jim phillips

Power Systems

T2G TECHNICAL TRAINING GROUP®

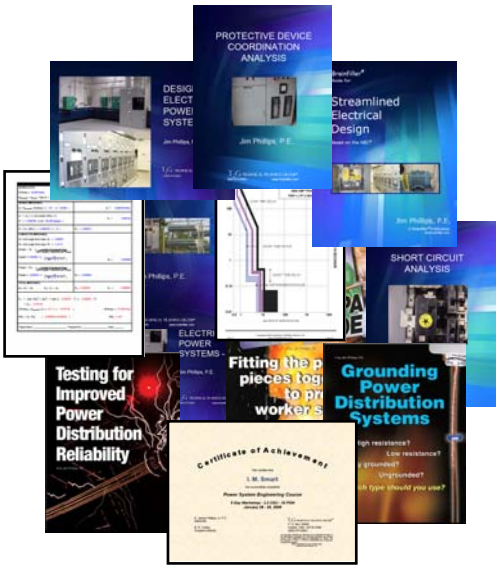
Power System Engineering Course

Comprised of Five of Jim's Most Popular Courses

This course by Jim Phillips, P.E. has become the **industry standard** that defines the "Crash Course" in electrical power systems. People from all over the world have attended this week long program that combines five of Jim's most popular classes including Power System Design 1 & 2, Short Circuit and Coordination Studies and Harmonics. He has developed this course based on almost 30 years of extensive experience with industrial, commercial and utility power systems. Even instructors from other training companies have attended Jim's classes to see how it's done. You will learn power system design as well as conduct a short circuit and coordination study and design harmonic filters.

3.2 CEUs or 32 PDHs - $1095 per person - Register 3 people and send a 4th for FREE!

To have this course at your location, call 1-800-874-8883 for an On Site Proposal.



What you *WILL* receive:

- 5 training manuals containing almost 500 pages
- Jim's short circuit calculation worksheets
- Harmonic analysis and design worksheets
- Technical articles and handouts
- Jim's 35 page Streamlined Design Guide
- Many calculation examples and problems
- 32 hours of Continuing Education Credit

What you ***WILL NOT*** receive:

- A commercial for products or equipment
- A sales pitch to sell engineering services
- A class that is just an overview or teaser

Power System Engineering Course

Scottsdale, Arizona	October 20 - 24, 2008
Orlando, Florida	March 16 - 20, 2009
Canton, Ohio	June 15 - 19, 2009
Scottsdale, Arizona	October 19 - 23, 2009

Power System Engineering Course

Jim Phillips, P.E.

Attend this class and see how to:

- Design electrical power systems more efficiently
- Select and size power system components
- Conduct short circuit studies
- Perform coordination studies
- Calculate overcurrent device settings
- Evaluate harmonics and design harmonic filters
- Understand power system design and analysis

Receive answers to these questions and more:

- How do I select conductors for loads?
- What are demand factors?
- Why is there more to design than the NEC®?
- Why do I contact the electric utility early in the project?
- What questions do I ask the utility company?
- What does voltage drop do to my sensitive loads?
- How can I design quicker and be more competitive?
- Why are harmonics and generators not always compatible?
- Why is ANSI C57 a better protection method for transformers than the NEC®?
- What is the X/R ratio?
- How does the X/R ratio effect a device's interrupting rating?
- What is motor contribution?
- How do I calculate motor contribution on new systems with an undefined load?
- Is a 150 degree C rise or 80 degree C rise better for transformers?
- Is a short circuit study legally required?
- What kind of data is required for the short circuit and coordination studies?
- What if I can't find all of the data, what assumptions can I make?
- Why is the *L/E ratio* ™ so important?
- How do you draw time-current curves?
- How do you selectively coordinate overcurrent devices?
- How do current limiting fuses operate?
- How do you determine circuit breaker settings?
- What are the amp tap, time dial and instantaneous settings on a relay?
- What is a symmetrical current vs. asymmetrical current?
- What logic should be used for determining device settings?
- How do I handle emergency generators and coordination?
- How do I properly apply series ratings?
- What are harmonics and do I need to worry about them?
- How can I predict if harmonics will cause a problem?
- How do I interpret IEEE 519 and what is the point of common coupling?
- Why do I sometimes need to oversize neutrals for 3rd harmonics but not others?
- When and how do I design a harmonic filter

Power System Engineering Course

Course Agenda

COURSE 1 - POWER SYSTEM DESIGN - I

INTRODUCTION
Electrical Safety, Codes and Standards, Economics

TYPES OF SYSTEMS
Radial, Network, Double Ended Substation, Loop System

VOLTAGE SELECTION
120/240V, 208Y/120V, 480Y/277V, Medium Voltage Selection, Delta vs. Wye, Voltage Drop Calculations

LOAD CALCULATIONS
Lighting and Appliance Loads, Receptacles, Code Calculations, VA per Square ft., Continuous vs. Non-Continuous, Demand Factors, Panel Schedules

CONDUCTORS
Conductor and Conduit Sizing, Insulation Type, Correction Factors, Neutral and Ground Conductors

PANELBOARDS
Power Panels, Lighting and Appliance, Sizing and Ratings

SWITCHBOARDS
Bus Ratings, Breakers, Bus Bracing, AIC, Layout, Series Ratings, Bus Structure, 6 Disconnect Rule

LIGHTING DESIGN
Zonal Cavity Lighting Calculations, Lighting Layout

CASE PROBLEM
Switchboard Circuit Design

COURSE 2 - POWER SYSTEM DESIGN - II

TRANSFORMERS
Types of Transformers, Characteristics and Specifications, K Factor, Protection Based on NEC® 450, Inrush Current

MOTOR CIRCUITS
Locked Rotor and Overload Protection, Insulation Class / Service Factor, Motor Tables, Sizing of Feeders, Protection

GROUNDING
Grounding Electrode System, Equipment Ground, Conductor Selection, Separately Derived Systems, High Resistance, Ground, Ground Loops and Power Quality

HAZARDOUS LOCATIONS
Class I, II, and III, Divisions and Groups, Explosion Proof

LIGHTNING PROTECTION
Concept of Protection, Air Terminals, Conductors, NFPA 780

GENERATORS
Emergency Vs. Standby, Selection of Unit, Gasoline, Gas (LP/Natural), Diesel Driven, Design Factors, Loads

AUTOMATIC TRANSFER SWITCHES
Size and Ratings, 3 Pole vs. 4 Pole, Protection of the ATS

UNINTERRUPTIBLE POWER SUPPLIES
UPS Operation, Heat Loss, Compatibility with Generators

CASE PROBLEM
Designing a Transformer Circuit

COURSE 3 - SHORT CIRCUIT ANALYSIS

SHORT CIRCUIT CALCULATIONS
Short Circuit Study Requirements, Conductor Impedance, Source Impedance, X/R Ratio, Conductor Calculations

TRANSFORMER CALCULATIONS
Transformer Impedance, Transformer Calculations, Source Impedance, Transformer Testing, Infinite Bus Calculations

For more information contact:
T_2G Technical Training Group® at 800-874-8883.

See sample videos of Jim's teaching style at:
www.brainfiller.com

Power System Engineering Course

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MOTOR CONTRIBUTION
Theory of Motor Contribution, Sub Transient Reactance, Xd", Effect on Short Circuit Current, Multipliers for SCAm

DEVICE INTERRUPTING RATINGS
Circuit Breaker and Fuse Interrupting Ratings, Testing Methods, Effect of X/R Ratio on Interrupting Ratings

SERIES RATINGS
Proper Application of Series Ratings, Fully Rated vs. Series Rated, Current Limitation, Let Thru Current, U.L. Tests

CASE PROBLEM
Short Circuit Study of Small Industrial System

COURSE 4 - COORDINATION STUDIES

COORDINATION STUDY REQUIREMENTS
Selective Coordination Basics, Time Current Curves, Data Requirements, Device Settings, Graph Scale Selection

COORDINATION OF DEVICES
Molded Case Circuit Breaker Coordination, Adjustable Instantaneous Settings, Coordination of Multiple Devices

SOLID STATE / ELECTRONIC TRIP BREAKERS
Long Time, Short Time, Instantaneous Settings, I^2T Settings, Coordination, Eliminating Instantaneous for Coordination

GROUND FAULT RELAYS
Residually Connected Schemes, Zero Sequence Relaying, Settings, Nuisance Tripping, NEC® Requirements, Settings

OVERCURRENT RELAYS
Amp Tap, Time Dial, Instantaneous, Current Transformers, Time Margins, Setting Selection, Time Current Curves

TRANSFORMER PROTECTION
NEC Requirements, Inrush, ANSI C57 Thru Fault Curves, Adjustments to Thru Fault Curves Based on Winding Configurations, Setting Devices for ANSI Protection

CASE PROBLEM
Coordination Study of Small Industrial Plant

COURSE 5 - HARMONIC ANALYSIS

POWER FACTOR CORRECTION
kW, kVA, kvar, PF Concepts. Leading and Lagging, Current Flow, Inductive Loads, Vector Analysis, Lagging Loads

POWER FACTOR CALCULATIONS
Determining Var Requirements, Sizing the Capacitor, Determining Number of Switching Steps and Location

UTILITY RATE STRUCTURE
Utility Rate Structure, Peak Demand, Demand and Power Factor Based Rates, “Creative” Rates after Deregulation

HARMONICS
Concept of Harmonics, Harmonic Spectrum, Sources of Harmonics, Non-Linear Loads, Harmonic Current Flow

HARMONIC RELATED PROBLEMS
Capacitor Failure, Fuse Interruptions, Equipment Heating, Breaker Mis-Operation, Metering Errors, Transformers

RESONANCE
Determining Parallel and Series Resonance, Effect of Source Impedance, Effect of Capacitor Size, Effects of Resonance on the System, Impedance vs. Frequency Scans

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IEEE 519
Voltage and Current Distortion Limits, Point of Common Coupling, Enforcement, $I_{harmonic}$ / I_{load} Factor

THIRD HARMONICS
Switched Mode Power Supplies, 3rd Harmonics and Neutrals, Over sizing Neutrals, The use of Delta-Wye K-Factor Transformers, Shared Neutrals, Design Requirements

EVALUATING HARMONICS
Resonance Calculations, THD Calculations, Effect of Parallel Resonance on THD, Effect of Source Strength, Load Types

CORRECTION OF HARMONIC PROBLEMS
Capacitor Operating Restrictions, Over sizing Neutrals, Harmonic Filter Design, Detuning Capacitor Banks

CASE PROBLEM
Design of a 5th Harmonic Filter Tuned to the 4.7th

FINAL DISCUSSION

ADJURN

Power System Engineering Course

Course Schedule - Open Enrollment Classes

This class is presently scheduled for the following dates and locations:

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Registration fee is $ 1095 per person.
Send 3 people together and the 4th person goes for **FREE!**

Call Brenda at 800-874-8883 or visit **www.brainfiller.com** to register.

On Site Training - Have This Course at Your Location!

Hold the workshop at your location for a greater savings. For an all inclusive fee you receive the following for each attendee:

Call Brenda at 800-874-8883 ***today*** for an On-Site Training Proposal!
Jim's schedule usually fills up very early for this class!

Continuing Education

T2G is an IACET approved CEU provider which is recognized by many state boards such as New York. T2G is approved in Florida as well.

Cancellation Policy

Cancellations received at least 8 business days prior to the class will receive a full refund. After that, there will be a $75 cancellation fee. We reserve the right to cancel or reschedule a course with liability limited to refund of the course fee.

About the Instructor

Jim Phillips, P.E.

For almost 30 years, Jim has conducted more than 1800 live seminars for tens of thousands of people from the United States and around the globe. His vast experience in the electrical industry makes him a highly sought after speaker on every facet of electric power system design and analysis.

He is a member of the IEEE 1584 working group "IEEE Guide for Performing Arc Flash Hazard Calculations" and was a regular contributor for NEC Digest® the NFPA's Official NEC® Magazine. During his career he has worked for Ohio Edison Company and Square D Company and later formed Phillips Engineers + Consultants. Jim's experience includes everything from utilities, industrial systems, to co-generation plants as well as hundreds of power system studies.

Jim taught at the college level and is active in IEEE where he has served on many committees including the Energy Policy Committee. He earned a BSEE from The Ohio State University and is a Professional Engineer in many states.