



### About the Speaker

Dr. P.K. Sen, P.E., Fellow IEEE (2011), has over 44 years of combined teaching, research and consulting engg. experience.

Prior to joining Colorado School of Mines in 2000, Dr.Sen taught

for 21 years at the University of Colorado. His industrial experience includes power plants and substation engineering design, system & feasibility studies, protection and relaying and various aspects of power systems engineering applications. He has published over 140 technical papers on a variety of subjects related to Power Systems Engineering, Protection/Relaying, Electric Machines and Renewable Energy, Energy Policy, Power Quality and Arc Flash and Safety. Dr. Sen has supervised and/or mentored over 150 graduate students (including non-traditional students, and practicing engineers from the Utility Industries, REA's, Consulting Engineers, and others).He is a Registered Professional Engineer in the State of Colorado. Currently Dr. Sen is a Professor of Engineering and the Site Director for the (Originally NSF funded) Industry University Cooperative Research Center (IUCRC) Power Systems Engineering Research Center ([www.pser.org](http://www.pser.org)) at Colorado School of Mines. Dr. Sen is a very active member of a number of Professional Societies including IEEE PES/IAS, has been instrumental in providing seminars and short courses, conduct workshops, and provide training for technical personnel in the Rocky Mountain Region for the past 30 years. Dr. Sen is known in the industry, locally, nationally and internationally for providing educational opportunities for practicing engineers at all level, and for both undergraduate and graduate students. He is an inspiring and prolific teacher with passion. He has authored numerous prize winning papers at the IEEE conferences, and IAS Magazine.

Dr P K Sen is IEEE Industry Applications Society Distinguished Lecturer for year 2012 and 2013.

### IEEE Madras Section – IAS Chapter

The Institute of Electrical and Electronics Engineers (IEEE) is the world's largest professional society that has about 3.6 Lakh members in over 150 countries worldwide.

The IEEE Madras Section is one of the most active sections in India, coming under Asia – Pacific Region, the Region 10 of IEEE covering Tamil Nadu and Pondicherry states of India. IEEE Madras Section was formally started, as a subsection of Bangalore Section, in 1973. This sub section was elevated into a full section, in 1978.

IAS is the Industrial Applications Society. If you are interested to join IAS, to enrich your professional skills, then, logon to this link <http://www.ieee.org/index.html> and select Societies and Communities (or) contact us. You will gain valuable knowledge / skills and develop new contacts and get access to fine IEEE Standards, Books and educational program all at reduced price for members.

### Driving Directions :

From Airport, drive towards the City centre and take Left at the First fly over (Kathipara Fly over at Guindy) towards Bangalore / Porur / Poonamallee. The venue is around 7 KM from Airport.

From Central / Egmore Railway Station, travel towards Guindy and take right at Kathipara Flyover towards Bangalore / Porur / Poonamalle. The venue is around 18 KM from Chennai Central.

### For details, contact, Workshop Coordinators:

Ms. Geetha Hariharan

(Mob: 94443 98647, Email [gh@Intecc.com](mailto:gh@Intecc.com))

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**The Institute of Electrical and Electronics Engineers (IEEE) Madras Section IAS Chapter**

**IAS Distinguished Lecture Program**

**On  
Fundamentals of Electric Power Distribution Systems Design**

Shortcut Methods, Quick Estimation and Application Guidelines

**One-day short course and workshop by  
Dr. P.K. Sen,**

PE, Fellow IEEE,

Professor of Electrical Engineering, Colorado School of Mines, Golden, CO 80401, USA

&

Senior Consultant

NEI Electric Power Engineering, Inc.,  
Denver, CO. 80033

Friday, 6<sup>th</sup> January, 2012  
9.30 am to 5 pm

at

**Mortensen Hall**

L&T Construction

Larsen & Toubro Limited  
Mount Poonamallee Road,  
Manapakkam,  
Chennai - 600089

## About the Workshop

This one-day short course and workshop has been designed for practicing engineers (young or experienced), managers, advanced students and technical personnel interested in different aspects of Electric Power Distribution Systems as applied to Electric Utility, Power and Energy industry. The main objective of the workshop is to introduce the basic tools required for all power systems calculations following the IEEE Color Books and utilize in solving a number of design problems. The primary focus of this course is on the medium voltage (MV) and low voltage (LV) power systems with some references to the sub-transmission system. It is assumed that participants will have some basic knowledge of fundamentals of electric power systems. Practical experience is preferable, but not required. Emphasis is given on hand calculations and estimations. Numerous real world design problems will be solved during the entire workshop.

The short course and workshop will be divided in two, four-hour Stand-alone module. The first half will discuss the big picture and is designed for all engineering, managerial and operation and maintenance personnel. The second half will build on the concepts from the first half and will include more design problems and calculations. Extensive handouts will be provided at the workshop. This introductory class is absolutely essential for all young practicing power systems engineers, utility and no-utility alike, consulting firms, manufacturing and process plant, and designed to facilitate in educating advanced students in power engineering curriculum.

## Target Audience

- Design and plant engineers (young as well as experienced), managers from utilities, industries (both manufacturing and user industries), consulting firms, contracting firms, infrastructure companies.
- Advanced students, researchers and educators interested in power distribution systems engg.

## Course Outline

### Part I (First Half – 4 hrs.):

- Scope of Electric Power Distribution Engineering and Characteristics of Power Distribution Systems from both Utility and Industrial / Commercial Users Perspective
- Power System Fundamentals & Design Tools:
- 3-Ph Power Voltage-Current Calculations; Active and Reactive Power;
- Losses and Efficiency;
- Voltage Regulation,
- Power Factor Correction and Shunt Capacitor
- Conceptual Design of Overhead and Underground Distribution Systems and Industrial Plant
- Transformer Procurement, Specification Writing and Evaluation: Losses and Efficiency, Testing, Overloading, Maintenance and Life Assessment
- Induction Motor, Variable Frequency Drive, Specification and Applications Guidelines
- Selection of Breakers, Shunt Capacitor, Motor Control Center - Specification and Evaluation
- Reliability, Safety and Design
- Quick Cost Estimate

### Part II (Second Half – 4 hrs.):

- Performance Evaluation and Application: Transformers, Shunt Capacitor and Static VAR, Overhead Distribution Line and Underground Cables, Voltage Regulators, Distributed Generation, etc.
- Short Circuit Calculations: Simplified Approach and Quick Estimate
- Grounding of Power Systems
- Symmetrical Components and Unsymmetrical Faults
- Applications Problems in Power Systems:
- Selection of Breakers and Transformers;
- Induction Motor Starting and Voltage Drop;
- Selection of Optimum Power Distribution Voltage
- Utility – Industry Interface;
- Fundamentals of Power Systems Protection

### Registrations:

- 1) Interested persons can register by contacting the workshop Co-ordinators.
- 2) Maximum number of participants are limited to 40 and hence the registration shall be accepted on first cum first serve basis.
- 3) Entry Fee - Nil