SUBSTATION DESIGN TRAINING

Training Centre:
Advance Group of Institutions
C-1, Second Floor Near Nirman
Vihar Metro Station
M:- 8467024957,7531923094
www.advanceelectricaldesign.com
info@advanceelectricaldesign.com

ADVANCE ELECTRICAL DESIGN & ENGINEERING INSTITUTE
(Registered under MSME & An ISO 9001:2008 CERTIFIED)

Training Centre Delhi:
C-1, Second Floor, Nirman Vihar
Metro Station Laxminagar, Delhi
110092 , Ph:8467024957
Websites :
www.advanceelectricaldesign.com
www.solardesignt raining.com/
Advance Electrical Design & Engineering Institute (AEDEI), **Registered under MSME**, An **ISO 9001:2008** Certified Institute of Electrical Design & Engineering training programs for Dedicated to Electrical Engineers. AEDEI is latest venture for providing the quality education in the best possible facilities is a key aim of Skill developments for various verticals in Electrical Engineering design.

**OUR MISSION**

Our Technical Institute offers a full range of training in electrical, Electronics & Communication and mechanical design courses full fill requirement of current industries,

These courses which encompass all aspects of core electricity from fundamentals to in-depth of design knowledge are based on several value adding pillars.

Our trainers share their know-how and design experience through demonstrations on dedicated equipment on industries. Courses include training dedicated documents and the possibility of follow-up with regular /internship /e-learning modules. Over one to 45 days depending on the topic, trainees get in-depth, hands-on instruction and the opportunity to practice their acquired know-how.

We cover all the range of engineering industries skills disciplines:

- Electrical System Design
- Solar Power Plant Design
- Heat Ventilation and Air Conditioning (HVAC)
- Solar Structure Design
- Hydro Power Plant Design
- Technical Transformer Design
- QA/QC Electrical Engineer
- Power System Software
OBJECTIVES OF TRAINING

- To make the Engineers expertise in Various engineering design field by experience faculty
- Engineers Job oriented programs.
- Develop the key skill in designing for employments.
- To familiarize with industries norms (BIS Code, NEC Code, IEC Code, IEEE Code, NFPA Code etc)
- To share experiences of various best practices.
- To clarify their doubts in the execution process.

KEY FEATURES OF TRAINING

- First Certified institute for electrical, Electronics, Mechanical and Civil Engineers
- Employment opportunities - EPC Companies, thermal power plant and Solar.
- Government sector (Contract Basis), Manufacturing, construction (Electrical Work).
- Placement Partner with 10+ companies in India.
- Expert Faculty from Industries experience more than 10 year and Electrical Consultants.
- Hands on training facility on live projects (Power Sector and Infra sector)
- Available Latest software for Designing (ETAP 12).
- study materials provide by AEDEI
- Individual Candidates provided projects for designing.
- Certified by Design Engineer - Structure.
SYLLABUS OF SUBSTATION DESIGN

Sub-Station Design Development

- Introduction to Bus-Bar Schemes
- Detail Study of One and Half CB Scheme
- Detail Study of Double Main and Transfer Bus Scheme
- Introduction to Key SLD
  Development of Detail SLD
- Introduction to Equipments
- Layout development from SLD
- Inter Coordination between SLD, Plan and Section
- Structure Loading Layout
- Clearance Diagram Development
- Cable Trench Layout Development
- EKD & BOM Development

Sub-Station Design Calculations

- Rigid B/B Design
- Flexible B/B Design
- Wind Force Calculation
- Sag Tension Calculation
- Rigid SCF Calculation
- Flexible SCF Calculation
- Pinch Force Calculation
- Cantilever Strength Calculation

DESIGN AND ENGINEERING OF SWITYARD

- Selection of project – Classification – Zone/Area wise
- Electrical Clearance of substation
- Insulation Coordination calculation of Equipment
- Outdoor Substation Layout
control room layout
- types of bus-bar schemes of substation
- substation main equipment
- sizing of transformers
- reactive compensation equipment
- shunt capacitors
- static VAR systems
- selection and sizing of voltage transformers (VT) for switchyards
- selection and sizing of current transformers (CT)
- HT/LT circuit breaker selection and sizing
- control & relay panels
- standard protection schemes for substation and transmission line
- substation automation system design
- selection of PLC, communication protocol
- benefits of substation automation system
- substation automation with IEC 61850 Standard
- selection and sizing of disconnectors and earth switches (isolators)
- selection and sizing of lightning protection
- selection of luminaries
- selection and sizing of bus support insulators
- selection and sizing of strain insulators
- power line carrier equipment (PLCC)
- earthing of switchyard
- cabling of switchyard
- fire protection facilities in substation
- DC auxiliary supply/ battery bank sizing and selection

Ref. Std
- IS 5613: Code of practice for design, installation and maintenance of overhead power lines.
- IEC 60071-2: Insulation co-ordination – Part 2:
- IEC: 62271-100: High-voltage switchgear and controlgear
- IEC 60853: Sections on operating conditions – Reference operating conditions and selection of cable type
- IEC 60949: Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects
- IS 3646: Code of Practice for Interior Illumination
- IEC60909: Short-circuit currents in three-phase A.C. systems
DESIGN AND ENGINEERING OF TRANSMISSION LINE

- Transmission Planning
- Indian Electricity Rules and State Regulations for transmission line
- Choice of Route of transmission line
- Selection of conductors for Overhead transmission
- Spacing of Conductors in transmission lines
- Calculation of SAG and Tension
- Overhead transmission line Clearance
- Selection of structure Pole, Lattice, Tower
- Survey of transmission line upto 220KV
- Sag Template and Tower Spotting
- Classification of soil of Soil for 220KV transmission line
- Tower Erection at Site Condition
- Choice of Spans for 440kV transmission
- Transmission line Earthing Calculation
- Selection of Transmission line Insulator and fittings
- Overhead transmission line lightning Calculation
- Transmission line mainenance and erection solution

Cable Sizing and Selection of single Phase and Three Phase

- Load Details Calculation
- Cable type and Construction features
- Site Installation Conditions
- Cable Selection Based on Current Rating of feeder
- Base Current Ratings of feeder
- Installed Current Ratings of Cable
- Cable Selection and Coordination with Protective Devices
- Feeders load detail
- Motors load detail
- Voltage Drop of cable
- Cable Impedances
- Maximum Permissible Voltage Drop by ANSI and IEC std.
- Calculating Maximum Cable Length due to Voltage Drop
- Short Circuit Temperature Rise calculation of cable
- selection Minimum Cable Size Due to Short Circuit Temperature Rise
- Initial and Final Conductor Temperatures withstand capability of cable

Ref.Std.IEC

- IEC 60364-5-52: election and erection of electrical equipment –Wiring systems
- IEC 60364-5-54:Selection and erection of electrical equipment –Earthing arrangements, protective conductors and protective bonding conductors
- IEC 60502-2: Power cables with extruded insulation and their accessories for rated voltages from 6kV up to 30kV
- IS 7098 (Part 2)-1985: Specification for Cross-linked polyethylene insulated PVC sheathed cables—Specification (3.3kV to 33kV).
- IS 1255: Code of practice for installation and maintenance of power cables up to and including 33 kV rating

Earthing Design and Calculation of Power Plants

GENERAL GUIDELINES

- Factors Influencing The Choice Of Earthed And Unearthed Systems
- System Earthing & Equipment Earthing Connections To Earth
- Resistance to Earth and Earth Electrode Current Density at The Surface of an Earth Electrode
- Selection of an Earthing Conductor and Connection of an Electrode
- Chemical Earthing Calculation
- Voltage Gradient around Earth Electrodes
- Connections to Earth Electrodes — Earthing And Protective Conductors
- Earthing Arrangement for Protective Purposes
- Earthing Arrangement for Functional Purposes
- Earthing Arrangements For Combined Protective And Functional Purposes
- Equipotential Bonding Conductors
- Typical Schematic of Earthing And Protective Conductors
- Earthing In Power Stations and Substations
- Earthing Associated With Overhead Power Lines
- Calculation of Earth Fault Currents
- Measurement of Earth Resistivity
- Measurement of Earth Electrode Resistance
- Measurement of Earth Loop Impedance
- Equipotential Bonding Conductors

Earthing Calculation for Switchyard and Power Plants

- Step Voltage, Touch Voltage
- Design Procedure
- Calculation of Maximum Step And Mesh Voltages
- Refinement of Preliminary Design

Application of Equations For Em And Use of Computer Analysis In Grid Design

Std. Ref. IS, IEC. IEEE, BS
BS 7430 Code of practice for Earthing
IS : 3043 Code of Practice for Earthing