

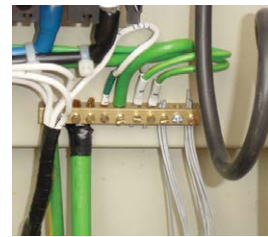


# ELECTRICAL POWER SYSTEM FUNDAMENTALS FOR NON-ELECTRICAL ENGINEERS

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## PRACTICAL SELF-PACED ONLINE COURSE

### YOU WILL LEARN:

- The basics of electrical power engineering
- Basic electrical design rules
- Practical steps in selection, installation and commissioning of electrical systems
- How to work more effectively with electrical engineering professionals

### WHO SHOULD ATTEND:

- Administration staff
- Civil, mechanical, chemical, mining engineers, technologists and technicians
- Electrical contractors
- Finance, IT and accounting managers
- Human resources managers
- Managers who are involved with or work with staff and projects in electrical engineering
- Non-electrical engineers and technicians
- Non-electrical personnel who want to understand the broader picture
- Plant and facility engineers
- Procurement and buying staff
- Project managers
- Sales engineers
- Electrical and instrumentation technicians

**CONTACT US**  
for course fees

## INCLUDES 3 FREE REFERENCE MANUALS

YOU WILL RECEIVE 3 OF OUR UP-TO-DATE TECHNICAL eBooks TO ADD TO YOUR LIBRARY



Over 1400 pages of tables, charts, figures and handy hints

- Electrical Power System Fundamentals for Non-Electrical Engineers
- Practical Power System Protection for Engineers and Technicians
- Electrical Drawings and Schematics

Please Note: eBooks are available in hard copy at 50% of the recommended retail price. Contact us for pricing details.

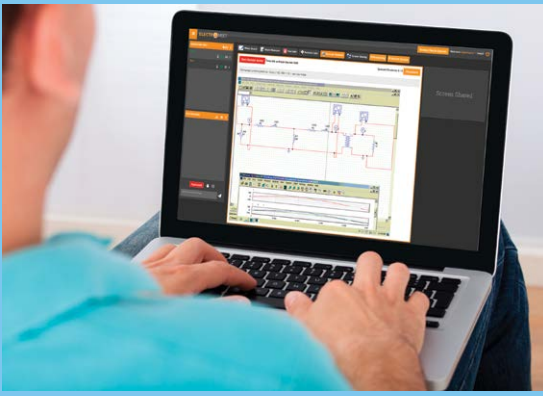
A practical online course presented by:

**Behrouz Ghorbanian**

BSc, MSc, MIEAust



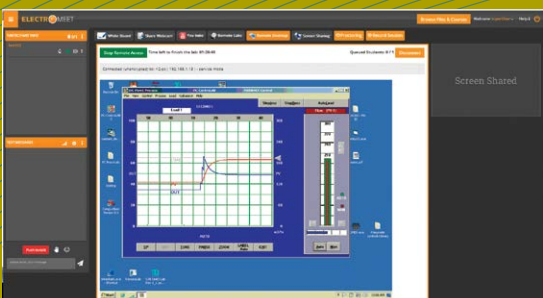
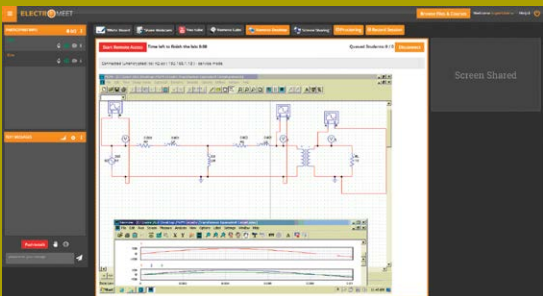
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- Complete lessons in an online environment
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- Learn while your travel – all you need is an Internet connection
- Receive a certificate of completion for CPD purposes

## FULLY ONLINE WITH UNLIMITED REMOTE ACCESS



Virtual Lab Examples - using Electromet\*\*

# 8 HOURS OF LECTURED RECORDINGS PLUS PRACTICALS

## THE COURSE

This course will focus on the building blocks of electrical engineering, the fundamentals of electrical design and integrating electrical engineering know-how into the other disciplines within an organisation. Unnecessary theory will be minimised and you will focus on best practice over the duration of the course.

The course will begin by reviewing basic electrical circuits and electrical laws. You will then be exposed to the basic principles of electrical generation, transmission and distribution. Electrical distribution will then be covered in considerably more detail.

The interesting area of electrical measurements, as applied to single phase and three phase systems, will then be reviewed. Transformers will be examined with an emphasis on power transformers as used in the electrical distribution industry. You will be exposed to earthing with a strong focus on safety issues. The session will be concluded with coverage of power system protection and components in terms of isolators, fuses and circuit breakers.

Furthermore, the course will continue with an examination of AC and DC motors and lighting and illumination. The power hungry topic of electrical heating and cooling in industry is then examined. The impact, especially in the modern world of power electronics, is discussed with a demonstration of the possible unpleasant harmonics arising from using this powerful technology. This then smoothly leads into the topic of dealing with power quality. The last major topics are electrical safety, national codes and customer installations. The penultimate topic of great interest to executive management in a company (and indeed municipalities and governments) is load forecasting.

The course is concluded with modern developments such as substation automation, the smart grid, and industrial data communications.

A practical online course presented by:

## Behrouz Ghorbanian

*BSc, MSc, MIEAust*



Behrouz has completed degree courses in Telecommunications and Electrical Engineering overseas. He also completed his studies in Electrical Utility Engineering at Curtin University in 2004.

Behrouz started his career in the oil and gas industry where his role got him involved in the maintenance and repair of electronic and navigational marine equipment (VHF and SSB radios, Sat Nav, engine control panels etc). He then moved to the power industry and was involved in the design, installation, and commissioning of substations mainly for consultancies and utilities. He has also established a good reputation in teaching power system protection over his long term services lecturing at Curtin University, and also over the period he worked as a Protection Engineer in New Zealand.

Over the past years, Behrouz has been involved in many major projects across Australia (Port Hedland, Barrow Island, Tamar Valley, Karratha, and Newman for example). His most recent experience is related to cost estimation and risk assessment of major substation projects with a special focus on the secondary systems (Protection, COMMS, SCADA). He has also worked as an Engineering Manager and Senior Project Engineer on major copper mine projects overseas.

Behrouz has also gained good knowledge in substation design, HV cables sizing and installation, transmission system design, earthing system design and applications, and power system protection design and applications.

For more information, visit  
[www.idc-online.com/content/self-paced-learning](http://www.idc-online.com/content/self-paced-learning)

# 8 ELECTRICAL TOPICS

## 34 SUBJECTS • 3 PRACTICALS

### COURSE OUTLINE

#### SESSION 1: OVERVIEW

- Units and electrical quantities
- Voltage, current, resistance, power, energy, frequency
- Inductance and capacitance
- Ohm's law, rms and average values
- Single and three phase systems
- Power factor

#### SESSION 2: POWER GENERATION, TRANSMISSION AND DISTRIBUTION

- Various forms of energy, energy conversion
- Modern power station
- Coal-fired power plant, hydro and nuclear
- Impact on environment
- Solar, wind, geothermal
- Transmission of electricity, distribution
- Power demand and tariffs, power factor
- HVDC

#### SESSION 3: ELECTRICAL MEASUREMENTS AND APPLICATIONS

- Electrical parameters – W/VA/VAR
- Measuring
- Power and energy measurement
- Smart metering
- Measuring voltages, currents and resistance

#### SESSION 4: TRANSFORMERS

- Magnetic fields
- Electromagnetic fields
- Transformer operation
- Step down and step up
- Construction
- Single and polyphase transformers
- Cooling
- Oils and coolants
- Efficiency
- Tap changers
- Voltage regulation
- Earthing of transformers

#### SESSION 5: EARTHING

- Need for earthing, direct and indirect
- shocks, touch and step potential
- Types of earthing, system and protective earthing, isolation
- Earth conductors and electrodes
- Measurement of earth resistance
- Lightning protection
- Bonding connection

#### SESSION 6: POWER SYSTEM PROTECTION

- Incipient and solid faults
- Need for protection, overloads, overvoltage and overcurrent
- Fuses, circuit breakers, relays
- Protection of equipment

#### SESSION 7: FUSES, CIRCUIT BREAKERS, RELAYS

- Isolation
- Electrical faults,
- Fuses
- Isolation, switching, tripping
- Circuit breakers
- Components of circuit breakers
- Medium voltage circuit breakers

#### SESSION 8: ELECTRICAL ROTATING MACHINES AC DC

- Basic principles
- Machines
- DC motor operation
- Speed, flux and armature voltage
- Speed control
- Single phase AC motors
- 3-phase induction motor
- Synchronous machines
- Torque versus speed
- Efficiency and power factor

*Continued on next page*



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### REGISTER IN THREE EASY STEPS

- 1** Go to [www.IDC-ONLINE.com](http://www.IDC-ONLINE.com) --> E-LEARNING --> Self-Paced Learning --> Then simply click on the course and complete the details.  
Select "ADD TO CART" and follow the directions to pay the affordable one-off fee.
- 2** Once you receive your \*confirmation email, follow the link and LOGIN to \*\*Electromet
- 3** Open the Online Course Package and START YOUR COURSE

\* Confirmation emails containing login details may take up to 24 hours

\*\* Electromet is a cloud-based program with no downloads.  
Online courses are hosted and completed by users through Electromet.



## COURSE OUTLINE CONTINUED

### SESSION 9: ELECTRICAL LIGHTING AND ILLUMINATION

- Incandescent lamps, high intensity discharge lamps, mercury vapour, metal halide lamps, fluorescent lamps, compact fluorescent lamps, LEDs
- Luminaire concepts
- Energy efficiency

### SESSION 10: ELECTRICAL HEATING IN INDUSTRY

- Principles of heating, electrical heating, resistance heating
- Welding
- Electric arc furnaces
- Induction heating

### SESSION 11: POWER ELECTRONICS AND APPLICATIONS

- Semi conductor devices
- Motor controllers
- Rectifiers
- AC motors and soft starting
- Variable speed drives

### SESSION 12: POWER QUALITY

- Power quality problems
- Voltage variations,
- Overvoltage and under-voltages,
- Voltage imbalances
- Voltage and frequency variations,
- Interruptions and surges
- Lightning and harmonics
- Harmonic compensation

### SESSION 13: ELECTRICAL SAFETY AND NATIONAL ELECTRICAL CODES

- Key elements of National Electrical Codes (AS3000/NEC/CEC/SANS)
- Electrical hazards
- Electrical shock
- Arc flash and burns
- Personal protective equipment
- Safety through better design and installation
- Work permits
- Authorisation personnel
- Training and first aid
- Legislation

### SESSION 14: CUSTOMER INSTALLATIONS

- Metering and billing
- Tariff structures
- Connections

### SESSION 15: THE ENGINEERING TEAM

- Design rules, specification, procurement
- Installation,
- Commissioning
- Punchlist of defects
- Contractual disputes
- Certificate of compliance

### SESSION 16: PLANNING AND LOAD FORECASTING

- Load forecasting principles
- Forward planning
- Supply and demand side management
- Evaluation of electrical projects

### SESSION 17: MODERN DEVELOPMENTS

- The smart grid
- Substation automation and industrial IT
- Data communications (including wireless)
- Cost of carbon/emissions trading

### PRACTICAL: DIY LAB EXPERIMENTS

- Basic Design Q&A
- Instructions on a range of practical experiments that could be done

### HARDWARE & SOFTWARE REQUIREMENTS

All you need to participate is an adequate Internet connection, PC and speakers. You will receive Electromeet access details once payment is finalised.

### PRE-REQUISITES

No formal electrical education is required as everything is examined from a fundamentals and practical point of view. As such, this is certainly not an advanced course but one focusing on the fundamentals using basic maths to ensure you quickly understand the key concepts.



**UPON SUCCESSFUL COMPLETION OF THE COURSE  
YOU WILL ATTAIN A CERTIFICATE OF COMPLETION**