

EEP201 Fundamentals of Power System Earthing

- Electrode resistance, potential gradient areas of common types of electrodes.
- Multiple electrodes.
- Stratified grounds.
- Electric shock, calculation of step and touch potentials.
- Introduction to substation earthing: ground potential rise, connection of services, grid and mesh potentials.
- Measurement of soil resistivity and electrode resistance.
- Earthing of transmission lines: tower foot resistance, current division between ground and aerial earth wires, division of earth currents at substations.
- Earth current distribution on faulted lines.
- Distribution systems: MEN, SWER, safety during faults.
- Flow of lightning currents to ground.

Student Comments

"This is what we need as practising engineers." *Powerlink Queensland*

"Well presented - relevant to workplace." *CS Energy*

"Excellent content and presentation." *Ergon*

EEP202 Thermal Ratings and Heat Transfer

- Thermal conduction in simple geometry.
- Forced and natural convection from plates and cylinders - common heat transfer correlations.
- Radiation from hot surfaces - view factors.
- Calculation of steady-state and time-varying temperatures in conductors.
- Temperature measurement methods for high voltage equipment.
- Thermal ratings of overhead lines - steady-state, cyclic and short-time ratings.
- Cable rating - temperature rise due to step current, cyclic and emergency loads.
- Temperature rise of power transformers--cooling methods, emergency overloads.

EEP203 Testing and Condition Monitoring

- HV Testing: DC, 50 Hz, and impulse - equipment, measurement systems, standard test methods, certification and traceability, evaluation of test reports.
- HV Test Methods for insulators, bushings, circuit breakers, isolators and surge arrestors.
- Temperature rise testing of electrical equipment: lines cables, and switchgear.
- Current withstand testing.
- Current interruption tests for fuses and circuit breakers.
- Evaluation of test reports - accuracy and traceability.
- Insulation testing: oil testing, DLA and PD tests.
- Condition monitoring systems: plant temperature, circuit breaker dynamics, insulation condition.
- In-situ methods.

Student Comments

"Presenters were excellent - very knowledgeable. A lot of work covered in a very short time." *Western Power, WA*

EEP204 Power System Load Flow Analysis

- p.u. revision.
- Data collection methods.
- Load flow algorithms: convergence criteria, multiple solutions, starting values, ordering and sparsity of matrices.
- Single and three-phase models: transformers, tap changers, overhead transmission lines, underground cables, capacitors and
- filters, controlled reactive devices, generators and motors, load representation.
- Load flow applications: base case and contingency analysis in planning augmentation options, system operations contingency analysis.
- Load flow analysis methodology--use of load forecasts, establishment of "base case".
- Practice in analysis of transmission and distribution systems using an interactive package.

Student Comments

"Well organised unit. Lectures were well prepared and informative." *Powerlink Queensland*

EEP205 Power System Fault Calculations

- Representation of generators, lines, transformers in positive sequence equivalent circuits.
- Balanced fault analysis.
- Selection of source voltages from pre-fault conditions. Unbalanced fault conditions.
- Complete sequence representation of power system equipment: transformers, cables and lines (including mutual coupling of parallel lines).
- Per unit positive, negative and zero sequence network diagrams.
- Calculation of generator and transformer sequence equivalent circuits from manufacturer's test data.
- Calculation of line sequence impedance's from line layout and soil resistivity - inclusion of tower foot resistances in zero sequence models.
- Residual currents in untransposed lines.
- Interference with telecommunications circuits.
- Short circuit calculations to AS3581 using an interactive computer package.

Recommended Prior Study: EEP204

Student Comments

"Helpful and constructive. Included useful examples and applications. Well done!" *Full-time student*

"Very good industry experience - this was reflected in the lectures." *Western Power, WA*

"Very useful and practical course." *Western Power, WA*

EEP206 Project Management

- Principles of project management and the operation of project management packages.
- Emphasis on the practical application of PC packages based on exercises related to the electricity supply industry and aimed at promoting the increased use of such packages by engineering and technical staff in the normal course of their work.
- Details include activity networks, Gantt charts, time schedules, analysis of critical path, types of resources, resource profiles, resource scheduling, project monitoring and reporting.

EEP207 Overhead Line Route Selection - Environmental Factors

- Overview of Legislation, Standards and Guides: radio interference, electromagnetic fields, low frequency induction, touch potentials, structure earthing, electrolytic corrosion, clearances, land legislation, environmental impact statements.
- Current safety and environmental issues.
- Requirements of other public utilities - telecom, railways, roadworks, marine, water, gas, oil.
- Cost of environmental enhancements and alternative technologies.
- Right of way.
- Route selection principles: structure types, terrain shielding, identification of natural and man-made features.

Student Comments

"Well done!" *Energex*

"Good course and excellent value." *CS Energy*

"Very good module. Enjoyed it!!" *Powerlink Queensland*

EEP208 Economic Analysis for Power System Engineers

- Principles of economic analysis for a tax paying entity.
- Various evaluation techniques are addressed including both discounted and non discounted techniques.
- The net present value approach is settled on as being the most appropriate approach.
- Issues such as the effect of interest and inflation on nominal cash flows are addressed.

- Cost benefit analysis for engineering decision making: econometric models for ESI, maintenance, refurbishment and replacement.
- Budgeting and cost control, budget preparation with spreadsheets, cash flows, monitoring expenditure and budget review, profit and loss and balance sheets.
- Risk analysis including WACC calculations, stochastic simulation and sensitivity.

Student Comments

"Excellent course in terms of both material and presentation." *Powerlink Queensland*
 "I rate this as one of the best courses I have attended for content and presentation"
Energex

"The most enjoyable and informative course I have attended. Well done." *Powerlink Queensland*

"Enjoyable course. Suggest all engineers do it." *Energex*

"The type of course I should have undertaken 2 years ago." *Capricornia Electricity*

EEP209 Power System Harmonics

- Generation of harmonics: converters, arc furnaces, SVC, inverters, electronic control.
- System response characteristics: resonance conditions, effect of load, typical system responses.
- Effects of harmonics: motors, generators, power cables, capacitors, electronic equipment, metering, relaying, telephone interference.
- Reactive power compensation and harmonic control: converter power factor, reactive power compensation, control of harmonic currents.
- Measurement of harmonics.
- Recommended practices including AS2279.

Recommended Prior Study: EEP205

EEP210 Abnormal System Voltages

- Supply quality standards: review of criteria, statutory requirements, emergency and short term limits.
- 50 Hz voltage: cause of voltage deviations, voltages during faults, motor starting.
- Negative phase sequence voltages: AS1359 requirements, voltage unbalance studies, modelling, measurement.
- Voltage Transients and flicker: AS2279 requirements, disturbing loads, remedial measures, transient disturbances and power system plant.
- Power system transient analysis: ATP studies.

Recommended Prior Study: EEP205

EEP211 Basic Power System Protection

- Protection system reliability and security.
- Methods of grading protection relays.
- Speed/sensitivity considerations. Comparison of "unit" and "non-unit" protection.

- Different causes and characteristics of the faults that occur on power systems and the specific protection relays that are used to detect them.
- Examination of local back-up protection.
- Effects of substation configurations on protection system design and performance.
- Various types of relays - electro-mechanical and electronic.
- Current and voltage transformers - theory and specification for different applications, including interposing current transformers.
- Protection of high voltage buses.
- Transformer protection - basic overview of the different types, including differential protection.
- Overcurrent and earth fault protection.
- Inverse time relays.
- Setting overcurrent and earth fault relays to achieve a co-ordinated scheme.
- Instantaneous overcurrent relays.
- Directional overcurrent and earth fault relays.
- Reclosers, sectionalisers and fuses - application and co-ordination.
- Distance relays - theory and construction.
- Setting distance relays for simple applications.
- Field testing and operational analysis of protection.
- Commissioning and maintenance of protection systems.
- Performance of protection under fault conditions.
- Information available for the analysis of protection performance.

Recommended Prior Study: EEP205

Student Comments

"A first class presenter with excellent notes and professional teaching style." *Powerlink Queensland*

"Very well presented unit." *Powerlink Queensland*

"Very thorough and comprehensive." *Capricornia Electricity*

"Thanks. Very enjoyable - backs up 10 years of practice." *S W Power*

EEP212 Advanced Power System Protection

- High impedance protection of power system plant (busbars, motors, generators, reactors & capacitors) including CT requirements, the application of shunt and series resistors, non-linear resistors, check schemes, back-up schemes and CT supervision.
- Protection of transformers, including biased and high impedance differential schemes as well as aspects related to earthing transformers.
- Feeder differential protection, including pilot wire, current differential and phase comparison schemes.
- Protection of high voltage capacitor banks, including consideration of inrush currents, overcurrent, over voltage, balance, and differential protection schemes.
- Application of single and three pole autoreclosing schemes to HV and EHV transmission systems.

- Protection of large motors, including differential and earth fault protection, thermal overload considerations, starting & stalling currents and the effect of negative phase sequence currents.
- Protection of large generators, including stator & rotor earth fault protection, biased differential, high impedance differential, negative phase sequence, under frequency, over excitation, reverse power and out-of-step protections.

Recommended Prior Study: EEP211

Student Comments

"Excellent." *Integral Energy*

"A very informative course, it explains a lot of what I have been doing." *Energex*

"Very relevant to my day to day job." *Snowy Hydro*

"Tim tams and mints were really good." *Powerlink Queensland*

EEP213 Statistics

- The role of statistics in electricity supply engineering.
- Strategies for collecting and recording valid data from which statistical inferences can be made; use of operational and inventory data.
- Graphical and numerical techniques to summarise data using statistical or spreadsheet packages.
- Review of probability concepts, random variables, probability distributions.
- Specific distributions used in system and component reliability studies.

Student Comments

"The course was very good because it was very well structured and presented. The best aspect was that a theoretical subject was presented as a tool to solve practical problems and problems were relevant, real engineering problems." *Energy Australia*

EEP214 Risk Assessment in the Electricity Supply Industry

- Identification of hazards: failure modes and effects analysis, failure modes effects and criticality analysis - outcomes from possible failure modes.
- Hazard and operability studies.
- Assessment of frequency - fault tree analysis, event tree analysis.
- Assessment of consequences: consequence analysis, criticality assessment in terms of chance of failure and consequences, incident scenario, damage criteria, damage identification.
- Legal and economic consequences.
- Case studies including identification of hazards, assessment of risks, and consequences in ESI.
- Loss of load models in generation.

Recommended Prior Study: EEP215

EEP215 Reliability

- Basic reliability concepts.
- Reliability analysis methods.
- Reliability methods.
- Application of important distributions.
- Failure rate, repair time and mean time failure.
- Reliability of series, parallel and complex systems.
- Discrete Markov Chains.
- Continuous Markov processes.
- Frequency and duration in reliability.
- Application of Markov Chain in the reliability evaluation of repairable systems.
- Application of reliability evaluation in power distribution systems, inclusion of cost estimation.
- Reliability assessment in subtransmission system planning, including non-constant transition rate considerations.
- Study of single and double contingencies with switching to restore supply.
- Inclusion of maintenance in system modelling.
- Probability and frequency of loss of load.
- Unsupplied energy and average load at risk.
- Maximum load at risk.
- Average outage duration.
- Hours of Loss of load.

Recommended Prior Study: EEP213

EEP216 Overhead Line Design - Electrical

- Electrical design of transmission lines with ratings of 33kV to 500kV.
- Economic conductor size.
- Characteristics of conductors.
- Standard and new technology insulators: power frequency, impulse and switching flashover voltage, pollution and creepage, wet and dry flashover, mechanical characteristics.
- Feasible structure types.
- Tower footing resistance and counterpoise.
- Insulation co-ordination methodology: determination of overvoltage withstand, design for required outage.
- Determination of RI using state of the art methods.
- Design to ensure that electrostatic and electromagnetic fields do not exceed NH & MRC guidelines.

Recommended Prior Studies: EEP201, EEP203, EEP207, EEP210

Student Comments

"I was much more impressed with the presentation of the notes for this course. The EEP216 notes are of the level we would expect from your courses and, coupled with a good presenter like Tony, the course should be beneficial to our staff both immediately and in the longer term." *Energy Australia*

EEP217 Overhead Line Design - Mechanical

- Conductor selection.
- Catenary theory.
- Sag-tension-temperature calculations.
- Requirements for survey data.
- Statutory and enterprise requirements for line layout: clearances, mechanical loading, safety criteria.
- Definition of loading conditions, structure capacities, layout clearances.
- Applied mechanics of strung conductors.
- Determination of everyday tensions from allowable stress or tension/mass ratio.
- Determination of vibration protection.
- Transmission line estimating techniques.
- Selection of structure type based on optimum capitalised costs.
- Line layout.

Recommended Prior Studies: EEP208, EEP216

Student Comments

"Terrific! I needed this course or similar about 10 years ago." *Mackay Electricity Corp*

"Excellent course" *Dunedin Electricity (NZ)*

"Great course. Enjoyed immensely and feel much more confident of producing correct, efficient overhead designs. Thanks." *Mackay Electricity Corp*

"Very good. Practical and useful material." *Powerlink Queensland*

"This is one of the most useful and practical courses I have done." *Energex*

EEP218 Introduction to Automated System Control and Supervisory Systems (SCADA)

- SCADA fundamentals and protocols.
- SCADA equipment: master station, remote terminal units.
- Transmission SCADA systems, distribution automation systems, distribution control systems, PC software applications.
- Alarm philosophy and control principles: definition of system displays, data logging, database point processing and attributes, master station configuration.
- Specification of MMI: identification of system functional requirements.
- Computer system platforms: computer technology fundamentals, computer hardware - processors, peripherals, display, user interfaces.
- Communication system principles, communications bearer fundamentals, data networks and protocols.
- Data communications and I/O capacities and types, I/O processing. Application of SCADA systems to transmission and distribution systems.
- Cost/benefits of alternative schemes.

Contact Hours: 15 hours

EEP219 High Voltage Substation Equipment: Power Transformers and Reactive Power Plant

- Principles of power transformer design from distribution transformers to EHV transformers: ratings, windings, core structure and materials, insulation and cooling methods, insulation and lifetime.
- Leakage and magnetising reactance.
- Losses, harmonics and inrush currents.
- Short circuit forces.
- Tests to measure: ratio, losses, impedance, phasing, temperature rise, accuracy and traceability of tests, interpretation of test reports.
- Surge phenomena in windings, RSG and impulse testing of power transformers, interpretation of test results.
- Oil cooling systems.
- Fire protection.
- Tap changers and associated controls.
- Analysis of transformer failure modes.
- In-phase and quad-boost regulators.
- Series and shunt reactors.
- Reactors for harmonic filters.
- SVCs: design considerations, equipment characteristics and equipment characteristics.

Recommended Prior Study: EEP203

Student comments

"The best course I have done this far." *Alstom Australia*

"Hard to fault. Well organised, practical." *ETSA Utilities*

EEP220 Distribution Planning

- Identify data and techniques used in load forecasting.
- Examine typical distribution network problems and identify performance limitations based on standards.
- Relate network problems to different configurations and the effects on customers.
- Study network reinforcement options on a simulation package.
- Options include regulators, series and shunt capacitors and reconductoring.
- Consider the above options to address a realistic network problem assessing line losses and voltage results.
- Analyse network reliability and assess the impact of ties, switches and various network configurations.
- Compare alternatives based on economic and technical considerations.
- Prepare a logical case which recommends one option in the form of a report.

Recommended Prior Studies: EEP208, EEP211, EEP219

Student Comments

"Well presented. Well written and structured course notes." *Energex*

EEP221 Limits to Power System Stability

- Time domain models and characteristics of synchronous machines.
- Induction generator models.
- Assessment of model bandwidth for use in dynamic studies.
- Excitation system models, turbine governor models, boiler models, hydraulic system models.
- Characteristics of load plant.
- Evaluation of small signal adequacy by eigenvalue analysis.
- Determination of modes of electromechanical and control systems.
- Identification of modes with insufficient damping, eigenvalue participating states and eigenvectors.
- Establishment of transfer evaluation of gains/phases at identified model frequencies.
- Time domain dynamic simulations of power system operation.
- Numerical models for prediction of large disturbance behaviour of interconnected power systems.
- Stability of system under contingency and emergency conditions.
- Stability improvement using: controlled reactive devices, special control systems, braking resistors, U/F load shedding, FACTS.

Recommended Prior Study: EEP205

EEP222 Maintenance of Electricity Supply Systems

- Establishment of maintenance policies: review of failure rates, emergency spares, identification of maintenance liabilities, identification of critical success factors to minimise life cycle costs, approval and dissemination of policy, policy review.
- Maintenance planning: identification of constraints, review of existing maintenance programs, establishment of plans for periodic actions, documentation of procedures, design of reporting procedures.
- Data recording and analysis: registers of defects, design of data collection and reporting systems, preparation of control charts, computer systems, data base development.
- Maintenance Operations: identification of refurbishment needs, resource evaluations, design of work procedures, impact of Acts and regulations, identification of staff training needs, supervision, auditing of work practices.
- Maintenance program evaluation: assessment against KPI, modification of programs to account for continuing defects and failures or to reflect changing technologies.

Recommended Prior Study: EEP214

Student Comments

"Quite impressed! Well structured, logically ordered, well presented, good balance between theory and practical. Liked tutorials - helped to understand content. Only problem - course too short." *Capricornia Electricity*

"It is good to do a course that is specifically based on electricity industry experience, presented by someone with practical knowledge of the maintenance work." *Capricornia Electricity*

"It is good to do a course that is specifically based on electricity industry experience, presented by someone with practical knowledge of the maintenance work." *Capricornia Electricity*

"Excellent course and presentation." *Hydro Electric Corporation*

"The course was very interesting. Excellent overall." *ETSA Transmission*

"Very good!!" *CS Energy*

"Completely new subject to me - most interesting and some very relevant examples used. Will result in me questioning some maintenance decisions in future." *Counties Power, N.Z.*

EEP223 Load Forecasting

- Nature of load patterns: historical patterns, links between customers and loads and between energy and demand demographics.
- Categories of DSM, costs of DSM options, benefits, and limitations to DSM.
- Tariffs and their impact.
- Impact of economic trends on demand growth.
- Load manipulation.
- Load forecast methods: data collection and availability, weather correction, interpreting data, synthesising missing data, developing load forecast data, developing alternative scenario load forecasts.
- Establishment of base loads from: historical load data, customer load predictions, and other contributing factors.
- Prediction of growth rates.
- Generation of load forecasts.

Recommended Prior Study: EEP213

EEP224 Underground Cable Engineering

- A look at the conducting and insulating materials used in modern cable design and factors that lead to their development.
- The electrical characteristics that describe the performance of insulated cables and a short qualitative look at the background theory.
- An examination of aspects of cable systems design:
 - Different types of cable ratings
 - Earthing, induced voltages and bonding of cable sheaths
 - Electromagnetic fields around underground cables
 - Characteristics and measurement of soil thermal parameters.

- An overview of manufacture, testing and standards for insulated cables
- Some notes on cable accessories
- A study of the underground cable circuit planning, design and installation:
 - Concept design/feasibility studies and cost estimates
 - Details design, permits and approvals
 - Civil and electrical construction and testing
- Considerations in the management of an underground cable installation:
 - Important aspects of safety
 - Considerations of ratings including the importance of a knowledge of the cable environment
 - Factors that affect cable ageing of different types of cables
 - A look at maintenance practices, monitoring systems and diagnostics.
- A brief look at fault location

Recommended Prior Study: EEP202, EEP212, EEP214, EEP221, EEP223

EEP240 Organisation and Financial Management in the ESI

- Financial reporting, including profit and loss and balance sheet.
- Interpretation of financial data and commercial practices with respect to various line items in financial reports.
- Key performance indicators, the derivation, interpretation and pitfalls.
- Financing arrangements.
- Taxation issues that affect the industry including income tax, repairs, tax effect of depreciation and capital gains tax.
- Various asset management issues including inventory and fixed assets.
- Cost volume profit analysis including break-even, contribution margin and EBIT.

Student Comments

"Excellent - more subjects of this nature in the course please!" *Energex*

EEP241 Distance Protection

- Current transformers: transient performance, saturation factors and effects on distance relay performance.
- Voltage transformers: transient performance and effects on distance relay performance.
- Distance protection: select a suitable relay characteristic based on an understanding of relay comparator operation (amplitude and phase angle comparators), implement non-switched distance protection schemes, implement switched distance protection schemes (including allowance for various starter characteristics), allow for the effects of mutual coupling with other feeders, design protection schemes and set relays for teed feeder systems and also for bridged or paralleled feeder configurations, allow for the effects of arc and/or fault resistance, ensure that load encroachment does not cause inadvertent tripping, ensure healthy phase fault currents do not degrade distance relay performance,

develop a grading plan to ensure coordination with protection relays (including IDMT relays) elsewhere on the power system, understand relay functions such as switch-onto-fault logic, VT supervision, memory, power swing blocking and healthy phase polarising.

- Protection signalling: direct, series, permissive (overreaching and underreaching), distance acceleration and blocking intertripping.

Recommended Prior Study: EEP211

Student Comments

"Excellent!" *Far North Queensland Electricity Corp*

"I really liked the working through from first principles." *TransGrid*

"A very well presented course from a very knowledgeable presenter." *ETSA*

EEP242 Efficient Marketing and Utilisation of Electricity: Demand and Supply Side Solutions

- Assessment of future DSM options: state, national and international DSM programs assessed; local opportunities examined; impact of new and evolving technology; compare options and select for cost effectiveness, load impact and community acceptance.
- Determination of avoidable costs: assessment of marginal cost of supply and identification of unavoidable and avoidable costs.
- Survey of customer needs and wants: conducting market research; application of existing tariffs or development of new tariffs.
- Planning and estimating market potential for DSM: comparison of options to develop the optimum plan to meet customer needs and supply authority requirements.
- Economic comparison of DSM and SSM options for a specific project including combined options.
- Design and implement DSM program: targets, resources, in-house or contract.
- Monitoring program performance.
- Assessment of DSM on local and system load forecasts.

Recommended Prior Studies: EEP208; EEP223

EEP243 Contract Administration

- Categories of contracts: supply; supply deliver & erect; performance guaranteed; services e.g. maintenance; period for supply of stock items or services.
- General conditions of contract: terms of payment and security deposit; quality assurance procedures; retention conditions.
- Special conditions of contract: delivery and penalties for delay; technical provisions; penalty/bonus for such factors as efficiency, performance, maintenance and reliability.
- Pre-tender acceptance negotiation practice.

- Evaluation of tenders: tender adjustments; determination of the lowest comparatively priced offer on a total capitalised cost basis which conforms with the specified technical and commercial requirements.
- Tender acceptance; contract correspondence; drawings - standards, amendment.
- Contract law, dispute resolving procedures.
- Contract progress monitoring: approval of drawings and documents; approval of delivery, erection, site testing.
- Acceptance, take over, maintenance period, retention provisions.

Recommended Prior Study: EEP208

Student Comments

"This is the only contract administration course that I am aware of where the examples and participants are from my industry. Very well done!!" *Rail Services Authority (NSW)*

"Recommended for all people associated with contract administration - they should do this course." *CS Energy*

"Very Good. Opened my mind to a range of areas where I could cause major contract problems, and lose a lot of money." *CS Energy*

"Greg Kenny is in a class of his own - to be able to present such a boring subject in such an enjoyable manner." *Rail Services Authority (NSW)*

EEP244 Circuit Breakers - Switchgear

- Basic switching theory for the main circuit breaker types: SF6, Vacuum, GIS, minimum oil, airbreak (11kV), bulk oil; characteristics and applications for these types at various voltage levels.
- Circuit-breaking principles: interruption of load current, small inductive current, short-line faults and out-of-phase switching.
- TRV and ITRV concepts.
- Direct and synthetic testing.
- Technical specifications of circuit breakers: operating voltage; impulse withstand; rated current; interrupting capacity; switching duties; operating mechanisms - single or 3 pole; clearing time; environment.
- Selection of circuit breakers: analysis of tenders on a whole of life basis.
- Circuit breaker failures: failure modes for different types; catastrophic failures; category of failure - design, operating or maintenance cause; reliability.
- Circuit breaker testing and condition monitoring.
- Circuit breaker maintenance and refurbishment.
- Emerging circuit breaker technology.

Recommended Prior Study: EEP210

EEP245 Introduction to Substation Design

- Preparation of design/site options: standard layouts (outdoor, indoor, GIS, package, single bus, 11/2 CB et) - cost, site, reliability lead time and communication factors; estimating procedures.

- Comparison of design/site options; whole of life cost comparison including capital and operating costs; environmental and public issues.
- Identification of design parameters: voltages, ratings, protection, metering, SCADA, communication, operational - preparation of one-line diagram and general arrangement; design scope; review with other parties.

Recommended Prior Studies: EEP202; EEP219; EEP244

EEP246 Customer Metering

- Tariff structures network and retail, and how they effect metering systems.
- Metered parameters, kW, kWh, var, varh, VA, VAh, power factor, demand and the interrelationships between them.
- Electronic metering multifunction, measurement methods used by electronic meters, advantages and limitations of various techniques.
- High voltage metering, import / export metering the techniques used, limitations, Blondel's theorem, safety aspects.
- Current and Voltage transformers, their use in metering, theory of operation and accuracy limitations.
- Metering in the deregulated market and in particular the requirements of Chapter 7 of the National Electricity Code.
- Brief description of single and polyphase electromechanical metering, the method of operation and the techniques used to measure reactive power.
- The use of electronic registers, summation registers and other techniques for customers with multiple points of supply.
- Communications methods used in remote meter reading.
- Standards and regulatory bodies international and Australian.

Student comments

"Excellent. I learned a lot." *Ergon Energy*

"A very worthwhile course." *Energex*

EEP248 Introduction to Electricity Markets

- Economic models of markets (e.g. monopoly, oligopoly, monopolistic competition, perfect competition.)
- Application to the electricity supply industry.
- Spot market operations and Ch.3 of the National Electricity Code.
- Theory of derivatives.
- Using electricity derivatives to manage spot price risk.
- Electricity market simulation.
- Deriving transmission/distribution revenues in the National Electricity Market.

Student comments

"Totally covered the course syllabus. I really enjoyed the subject!" *CS Energy*

"Well presented and interesting course." *Full-time student*