centralized, but today many companies have discovered the advantages of decentralizing that control in what is known as distributed control systems (DCS). Of course, the underlying DCS programming is responsible for the complete plant operation design, equipment startup and shutdown conditions, inter-relationships between equipment, and other elements of operations control. This includes logic charts and control drawings with detailed, control and sequential function loops, in addition to controller parameters and tuning, graphics, etc. Understanding all that programming is immensely beneficial to plant operators, maintenance personnel, and managers attempting to troubleshoot problems, improve process control, optimize operations, and modify the underlying plant logic. Without that detailed understanding and ability, plant troubleshooting and improvement will be that much more abstract and obscure. Tying that appreciation of DCS software programming with its hardware components will then close the loop. This is what this course offers to its attendees.

Course Objectives

Explaining how to read DCS logic charts and control drawings
Developing participants' confidence to troubleshoot plant operation failures through DCS logic
Identifying relevant logic/control diagrams when confronted with equipment and/or plant failure
Elucidating the process of bypassing ostensibly unsurmountable obstacles due to DCS logic
Understanding process fluctuations and controller tuning, and consequently, plant optimization
Mastering modification of plant logic charts, and possibly, creation of new programs if needed
Designing process trends and historical reporting according to process and management needs
Clarifying DCS hardware fundamentals for system choice, maintenance, and improvement purposes

Who Should Attend?

- ✓ Plant operators
- ✓ Operations managers

- ✓ Instrumentation and electrical personnel

Course Details/Schedule

Day 1

- Distributed control systems – philosophy and types
- DCS fundamentals and programming basics
- Logic charts, truth tables, gates, latches, etc.
- Function block diagrams and SFC (sequential function charts)
- Graphics building and features

Day 2

- Troubleshooting operations through logic charts & control drawings
- RTS and SD conditions, bypass loops
- Interconnections and collective signals
- Cross-utilization of logic/control and process alarms/trends
- Case studies and real examples

Day 3

- Conflicting signals, sudden trips, and delays
- Signal inspection at every station
- New programs creation and modification
- Virtual and actual testing of programs
- Case studies and real examples

Day 4

- Introducing new instruments/modules
- PID controllers configuration and tuning
- Main parameters control
- Process & system alarms management
- Diagnostics, reporting, and events recording

Day 5

- DCS hardware/architecture and I/Os
- Configuration of field control (FCS) and human interface (HIS) stations
- Critical spare parts
- Security and redundancy configuration
- UPS and backup protection

01036 Design and development of high-power DC to DC Converters

Course Description

This course explores the possible ways of designing and developing Isolated DC to DC converters. It explains to participants the basic terminologies used in this field, while at the same time discussing advanced DC/DC techniques. The theoretical part is enhanced through practical work. Some of the tools and equipment which are going to be used during the course are power supply, DMM, oscilloscope and miscellaneous accessories.

Course Objectives

Quick start to design and developement of DC/DC conveter
Gaining the knowledge of available integrated circuits in this field
Designing the circuit for fixing the threshold level of input start-up voltage
Introducing safety features for isolated DC/DC converters
Exploring available transformers from different vendors

Who Should Attend?

- ✓ Engineers having their bachelor degree in electronics
- ✓ Engineers having minimum of 4 years of experience of designing COTS DC/DC converters based power solutions
- ✓ Those who have experience in using different switching regulators
- ✓ Anyone who has experience in component selection and electronics circuit designing

Course Details/Schedule

Day 1

- Topologies
- Introduction to basic terminologies
- Isolated DC/DC Converters definition
- IC chips available from different vendors for different topologies used in designing of isolated topologies

Day 2

- Topologies Continued
- Magnetic fundamentals
- Operating principals of SMPS transformer and inductor

- Transformers and Inductors available from different vendors to be used in isolated DC/DC converter
- Skin Effect
- Proximity Effect
- Practical work

Day 3

- Control Loop in DC/DC Converters
- Feedback Control circuitry & Control Loop stabilization
- Converter's Models
- Voltage, Current, Hysteretic and PFM modes
- Snubber circuits
- Feedback Circuits implementation
- Compensator design and considerations
- Practical work

Day 4

- Control and Power Circuit Components
- Design guidelines Component Characteristics
- Mosfet & Gate Drive requirements
- Diode
- Capacitor
- Practical work

Day 5

- Advance DC/DC Techniques
- Synchronous rectification and advantages
- Multiphase Converter advantages and available IC chips
- Soft switching techniques
- Forward Active Clamp circuit
- Full Bridge Phase Shifted Modulation
- Practical work

Day 6

- Advance DC/DC Techniques Continued
- Voltage sensing
- Isolated Feedback miscellaneous techniques and available IC chips
- PCB Layout considerations
- Basic EMI filters requirements and common mode chokes

- Qualification of Power Supply, requirements, tools and equipment for qualifications
- Case studies and examples
- Practical work

Day 7

- Safety features for isolated DC/DC converters
- Isolation, its advantages, benchmarking for isolation voltage measurements, tools and equipment
- Input over voltage protections and its circuits
- Output over voltage protections
- Output continuous short circuit protection
- Over temperature protections
- Inrush current limiting
- Practical work

01037 Air Circuit Breaker Construction and Operation

Course Description

This course covers Basics of Circuit Breakers and related products. This knowledge will help you better understand customer applications. In addition, you will be better able to describe products and determine important differences between products. You should complete Basics of Electricity before attempting Basics of Circuit Breakers. An understanding of many of the concepts covered in Basics of Electricity is required for Basics of Circuit Breakers.

Course Objectives

Explain the need for circuit protection
Identify various types of overcurrent protection devices
Explain the basic operation of a thermal-magnetic circuit breaker
Describe circuit breaker characteristics shown on a timecurrent curve
Define important circuit breaker rating terms
Explain why circuit breaker coordination is important
Identify internal and external circuit breaker accessories
Identify the various types of circuit breakers
Identify circuit protection ratings for various types of circuit breakers

Who Should Attend?

- ✓ Engineers
- ✓ Electricians
- ✓ Technicians
- ✓ Contractors
- ✓ Anyone aspire to increase his capabilities in this area

Course Details/Schedule

Day 1

- Introduction
- Need for Circuit Protection
- Types of Overcurrent Protection Devices
- Circuit Breaker Design
- Types of Circuit Breakers
- Circuit Breaker Ratings
- Time-Current Curves

Day 2

- Maintenance Of Air Circuit Breaker.
- Overhauling Of ACB.
- Trouble Shooting Of ACB.
- Repairing Of ACB.

Day 3

- Testing Of ACB (Over Current Tripping Test)
- Primary Injection Test.
- Secondary Injection Test.
- Control and Operating Test.
- Insulation Resistance Test.

Day 4

- BS EN ISO 463:2006
- BS EN 837-1:1998
- BS EN 60934:1994
- BS EN 60359:2002, IEC 60359:2001

Day 5

- Selective Coordination
- Series-Connected Systems
- Residential Circuit Breakers
- Panelboard Circuit Breakers
- General Purpose Thermal-Magnetic Circuit Breakers
- Solid-State Trip Unit Circuit Breakers
- Internal Accessories
- External Accessories

01038 Troubleshooting Printed Circuit Boards, Design, Implementation

Course Description

This course covers the design of printed circuit boards using ORCAD Software package, and will provide participants with an insightful training on PCB design from practical and industrial perspective. Moreover it will show them how to design boards more effectively and produce professional results. It provides tips and tricks to help in designing motherboards, processors and microcontroller boards which work for the first time. This course contains the required information needed to understand where to place components, SMD, and Through-hole technologies as well as manufacture specifications and requirements, circuit routing, schematics and design testing. By the end of the course, participants will learn how to create professional manufacturing output files for their boards.

Course Objectives

Exploring printed circuit board uses and components
Introducing OrCAD Capture
Creating useful folder structure, importing reference schematic, collecting and sorting documents
Drawing schematics and conventions
Creating readable schematics easily

Who Should Attend?

- ✓ Electrical engineers
- ✓ Production engineers
- ✓ Designers of electronic systems
- ✓ Circuits and PCB designers
- ✓ Mechanical engineers interested in an electronics product development

Course Details/Schedule

Day 1

- Introduction to the PCB
- Purposes of a PCB
- Examples
- Typical Development Flow for a PCB
- Basic Electronic Components: Resistors, Capacitors, Inductors, Diodes, Transistors, Relays, and Connectors
- PCB Materials

- Introduction to OrCAD Capture
- Introduction to setting up a design project
- How to identify the components used in a design

Day 2

- Starting a new project in capture
- Schematics design
- Pspice simulation example in capture
- Generation net-list and BOMs files
- Introduction to OrCAD layout
- Starting a new project in Layout (importing from capture)

Day 3

- Creating library in layout
- PCB Layout Placement (How to do layout; how to do placement; tips and tricks)
- Setting up design rules for the project
- PCB track width determination
- Manual routing for single layer board
- Tips in manual routing

Day 4

- SMD device in PCB designing
- Manual routing for double layer
- Auto routing for double layer
- Auto routing for Multi-layer
- Design rule setting and manufacturing requirements
- LPKF technique

Day 5

- Soldering –desoldering technique.
- Generating Output documentation
- How to add important information for manufacturers?
- How to generate professional documentation?
- Assembly drawings
- Gerber files
- Gerber file generation
- Drill file generation
- Assembly file generation
- BOM file generation

01039 Electrical Protection Devices: Construction & Maintenance

Course Description

Industrial and commercial facilities are more dependent on reliable power systems than ever before. The goal of protection devices is to allow for normal equipment operation as well as to protect the main parts of the electrical systems from damage. This course is designed to help the participants to understand how electricity works, and how to work with it safely, it is designed to present fundamental information about protection devices, and how they function.

Course Objectives

Understanding how electricity works
Being familiar with terminology like "volts", "current", "amps", and the like
Knowing the importance of fuses and circuit breakers, and how they function
Understanding the concepts of "insulation" and "grounding"
Working safely with and around electrical equipment
Knowing what to do in electrical emergencies

Who Should Attend?

- ✓ Electrical engineers
- ✓ Supervisors
- ✓ Technicians
- ✓ Those who are responsible of the protection of industrial power systems.

Course Details/Schedule

Day 1

- How Electricity Works
- Fuses and Circuit Breakers
- Grounding and GFIs
- Safe Work Practices
- Outlets, Plugs and Extension Cords
- Working With Electrical Equipment

Day 2

- Using Ladders Around Electricity
- Electrical Emergencies
- OSHA and EPA regulations overview
- Personal Protective Equipment (PPE)

- PPE Testing & Maintenance
- Insulated Tools

Day 3

- Non-contact Test Equipment
- Safe Use of Electrical Testing Instruments
- Maintenance Procedures for both AC and DC Systems
- Torque Connections
- Connection Resistance
- Thermal Imaging

Day 4

- Over-current Device Specification & Selection
- Short Circuit Analysis
- Energized Work Permits (EWP)
- Technical Workforce & Management Responsibilities
- High Voltage Awareness
- High Voltage Safe Work Practices

Day 5

- PPE, Test Equipment, Capacitor Safety
- Equipment Specific Procedures & Subsequent Labeling
- PPE Determination Exercises
- Operating High Voltage Disconnects
- Attaching Grounding Cables

01040 Diesel Generator: Operation and Maintenance

Course Description

This technical course covers the fundamentals of operations and maintenance of power generators. It includes a detailed study of power generators and voltage regulators, and the interaction between the two. The course also provides a solid understanding of generator paralleling as well as generator/regulator response to changing loads and system voltages.

Course Objectives

Understanding the function of the components in power generators
Being able to operate power generators safely and effectively
Describing operation of common generator voltage controls
Learning the electrical tests performed on generators
Understanding how to maintain the different parts of the generators

Who Should Attend?

- ✓ Field engineers
- ✓ Maintenance technicians
- ✓ Electricians
- ✓ Those who are involved in operating and maintaining generators

Course Details/Schedule

Day 1

- Electrical Theory Review
- Magnetism
- AC Generators
- Power
- Generator Construction
- Stator & Windings
- Frame
- Core
- Stator Bars
- Wedges
- End Support
- End Shield

Day 2

- Bearings
- Generator Rotor
- Forging/Winding
- Retaining Ring
- Fans/Blowers
- Collector Rings
- Generator Cooling
- Gen Support Systems
- Gas Control System
- Seal Oil System
- Stator Winding Cooling
- Generator Voltage

Day 3

- Regulators
- Automatic Voltage Regulators
- Regulator Protective Features
- Protective Relays
- Operator Response to Protective Relays
- Types of Relays
- Relay Descriptions
- Synchronizing and Operating
- Electrical Power Systems
- Reactive Power
- Generator Voltage Controls
- Synchronizing the Generator

Day 4

- Generator Capability
- Operational Limits
- Abnormal Operations
- Unbalanced Phase Currents
- Loss of Field
- Off Frequency Operation
- Operation in Air
- Pre-outage Preparation
- Safety
- Parts Identification
- Tooling

- Lifting Devices

Day 5

- Site Planning
- Technical Info.
- Replacement Parts
- Schedules
- Outage Management
- Pre-Outage Inspections
- Generator Maintenance
- Disassembly
- Cleaning & Inspection
- Electrical Testing
- Reassembly

01041 Power System Control and Protection

Course Description

Power system operations and control continue to be utility mission-critical activities, focused on the reliability and security of the grid as well as on economic dispatch of the system. in this course, participants will learn the fundamentals of power system dispatchers as well as fossil fuel and hydroelectric generating station switchboard and control operators.

Course Objectives

Being familiar with the constraints in power system operation
Understanding principles of frequency control
Learing voltage and power flow control principles
Being familar with Real and Reactive Power Scheduling
Understanding the fundamentals of Preventive, Emergency and Restorative Control
Practicing Power System Structures planning and coordination

Who Should Attend?

- ✓ Power plant and system operators
- ✓ System planners
- ✓ System security monitors
- ✓ Electric power marketers and brokers

Course Details/Schedule

Day 1

- Overview of power system operations and control
- Security analysis framework
- Role of the EMS (energy management system)
- Optimal power flows
- Optimization
- Economic dispatch problems
- Formulation of optimal power flow problem
- Solution methods

Day 2

- Objective functions and representation of constraints
- Applications to dispatch and rescheduling
- Pricing information and spot pricing

- Role of reactive power
- Resource scheduling and commitment
- Nature of resource scheduling problem
- Time hierarchies
- Objectives and constraints

Day 3

- Unit commitment and hydro-thermal coordination
- Role in EMS
- State estimation
- Fundamental notions
- Static state estimation - role and formulation
- The least squares state estimation solution
- Constrained weighted least squares estimation

Day 4

- Key functions and their interrelationships
- Measurement requirements
- Observability
- Bad data identification/ detection, analysis and processing
- Electricity restructuring
- Transition from monopoly to competition
- Competitive electricity markets
- Market design
- Interrelationships between various markets

Day 5

- Impacts of restructuring and competition
- Unbundling
- Nature of transmission services
- Congestion management
- Ancillary services
- Informational needs

01042 CYMGRD-Grounding Grid Analysis

Course Description

The CYMGRD software is a substation grounding grid design and analysis program specially designed to help engineers optimize the design of new grids and reinforce existing grids, of any shape, by virtue of easy to use, built-in danger point evaluation facilities. User-friendly data entry, efficient analysis algorithms and powerful graphical facilities render the CYMGRD software an efficient tool that helps the engineer arrive at technically sound and economical designs. The CYMGRD software will be used along the course.

Course Objectives

Understanding the objectives of the grounding system
Understanding the grounding grid analysis
Identifying the conditions of danger
Understanding the selection of grounding conductors and rods
Evaluating ground resistance

Who Should Attend?

- ✓ Engineers
- ✓ Technicians
- ✓ Supervisors
- ✓ Anyone who is involved in substation grounding grid design and analysis

Course Details/Schedule

Day 1

- The objectives of the grounding system
- Definition of relevant terms: Ground Potential Rise (GPR), Touch, Step and Mesh Voltages
- The need for grounding
- Conditions of danger
- The grounding problem
- Range of tolerable current
- Tolerable body current limit
- Accidental ground circuit
- Criteria of tolerable voltage
- Selection of grounding conductors and rods
- Soil characteristics

- Soil structure and selection of soil model

Day 2

- Evaluation of ground resistance
- Determination of maximum grid current
- Ground grid design procedure
- Soil Resistivity Measurements (e.g. by the Wenner method)
- Selection of adequate soil model
- Conductor sizing
- Calculation of maximum permissible touch and step voltages
- Preliminary grounding grid design
- Calculation of the grid resistance
- Calculation of the maximum grid current
- Calculation of the Ground Potential Rise
- Calculation of the mesh voltages

Day 3

- Calculation of the step voltages
- Verification of the touch voltage criteria
- Verification of the step voltage criteria
- Modifications of the preliminary design
- Final design
- Grounding Grid Design Analysis with CYMGRD
- CYMGRD Presentation
- CYMGRD Graphical User Interface
- Presentation of the different menus
- Presentation of the different views
- Notions of study and project
- Soil Resistivity Assessment

Day 4

- Entry of onsite soil resistivity measurements
- Selection of adequate soil model
- Safety assessment
- Calculation of maximum permissible touch voltage
- Calculation of maximum permissible step voltage
- Conductor sizing
- Entry of earth fault current
- Selection of conductor material
- Calculation of the conductor minimum required size

- Grounding grid analysis
- Split factor and decrement factor calculation
- Entry of the grid data

Day 5

- Calculation of the maximum grid current
- Calculation of the grid resistance
- Calculation of the Ground Potential Rise
- Verification of the touch voltage criteria
- Touch and Surface potentials contours
- Contour color coding and Safety analysis
- Spot-check danger point evaluation
- Verification of the step voltage criteria
- Profile voltage plots
- Inspecting potential profile plots
- Remedial Measures for Hazardous Situations

01043 Industrial Electronics Maintenance Skills

Course Description
This training course is designed to take participants step-by-step through the knowledge and skills they will need to start their career in the Industrial Electronics and Electrical Maintenance Technology field. They will learn the fundamentals of electricity and become an expert in dealing with electrical and electronic measurements and instruments. The course includes Fundamentals of Electronics, Electronic Circuits, Controls, and much more.

Course Objectives

Understanding fundamentals of industrial electronics and electrical maintenance
Practicing safe working methods on electrical systems
Using electrical test equipment effectively
Being able to select appropriate type of tools to be used in electrical maintenance
Using circuit diagrams as an aid to maintenance

Who Should Attend?

- ✓ Maintenance supervisors
- ✓ Electrical engineers
- ✓ Energy auditors
- ✓ Those who currently fulfil a maintenance role

Course Details/Schedule

Day 1

- Measuring voltage, current, power (wattage), power factors, and resistance in AC and DC circuits
- Testing solid state components
- Resetting circuit breaker after overload
- Testing and replacing faulty electrical control components
- Installing electric motors
- Defining theory of Ohm's law
- Wiring low voltage (less than 110 volts) control circuit
- Installing raceways and wiring on equipment

Day 2

- Installing PLC
- Installing motor control circuitry on equipment
- Installing variable speed AC/DC drive on equipment

- Maintaining proper ground requirements
- Determining appropriate types of motors for a given mechanical load and determine the over-current protection
- Interfacing a robot to external peripheral equipment
- Electrical Electronic Mechanic
- Measuring synchronous data communication equipment

Day 3

- Installing pre-manufactured fiber optics lines
- Ordering materials needed for a job
- Recording preventive maintenance activities
- Observing corrective maintenance/repair on machinery
- Interpreting charts, table, and graphs
- Understanding the principles of quality assurance
- Participating in the implementation of quality assurance programs

Day 4

- Identifying the effects of continuous quality improvement
- Utilizing problem solving and critical thinking techniques to identify and solve problems
- Discussing data collection techniques for the quality assurance and problem solving process
- Identifying opportunities for applying problem solving skills
- Discussing different types of drawings
- Interpreting drawings
- Interpreting symbols

Day 5

- Identifying types of measuring instruments
- Using appropriate measurement instrument for a measurement task
- Reading measuring instruments
- Identifying the appropriate formula and units for a measurement task
- Differentiating between English and Metric measurement systems, when necessary
- Communicating measurements using proper symbols or words
- The importance of calibration

01044 Arc Flash Analysis and Prevention Techniques

Course Description

This course is designed to save lives, prevent disabling injuries, and prevent damage to plants, building and equipment. In this course, participants will gain an immense respect for the power of electricity. They will learn about personal safety for working on or around electrical systems and equipment, how to use proper materials and procedures for doing electrical work and the potential consequences for themselves or others if they don't

Course Objectives

Understanding how to identify electrical hazards
Being familiar with the difference between "qualified" and "unqualified" electrical workers
Being familiar with the safe approach distances to exposed electrical conductors
Learning the proper work practices in wet or damp locations containing electricity
Understanding the safety requirements for electrical installations

Who Should Attend?

- ✓ Electricians
- ✓ Maintenance & electrical supervisors
- ✓ Machine operators
- ✓ Field service technicians
- ✓ Building engineers
- ✓ Stationary engineers
- ✓ Building & maintenance managers
- ✓ Environmental safety & health personnel

01045 Electrical Insulators Specifications

Course Description

Overview of insulating materials in high voltage equipment. Electrical insulation systems and design concepts. Degradation mechanisms and defects. Basic methods for diagnostics and monitoring based on insulation resistance, loss tangent, and capacitance. Advanced methods based on dielectric spectroscopy, polarisation and depolarisation currents, recovery voltage. Partial discharge measurements based on oscilloscope techniques, phase resolved acquisition techniques, acoustical PD measurements, PD localisation. On-line techniques. Chemical and physical analyzing methods. High voltage test methods: AC, DC and impulse. Power equipment: generators, breakers, transformers, cables, capacitors, outdoor insulation, etc. Participants also learn how to choose the right solution for badly performing insulators in high voltage stations and lines. When the right actions and procedures are selected using a full understanding of the background data, and how targeted maintenance can improve the performance of insulators and bushings with pollution and wetting problems

Course Objectives

Understanding the installation, fitting, fabrication and attachment of insulation, finishing and weatherproofing materials to a high standard of workmanship
Describing the mechanisms behind ageing and deterioration of electrical insulation systems
Describing the principle of operation for basic methods of diagnostics and monitoring
Analyzing the information content given by the different instruments
Analyzing possible error sources in the results
Using and developing models for interpretation of measurement results based on equipment design and material properties
Identifying when there is a need or not for a complementary high voltage stress test

Who Should Attend?

- ✓ Maintenance supervisors
- ✓ Electrical engineers
- ✓ Electricians
- ✓ Service technicians
- ✓ Line and station engineers
- ✓ Reliability specialists

01046 Transmission Lines Operations, Protection and Maintenance

Course Description

This course begins with an overview of basic transmission Line terminology, distance theory, distance schemes in addition to differential Line protection. it will continue to cover industry maintenance and asset condition assessment techniques available to manage reliability, safety and other risk factors, as well as methodologies to prioritize these activities. In addition, the course will cover transmission line asset end-of-life replacements and refurbishments with examples that will allow utilities to establish the most economic alternatives. The information will be structured in a way to facilitate work programming that can be used for business planning and regulatory submissions

Course Objectives

Describing how transmission and distribution systems generally operate
Identifying the basic components of a transmission and distribution system and explain their functions
Being familiar with relay types, selection & calibration, and their applications in different location of electrical power network
Learning about the power transformers characteristics and maintenance
Understanding how and why transformers testing and maintenance are important
Describing the flow path of electricity from a power plant, through a typical T&D system, to the customer

Who Should Attend?

- ✓ Maintenance supervisors
- ✓ Electrical engineers
- ✓ Electricians
- ✓ Service technicians
- ✓ Line and station engineers
- ✓ Reliability specialists
- ✓ Plant engineers
- ✓ Electrical maintenance
- ✓ Service technicians
- ✓ Contractors
- ✓ Anyone who is involved in planning, installing, and configuring electrical transmission lines

01047- Power Plant Operations and Maintenance

Course Description

The Power Plant Training program will prepare you for an entry-level career as a power plant operator. These plants use hydrocarbon-based fuels (oil, gas, or coal) to produce electricity, and the plants are operated by power plant operators. Power plant operators are highly paid and enjoy a stable work environment. There's an ongoing need for entry-level personnel

Course Objectives

Operate a power plant with safety as the prime consideration
Monitor instrumentation and the operation of equipment
Make adjustments to keep system process variables, such as flows, temperatures and pressures, within acceptable ranges
Detect potential and actual problems and take corrective action to prevent the interruption of system operations
Analyze operational trends and take corrective actions
Use standard operating procedures to start and stop production equipment
Maintain communication with other operators, maintenance, and management

01048 Switchgear and Circuit Breakers

Course Description

Circuit breakers and switchgear are necessary system items for the electrical control of electrical plant. The safe use of these devices and associated equipment requires correct initial selection, operation and maintenance. It is also necessary to have a detailed understanding of how these devices should be installed, the local substation and system ratings, and how the various breakers operate, in order to enable accurate troubleshooting and subsequent repair. The course will provide participants with a solid understanding of Circuit Breaker and switchgear theory and standards. The course will also make participants aware of issues concerning the proper application, installation and maintenance of circuit breaker equipment.

Course Objectives

Understanding fundamentals of operating switchgear and circuit breakers
Understanding the operation of switchgear components
Being able to select appropriate type and rating of circuit breakers and switchgear
Learning the troubleshooting procedures for circuit breakers and associated switchgear
Being familiar with the use of test equipment

Who Should Attend?

- ✓ Maintenance supervisors
- ✓ Plant engineers
- ✓ Electricians
- ✓ Plant mechanics
- ✓ Service technicians
- ✓ Contractors
- ✓ Energy auditors
- ✓ Layout professionals

Course Details/Schedule

Day 1

- Switchgear, theory and applications
- Switchgear and circuit breaker control drawings
- Switchgear ratings
- Short circuit current estimation

Day 2

- Low-voltage (LV) and Medium-voltage (MV) circuit breakers overview
- The purpose of LV and MV circuit breakers
- Applications of LV and MV circuit breakers
- Modern LV and MV trip units

Day 3

- LV Electrical Circuit Breaker (ECB) construction and adjustments
- LV ECB operations and control
- LV ECB maintenance
- LV ECB troubleshooting and repair
- LV ECB testing and inspections

Day 4

- MV ECB construction and adjustments
- MV ECB operations and control
- MV ECB maintenance
- MV ECB troubleshooting and repair
- MV ECB testing and inspections

Day 5

- General circuit breaker maintenance
- Maintenance intervals
- Grounding
- Principles of grounding
- Grounding procedures
- Ground and test device
- Ground fault protection
- Switchgear maintenance

01049 Basic Instrumentation For Process Operators

Course Description

Instrumentation plays a critical role in the measurement and control of modern process plant operation. Instruments are used to measure and control the condition of process streams as they pass through a plant and to automatically stop or shutdown the process if the parameters exceed certain limits. This module provides fundamental knowledge & understanding of Process Control Systems and Elements and Electronic Control Instrumentation.

Course Objectives

Identifying the Integral Control Safety System Concept
Identifying the Control Loop components and to describe their function
Describing equipment used to measure process variables
Explaining the different types of control loops
Identifying and state the main features of combined control loops
Describing the use of cascade control
Describing the use of ratio control
Describing the use of feed-forward control

Who Should Attend?

- ✓ Engineers
- ✓ Process operations professionals
- ✓ Field & DCS operators
- ✓ Oil & Gas Treatment technicians

Course Details/Schedule

Day 1

- Introduction to Instrumentation
- Integral Control Safety System (ICSS) Concept
- Basic Control Loop Elements & Function
- Control Loop Instrumentation

Day 2

- Temperature Variable and Measuring Devices
- Pressure Variable and Measuring Devices
- Pressure Transducers
- Flow Variable and Measuring Devices

- Level Variable and Measuring Devices

Day 3

- Modern PID Controller
- Ratio Control
- Cascade Control
- Feed Forward Control
- Control Loops Applications & Operation.

Day 4

- DCS
- SCADA
- PLC
- Fire & Gas System

Day 5

- ESD Construction
- ESD Applications
- Exercises

01050 Digital Image Processing Using MATLAB (DIP)

Course Description

The main objective of this course is to introduce fundamental and advanced concepts of digital image processing and computer vision using practical techniques will be applied in both spatial and frequency domain. All our manipulations will be achieved using MATLAB.

Course Objectives

Understand principles of digital image processing and computer vision
Have sufficient experience to filter noisy image and to restore degraded one.
Understand the difference between spatial domain and frequency domain techniques
Use features extraction techniques for making intelligent machine decisions

Who Should Attend?

- ✓ Undergraduate Engineering students,
- ✓ Master students,
- ✓ Engineers

Course Details/Schedule

Day 1

- General Introduction to DIP
- Principles of Digital Image processing,
- The histogram & histogram equalization,

Day 2

- Image Filtering (Spatial Domain techniques),
- Image degradation & restoration process

Day 3

- Edges Detection techniques & boundary description,
- Morphological operations,
- Geometric spatial transformation & Interpolation,
- Colored Image processing

Day 4

- Image processing in the frequency domain,
- Dynamic objects detection & features extraction techniques,

Day 5

- Wavelets and their applications
- Gabor filter and its application

01051 Introduction to Digital Filters with Audio Applications

Course Description

Modern audio production involves an ever-expanding set of specialized tools. Each year, there are the number of applications using audio increases. Recently, audio has moved from analog recording to totally digital recording using computers. This course provides a brief overview of audio and its production.

Course Objectives

Learning how sound waves work
Discussing audio signal processing
Addressing harmonic distortion in Audio Amplifier
Exploring the types and functions of audio filters
Understanding the basic concepts of Digital Signal Processing (DSP)

Who Should Attend?

- ✓ Audio engineering
- ✓ Technicians
- ✓ Anyone who is involved in audio processing field

Course Details/Schedule

Day 1

- Introduction of Audio
- Sound waves
- Electronic version
- The audible range
- What does sound consists of?

Day 2

- Amplifiers
- Sources of undesired Total Harmonic Distortion (THD)
- Output (crossover) distortion
- Amplifier distortion
- Harmonic distortion
- Intermodulation distortion

Day 3

- Audio signal processing
- Analog vs. digital formats
- Specialized recording equipment
- Frequency Modulation (FM)
- FM spectrum
- FM performance

Day 4

- An introduction to filters
- Some key points and terms
- Tone control
- Major types of filters
- Pass filters and distance
- Low pass filter
- High pass filter
- Band pass filter
- Passive and active filters

Day 5

- Digital signal processing (DSP)
- DSP's components
- Choosing the right digital signal processor
- Implement algorithms on a hardware platform
- Programming considerations for real-time I/O

TRAINING PROGRAM

FOR ELECTRICAL AND ELECTRONIC ENGINEERING

EHVE-ELECTRICAL HIGH VOLTAGE ENGINEERING-01
EMVE-ELECTRICAL MEDIUM VOLTAGE ENGINEERING-02
ELVE-ELECTRICAL LOW VOLTAGE ENGINEERING-03

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