A Comprehensive 3-Days Instructional Training Course on Electrical Installation Design and Calculations

<table>
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<tr>
<th>Date:</th>
<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
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<td></td>
<td>20 Jul 2018 (Fri)</td>
<td>27 Jul 2018 (Fri)</td>
<td>3 Aug 2018 (Fri)</td>
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<tr>
<td>Duration:</td>
<td>9.00 am to 5.30 pm (8 hrs)</td>
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<tr>
<td>Venue:</td>
<td>18 Sin Ming Lane #06-01 Midview City Singapore 573960</td>
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<tr>
<td>CPD:</td>
<td>❖ 21 PDUs qualified by PE Board</td>
<td>❖ 21 STUs (M&amp;E)</td>
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Course Synopsis

A Comprehensive instructional training course on Electrical Design and Calculations is designed to provide high quality guidance that is simple to follow and how to design an electrical installation to compliance with the technical requirements of the new (2018) Edition of the Code of Practice for Electrical Installation CP 5.

Course Schedules and Programmes:

**Day 1**
An overview and a quick run into the key topics of the regulations as set out in the Code of Practice for Electrical Installation, based on the latest (2018) Edition of CP 5.

**Day 2**
- Sharing of design experience based on trainer’s own work and field experiences
- Design Process and Load Estimations
- Power Distribution and Protection Systems, etc.
- Overcurrent and Electric Shock Protections
- Switching and Isolation, Electrical Fire Protections
- Earthing and Bonding and Installations in Special Locations

**Day 3**
Design Problems and Solutions
Course Objectives

This comprehensive course is intended to help working Electrical Engineers and Contractor’s Engineers, as well as mid-career electrical design engineers in engineering consulting companies who are engaged in designing and installing electrical systems for commercial buildings and industrial plants.

The course should also be suitable for intermediate grade electrical designers who are hoping to move into a position of more responsibility as project manager and/or chief electrical designer, and those younger electrical engineers preparing to sit for the PPE Part II Examination conducted by the PE Board.

It should also be a valuable assistance to senior engineers of other disciplines who have some project responsibility requiring coordination with electrical engineers and installers in project works. It should also be helpful to electrical technicians, testing and commissioning inspectors, LEWs and RTOs.

Because the course materials are electrical in content, naturally it is written with electrical designers in mind. It assumes that the designers have some previous knowledge and experience, but there will always be problems arising with which he is not completely familiar.

Depending on the course participants’ background, the contents of the course may occasionally seem possibly too advanced or too elementary. The subject topics were selected and arranged in accordance with two criteria:

- Materials are arranged and presented that will make the designer's task easier and speedier.
- In addition, the data and information are presented in the order of requirement as the design progresses.

Trainer

Er. Lee Keh Sai is a Chartered Electrical Engineer and a Registered Professional Engineer with more than 50 years of industrial experience. He specializes in Electrical Power Engineering, Energy Management and Power Quality Solutions.

Er. Lee is the Principal of K.S.Lee & Associates which he established in 1970. He has provided consultancy services to many MNC and SMEs. Prior to the establishment of his consultancy services, he held senior staff positions in the Electricity Department of the former Public Utilities Board and later with Shell Eastern Petroleum at their Pulau Bukom Refinery Complex.

Er. Lee has served in various capacities in many professional associations, government agencies and educational institutions. He had previously served as Deputy Chairman, Board of Governors, for both the ITE and Singapore Polytechnic.
Course Contents

Part 1
1. Introduction and an overview of CP 5, What it contains?
2. Sharing of experiences based on trainer’s own work experiences
3. Brief description of electrical design process and calculation via applications of CP
4. Preparation of Design Requirements:
   a) The Designer’s Job File
   b) The Building and Plot Plan
   c) Client’s specifications and other requirements
   d) Motor list
   e) Summary of design criteria
   f) Schedules and Progress Chart

Part 2
1. Fundamental Requirement for Planning and Designing of Electrical Power Distribution Systems for buildings and Industrial plants
2. Design sequence
3. Identify the loads and their characteristics
4. Standby Systems
5. Supply Characteristics
6. Typical One-line Diagram & Proposed Distribution Systems
7. Distribution system and incoming switchgear arrangement
8. Main distribution station – High Voltage Switchgear
9. Outline Diagram of Proposed Distribution System
10. Low- Voltage Distribution System
11. Voltage drop in Consumer’s Installations
12. Distribution System Voltage drop
13. Prospective Fault Currents
14. Electric Shock Protection
15. Selection of Protective Conductors

Part 3
1. Maximum demand and diversity
   a) Demand factor
   b) Diversity factor
   c) Coincidence factor
   d) Load factor
   e) Contribution factor
2. Preliminary installation design outline
3. Final circuit current demand
4. Diversity between final circuit
5. Estimation of max demand for more complex installation
6. Estimation method
7. Sub-distribution point estimation
8. Socket outlet circuits
Part 4
1. Selection of cables for current – carrying capacity
2. Overcurrent requirements
3. Fault current / overload current, including small overload
4. Explanation on tabulated current carrying capacity (Iₜ) Tables
5. Overcurrent Protective device factor (Cᵢ) rating correction factors for:
   a) Ambient temperature rating factor (Cₐ)
   b) Group rating factor (Cg)
   c) Grouping factors for three phase and single phases circuits in common enclosure
   d) Thermal installation factor (Ci)
   e) Buried cable circuit rating factor (Cc)
   f) Soil thermal resistivity rating factor (Cs)
   g) Depth of laying rating factor (Cd)
6. Protection against overload and short circuit
7. Overcurrent Protection of Conductors in parallel
8. Protection against fault current only calculate the magnitude of fault current

Part 5
1. Designing of simple installations and final circuits
2. Supply characteristics and earthing arrangements
3. Declared supply characteristics
4. Fault rating of Switchgears
5. Final circuit overcurrent protective devices and cables
6. The Radial final circuits
7. Tabulated cable rating (Iₜ) and as installed current carrying capacity (I_z)
8. Circuits without overload protection and circuits with overload protection
9. Final circuit voltage drop limitations
10. Radial final circuit voltage drop and ring circuit voltage drop
11. Fault protection
12. Short-circuit current protection
13. Protective conductors

Part 6
Voltage drop calculation under normal load conditions
1. The simple approach
2. The more accurate approach taking accounts of conductor operating temperature and load power factor
3. Voltage drop in ring circuits
4. Voltage drop in ELV Circuits

Part 7
1. Determination of maximum and minimum prospective fault current by calculation
2. Example calculations

Part 8
1. Electric Shock Protection
2. Protective Measure: Automatic disconnection of supply
3. Maximum disconnection times
4. Circuit calculations
Part 9
1. Protection against fault current and introduction to the adiabatic equation
2. Protection by one device
3. Protective conductors of same material as Line and Neutral Conductors and Protective Conduct of a different material to Line and Neutral Conductors
4. Checking for compliance of a reduced current carrying Capacity Protective Conductor meeting Table 54.7 requirements through selection or Calculation. The calculations can be carried out in three different ways
5. Simple calculation – when the protective device is circuit breaker to BSEN 60898 RCBOs to BSEN 61009.
6. Plotting protective conductor adiabatic

Part 10
1. The use of a sheath or armour of a cable as protective conductor
2. Plotting cable armour adiabatic
3. Calculation of armour capability

Part 11
The use of steel conduct and trunking as protective conductor

Part 12
1. Earthing and bonding conductors
2. Main protective bonding conductor
3. Supplementary bonding conductors
4. Impedance of copper and aluminium conductor
5. Conductor resistance and temperature

Part 13
Impedance of cable from voltage drop tables
1. Single phase circuit
2. Three or four core-cable, three phase circuit
3. Calculations associated with site testing earth fault loop impedance Zs
4. Earth fault loop impedance corrections for temperature
For enquiry, please call ACES Secretariat at Tel: 6659 5023
Kindly sign and submit your completed registration form to secretariat@aces.org.sg

PAYMENT BY CHEQUE:

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<th>Code</th>
<th>Date</th>
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<td>ACES Member/</td>
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<td>M&amp;E RE/RTO</td>
<td>Member</td>
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<tr>
<td>E1</td>
<td>Day 1: 20 Jul 2018 (Fri)</td>
<td>9.00 am to 5.30 pm</td>
<td>$200</td>
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BY CHEQUE:

Cheque should be crossed and made payable to “Association of Consulting Engineers Singapore” and mailed to “18 Sin Ming Lane #06-01 Midview City, Singapore 573960, Attention: ACES Secretariat”.

[Note: On the back of the cheque, please indicate participant name & event name]

Terms and Conditions
By submitting and signing this application form, the company and individual applicant agree to the following:

a) The company and individual applicant has read and understood the terms of the flyer (if available) and the application form.
b) Payment for the course must be made before the course commencement date.
c) ACES reserves the right to amend any details relating to the course, revise the course fees without prior notice, cancel or postponed the course.
d) Request for withdrawal or replacement must be made in writing. Requests are subject to approval by ACES.
   - Written request for replacement must reach ACES before the course commencement date. There will be no additional charges for suitable replacement.
   - Written request for withdrawal that reaches ACES
      - At least 7 working days before course commencement: Full Refund
      - 4 to 6 working days before course commencement: 50% of the course fee Refund
      - 3 working days before and upon course commencement: No Refund

To be completed by Company and Individual Applicant

COMPANY APPLICANT
Name: ____________________________
Signature: _________________________
Date: _____________________________

INDIVIDUAL APPLICANT
Name: ____________________________
Signature: _________________________
Date: _____________________________

Company stamp (for company application)