2017

SUBSTATION DESIGN TRAINING

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

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ABOUT US

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 ofStrain 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

IEEE Std 80-2000 :Guide for Safetyin AC Substation Grounding.
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 826-1991: Technical report on loading and strength of overhead transmission lines.
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 maintaince 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 cablesup 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 af 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

Earhing 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 EmAndesUse of Computer Analysis In Grid Design
Std. Ref. IS, IEC. IEEE, BS
IEEE Std 80-2000 Guide for Safetyin AC Substation Grounding.
BS 7430 Code of practice forEarthing
IS : 3043Code of Practice for Earthing