Gain cutting edge expertise with this prestigious, practical ADVANCED DIPLOMA

Advanced Diploma of
APPLIED ELECTRICAL ENGINEERING
(Electrical Systems)

WHAT YOU WILL GAIN DURING THIS 18 MONTH PROGRAM:

• Skills and know-how in the latest technologies in electrical engineering
• Practical guidance from electrical engineering experts in the field
• Knowledge from the extensive experience of the lecturers, rather than from only the theoretical information gained from books and college
• Credibility as the local electrical engineering expert in your firm
• Networking contacts in the industry
• Improved career prospects and income
• An Advanced Diploma of Applied Electrical Engineering (Electrical Systems)

Visit our website: www.eit.edu.au

** A note regarding recognition of this program in the Australian education system: EIT’s sister company, IDC Technologies, is the owner of this program. The qualification is officially accredited within the Australian Qualifications Framework by the Training Accreditation Council, and is approved by the Australian Skills Quality Authority (ASQA) for delivery by EIT in all Australian states. EIT delivers this course program to students worldwide.
Introduction

Join the next generation of electrical engineers and technicians and embrace a well-paid, intensive yet enjoyable career by embarking on this comprehensive and practical program. It provides a solid overview of the current state of electrical engineering practice and is presented in a practical and useful manner - all theory is tied to a practical outcome. Leading electrical engineers present the program over the web in a distance learning format using our acclaimed live e-learning techniques.

There is a great shortage of electrical engineers and technicians in every part of the world; due to retirement, restructuring and rapid growth in new industries and technologies. Many companies comment on how difficult it is to find experienced electrical professionals, despite paying outstanding salaries. About fifteen years ago significant shortages in the power industries developed the world over. These remain with specialists in this area being few and far between. The aim of this 18 month e-learning programme is to provide you with core electrical engineering skills so that these opportunities may be accessed, to enhance your career and to benefit your firm.

Often universities and colleges do a brilliant job of teaching the theoretical topics, but fail to actively engage in the application of the theory of electrical engineering. Much of the material key to electrical practice and its professional application in the workplace [eg practical switchgear, circuit breakers] is not covered in sufficient detail in university and college curriculums. This advanced diploma is presented by lecturers who are highly experienced engineers from industry, having worked in the trenches' in the various electrical engineering areas. When doing any program today, a mix of both extensive experience and teaching prowess is essential. All our lecturers have been carefully selected from seasoned professionals.

This practical program avoids weighty theory. This is rarely needed in the real world of industry where time is short and immediate results, based on hard-hitting and useful know-how, is a minimum requirement. The topics that will be covered are derived from the acclaimed IDC Technologies' programs attended by over 500,000 engineers and technicians throughout the world during the past 16 years. And, due to the global nature of electric engineering today, you will be exposed to international standards.

This program is not intended as a substitute for a 4 or 5 year engineering degree or diploma, or for an accomplished and experienced professional electrical engineer who is working at the leading edge of electrical practice in these varied fields. It is however, intended to be the distillation of the key skills and know-how in practical, state-of-the-art electrical engineering. It should also be noted that learning is not only about attending programs; but also involves practical hands-on work with your peers, mentors, suppliers and clients.

“

“This is ideal for people such as myself that don't live or work in a city environment. It is the only viable way of increasing knowledge whilst working full time on a fly-in-out roster pattern.”

Brett Lapham

“When you are in a particular field and profession for a long time you rather think you know it all. This program has made me realize that there are new things to learn every day especially with the ever changing technology. ”

Stephen Ozveya

To apply, please contact enquiries@eit.edu.au

EIT Program Delivery Methodology

Not all e-learning is the same. See why our live fully mentored methodology is so unique and successful.

Visit:

VALUE plus!

As part of the incredible value we have built into this program, you also receive:

• Two places on any IDC Technologies public 2-day workshop*

OR

• Two places at any IDC Technologies conference (conference component only, excludes workshop if available)*

PLUS

• A library of 30 technical eBooks

All of this is valued at over US$5000!

You may also be eligible for a tax deduction on your personal income tax – contact your tax advisor for more information.

* to be used within 2 years of program enrolment and subject to availability. Your fee for this program must be up to date. The offer is for workshop or conference fee only and does not include travel, accommodation or other costs. EIT is not responsible for cancellation or postponement of IDC Technologies workshops and conferences. Please note: IDC workshops will only run should there be enough full paying registrations to cover costs. When registering for an IDC workshops or conference, please specify you are claiming the Value Plus offer. Other conditions may apply at our discretion.
Accreditation & International Standing

The EIT (and many individual programs) has received recognition, endorsement and/or accreditation as a training provider from authorizing bodies based around the world, including those listed below. Please ask us for specific information for your location.

AUSTRALIA

The Engineering Institute of Technology was declared an educational institution under Section 10 of the copyright Act 1968. The notice was published in accordance with section 10A(4) of the act in the Commonwealth of Australia's Business Register Gazette (under B56). "The Engineering Institute of Technology declares that its principal function is the provision of programs of study or training for the following purpose: the continuing education of people engaged in a particular profession or occupation." – Dated 8th November 2011.

The Engineering Institute of Technology [EIT] is a private Registered Training Organization [RTO] – provider number 51971. EIT is registered with and regulated by the Australian Skills Quality Authority [ASQA]. ASQA is the national regulator for Australia’s vocational education and training sector. They regulate programs and training providers to ensure nationally approved quality standards are met.

Many of the programs offered by EIT are nationally accredited and recognized qualifications and are listed on training.gov.au [TGA]. TGA is the official National Register of information on Training Packages, Qualifications, Programs, Units of Competency and Registered Training Organizations [RTDs]. EIT qualifications accredited to date can be viewed on EIT’s registration page on TGA under the “Scope” tab. You can find EIT on TGA by searching for our provider number – 51971. Programs listed on EIT’s scope have been approved for delivery in all Australian states and territories. Please note that many additional programs are also in the process of accreditation.

This program is provisionally accredited by Engineers Australia. Pending full accreditation you may become a full associate member of Engineers Australia and your qualification will be recognised by Engineers Australia and via the Dublin Accord by leading professional associations and societies in Australia, Canada, Ireland, Korea, New Zealand, South Africa, United Kingdom and the United States. The Dublin Accord is an agreement for the international recognition of Engineering Technician qualifications.

This professional recognition greatly improves the global mobility of graduates, and offers you the opportunity of a truly international career.

NEW ZEALAND

The New Zealand Qualifications Authority recognizes individual qualifications gained overseas on a case-by-case basis. Advanced Diplomas, for example, when registered at the time of award under the Australian Qualification Framework [AQF] are typically recognized as broadly comparable to a National Diploma at level 6 on the NZQF.

SOUTH AFRICA

The Engineering Council of South Africa (ECSA) which aims to promote a high level of education and training of practitioners in the engineering profession, has validated a large number of EIT programs. Members can check details on the ECSA website. South African students who successfully complete an EIT Advanced Diploma and other qualifications have the option to apply for recognition by SAQA, who have determined in the past that an Australian Advanced Diploma program is at Level 6 in the South African National Qualifications Framework (equivalent to Higher Diploma) in South Africa’s educational system. However, in most cases formal individual recognition by SAQA is not required as the international validity and accreditation of this credential is very sound.

UNITED STATES

IEEE is the world’s largest professional association advancing innovation and technological excellence. EIT is an IEEE Continuing Education Provider. IEEE Continuing Education Programs are peer-reviewed by content experts. This peer review guarantees both quality of the technical content of learning materials, as well as adherence to IEEE’s strict criteria for educational excellence. All programs that pass this strict process are entitled to award IEEE Continuing Education Units [CEUs], recognized as the standard of excellence for continuing education programs in IEEE’s fields of interest.

The International Society of Automation [ISA] is a leading, global, non-profit organization that sets the standard for automation around the world. ISA develops standards, certifies industry professionals, provides education and training, publishes books and technical articles, and hosts conferences and exhibitions for automation professionals. ISA has reviewed the curricula of the programs offered by EIT as they relate to the instrumentation, control and automation discipline and are enthusiastic about promoting their availability to the automation community.

UNITED KINGDOM

Nationally recognised qualifications that have been achieved at EIT can be compared by UK NARIC to the UK framework. UK NARIC is the UK’s national agency responsible for the recognition of qualifications from overseas and provides services for individuals and organizations to compare international qualifications against UK qualification framework levels. UK NARIC is managed by ECCFIS Ltd (see http://www.ecctis.com.uk/naric/default.aspx) which administers the service for the UK Government. Graduates of EIT’s Advanced Diploma programs in the UK can be confident that their international qualification has been officially evaluated as comparable to the BTEC/SQA Higher National Diploma (HND) standard/Foundation Degree Standard. A BTEC Higher National Diploma is at the same level of the National Qualifications Framework as NVQ/SVQ Level 4. Recognition will be at a higher level for graduate programs.

The Institute of Measurement and Control in the United Kingdom is Britain’s foremost professional body for the Automation Industry. An EIT Advanced Diploma is recognized by the Institute of Measurement and Control as contributing to the ‘initial professional development’ required for eventual registration as Chartered or Incorporated Engineers. The Advanced Diploma is also approved by the Institute as providing CPD.

CANADA

EIT is a Participating Partner with the Engineering Institute of Canada [EIC] and EIT programs can be utilised by members to register for Continuing Education Units [CEUs]. EIC’s Continuing Education Program is supported by The Canadian Council of Professional Engineers, The Association of Consulting Engineers of Canada, and The Canadian Academy for Engineering. EIC is a member of the International Association for Continuing Education and Training, with headquarters in Washington, DC.

OTHER COUNTRIES

Students who successfully complete an EIT Advanced Diploma and other qualifications may be able to apply for recognition of their qualification within the local [home country] education system. Many countries have a process for “recognition of foreign qualifications” which is utilised by new residents when they have qualifications earned overseas. Although you will be studying from your home country you will be awarded an Australian qualification from the EIT, so your qualifications may be able to be recognized as a “foreign qualification” if you apply through your local system. If you would like to find out more, please contact your local education authorities because it is not practical for the EIT to know the systems that apply in all countries. However, in many cases formal individual recognition within the home country may not be required because the international validity and accreditation of this credential is very sound.

Members of other engineering organizations may be able to claim credit for professional development and are advised to check with their own organization.

For additional information please see http://www.eit.edu.au/international-standing.
The program is composed of 16 modules. These cover the following seven main threads to provide you with maximum practical coverage in the field of electrical engineering:

- Electrical technology fundamentals
- Distribution equipment and protection
- Rotating machinery and transformers
- Power electronics
- Energy efficiency
- Earthing and safety regulations
- Operation and maintenance of electrical equipment

The 16 modules will be completed in the following order:

1) Electrical Circuits
2) Basic Electrical Engineering
3) Fundamentals of Professional Engineering
4) Electrical Drawings
5) Electrical Power Distribution
6) Transformers, Circuit Breakers and Switchgear
7) Electrical Machines
8) Power Cables and Accessories
9) Earthing and Lightning / Surge Protection
10) Power System Protection
11) Electrical Safety and Wiring Regulations
12) Testing, Troubleshooting and Maintenance of Electrical Equipment
13) Energy Efficiency and Energy Use
14) Power Quality
15) Power Electronics and Variable Speed Drives
16) DC and AC High Reliability Power Supplies

For detailed information on the content and breakdown of modules, see pages 12 to 27.

Who Would Benefit

- Electrical Engineers and Technicians
- Project Engineers
- Design Engineers
- Instrumentation and Design Engineers
- Field Technicians
- Electricians
- Plant Operators
- Maintenance Engineers and Supervisors
- Energy Management Consultants
- Automation and Process Engineers
- Project Managers
- Instrument Fitters and Instrumentation Engineers
- Consulting Engineers
- Production Managers
- Chemical and Mechanical Engineers
- Instrument and Process Control Technicians

Presentation Format

The program features real-world applications and uses a blended approach involving interactive on-line webinars, simulation software and self-study assignments with a mentor on call.

The program consists of 72 topics delivered over a period of 18 months. Presentations and group discussions will be conducted using a live, interactive software system. For each topic you will have an initial reading assignment (which will be delivered to you in electronic format in advance of the online presentations). There will be coursework or problems to be submitted and in some cases there will be practical exercises, using simulation software and remote labs that you can easily do from your home or office.

You will have ongoing support from the lecturers via phone, fax and email.

Live Webinars

During the program you will participate in 72 live interactive sessions with the lecturers and other participants from around the world. Each webinar will last approximately 60 to 90 minutes, and we take student availability into consideration wherever possible before scheduling webinar times. Please refer to 'When will the sessions take place?' in the Frequently Asked Questions. All you need to participate is an adequate Internet connection, speakers and a microphone. The software package and setup details will be sent to you prior to the program.

Prior Learning Recognition and Exemptions

EIT can give you full or partial credit for modules where you can demonstrate substantial prior experience or educational background. An assessment fee may apply. If you wish to find out more please ask us for your copy of the policy for recognition of prior learning.

Time Commitment for the Program

You will need to spend an estimated 10-15 hours per week. This includes the preparatory reading, attendance at each webcast [1 hour plus 15-30 minutes for discussion], which runs once a week, and the time necessary to complete the assignments and practical work and the time needed to complete assignments for submission. This time would be required to ensure the material is covered adequately and sufficient knowledge is gained to provide sound, enduring and immediately useful skills in engineering. EIT operates almost all year long, so your studies will continue most weeks of the year to enable you to achieve the qualification in an accelerated time period when compared to a traditional semester-based system.
Practical Exercises, Remote Labs and Assignments

You will participate in practical exercises using a combination of remote laboratories and simulation software, to ensure you get the requisite hands-on experience. This will give you a solid practical exposure to the key principles covered in the program and ensure you are able to put theory into practice.

As research shows, no matter how gifted and experienced an lecturer (and we believe ours are some of the best worldwide), no one learns from an lecturer only presenting program materials to them in a lecture format. It is only by the additional activities of hands-on exercises using simulation software, remote laboratories, practically based assignments and interactive discussion groups with both your peers and the lecturer that you are able to internalize this knowledge, “take ownership of it” and apply it successfully to the real world. You should note that there is some degree of overlap between the practical sessions between the different units to reinforce the concepts and to look at the issues from different perspectives.

Traditional distance learning thus presents challenges in achieving these goals but we believe today with the modern e-learning technologies available combined with outstanding lecturers that we can achieve these goals and give you an equivalent or indeed even better experience than on a traditional university campus. Practical sessions may be added, deleted or modified by the lecturers to ensure the best outcome for students.

Benefits of Live E-learning

- Attend lessons in a live, virtual classroom with your lecturers and fellow students
- Upgrade your skills and refresh your knowledge without having to take valuable time away from work
- Receive information and materials in small, easy to digest sections
- Learn from almost anywhere - all you need is an Internet connection
- Have constant support from your program lecturers and coordinator for the duration of the program
- Interact and network with participants from around the globe and gain valuable insight into international practice
- Learn from international industry experts
- Live interactive webinars, not just a ‘book on the web’
- Receive an accredited Advanced Diploma of Applied Electrical Engineering [Electrical Systems] for CPD purposes

About the Engineering Institute of Technology (EIT)

The key objective of the Engineering Institute of Technology (EIT) is to provide an outstanding practical engineering and technology education, from Diplomas to Master degrees and beyond. The finest engineering lecturers, with extensive real engineering experience in industry, are drawn from around the world. The learning is gained through synchronous, online (e-learning) technologies.

EIT offers awards in a growing array of engineering fields. With the internationalization of education, EIT ensures approval from a growing list of reputable accreditation agencies.

Many (perhaps, most) engineering faculties at universities and colleges experience a significant challenge delivering the program-work affordably and with excellence. EIT achieves this using online based education – economical class sizes are attainable, international experts are engaged to instruct and remote laboratories and simulation software are employed.

EIT is a sister company of the well known and reputable engineering training organization, IDC Technologies. IDC has been operating for over 20 years, from offices throughout the world, delivering practical short programs to well over 500,000 engineers and technicians.

For more information or to apply, please contact us at enquiries@eit.edu.au

Why EIT?

- Our lecturers are selected and recruited from amongst the top engineers/lecturers in their field - worldwide. These lecturers are highly skilled at presenting challenging concepts and ideas to students of varying levels and abilities.
- As shown in this detailed program prospectus, the programs are aimed at practising professionals giving hard-hitting practical know-how relevant to today’s market and is aimed at people working in industry. We design and select Case Studies and practical exercises in the program based upon real-world business requirements Feedback from the tens of thousands of students we have trained over many years has allowed EIT a unique understanding of real world business requirements and we have tailored the program accordingly.
- We have experience in training over 500,000 engineers and technicians throughout the world and have built up a library of outstanding reference materials which focus on what engineers and technicians need in their work today in industry and mining. The value of these references is considerable and they are a great asset to industry professionals. These reference materials are included in the cost of the program.
- The program content is challenging and designed for engineers and technicians already working in industry. We assume a general understanding of the demands of the workplace. A student without practical experience would be unsuited to the program.

Program Fees

Your program fees include weekly webinars with leading engineering and technical experts, 30 technical eBooks, all program materials, software and postage, plus grading and support from the program coordinators and lecturers. We provide payment options and can accept fees in a variety of currencies. Please contact your advisor for fees in an appropriate currency for your location.
Comprehensive e-Books and Associated Documentation

You will receive 30 of our up-to-date technical eBooks to add to your library. Together these texts contain over 8000 pages of valuable know-how distilled from years of experience in presenting these programs throughout the world.

Participants only completing selected topics will receive only the relevant documentation.

1. Safe Operation and Maintenance of Circuit Breakers and Switchgear
2. Understanding Electrical Engineering and Safety for Non-Electricians
3. Practical Energy Efficiency, Design, Engineering and Auditing
4. Lightning, Surge Protection & Earthing of Electrical & Electronic Systems in Industrial Networks
5. Practical Earthing/Grounding, Bonding, Lightning and Surge Protection
6. Practical Power System Protection for Engineers and Technicians
7. Electrical Drawings and Schematics
8. Practical Power Transformers: Operation, Maintenance & Testing
9. Troubleshooting, Maintenance & Protection of AC Electrical Motors and Drives
10. Practical Power Distribution
13. Practical Electrical Safety Techniques for Industry
16. Practical Troubleshooting of Electrical Equipment and Control Circuits
17. Practical Power Quality: Problems & Solutions
18. Practical Arc Flash Protection for Electrical Safety Professionals
19. Practical HV Cable Jointing & Terminations for Engineers and Technicians
20. Critical Power Supply Options and Planning of High Availability Supplies
21. Operation and Maintenance of Diesel Power Generating Plants
22. Practical Electrical Substation Safety for Engineers and Technicians
23. Electrical Maintenance for Engineers and Technicians
24. Wind & Solar Power - Renewable Energy Technologies
25. Practical Motor Protection, Control and Maintenance Technologies
27. Practical Power System Harmonics, Earthing and Power Quality - Problems and Solutions
28. Practical Variable Speed Drives for Instrumentation and Control Systems
29. Practical Medium & High Voltage Testing of Electrical Equipment for Engineers and Technicians
30. Installation, Testing and Troubleshooting of Transformers

Please Note: Students who choose to pay upfront will receive all 30 eBooks in advance. If you opt to pay by installments you will receive eBooks periodically throughout the program.
WHAT OUR STUDENTS HAVE TO SAY

QUOTES FROM PAST STUDENTS

on a recent EIT survey to the following question:

What made you choose an EIT program[s]?

“Good reputation, had attended good full-time programs previously.”
Worley Parsons

“Program facilitator CV, ...reputation, e-learning flexibility.”
SMK, New Zealand

“Content tends to practical and targeted.”
MIPAC, Australia

“Non-vendor specific training and lower program costs with online training capabilities.”
Worley Parsons

“The content of the program and the way the program was broken down were the key factors.”
GEA Group

“I can do those programs at my own free time which made it more convenient for me.”
Iluka, Australia

“Content was applicable to my job and industry. Taught by industry experts not academics. E-room delivery mode. Accreditation in various nations.”
Sanofi Pasteur, Australia

“Because it is specialist, and so many available programs.”
Kacst, Saudi Arabia

“Covered all my criteria and gave me recognised qualifications on completion.”
Netafim

“I took a previous program, IDC [sister company] is professional.”
Cat Group

“I have done other programs with IDC [sister company] and was happy with the service provided.”
GHD

“Had completed programs previously. Good content.”
Woodside

“I understood from friends that it is good quality.”
Rio Tinto

“Better choice of topic.”
Rockwell RA

“Believed to be good quality based on previous training programs I have done in person.”
BHP Billiton, South Africa

“It was referred to me by a colleague and I have attended seminars run by IDC before. The program that I am currently enrolled in also had all the outcomes I was looking for to further my career.”
Rio Tinto

“The program content was relevant to my work environment and practical.”
Alcoa

“I have done a few IDC programs in the past and found them to be very good and delivered by people with practical knowledge of the subjects.”
Kalgold

“It provides good online program delivery including its quality support structures.”
OneSteel

“Program interest and content.”
ABB, Australia

“The fact the I could do it online and it was in line with furthering my knowledge for work.”
CAED, Australia

“It ticked all the boxes ... quality, suitability, depth, length.”
Powerco, New Zealand

“Better choice of topic.”
Rockwell RA

“Program was visible and relevant.”
Schneider Electric, UK

“Convenience.”
Rio Tinto

“To be perfectly honest with the small amount of research on various programs I did the programs are generally the most relevant to my area of work. That’s not to say they are perfect but they seem to be superior to others readily available in this part of the world.”
WEL Networks, New Zealand

“Program content seems practical and applicable. I already have a BSc where the focus is on the theory.”
BHP Billiton, South Africa

“Industry recognition and recommendation by colleagues.”
Rio Tinto

“Seemed the most convenient option, and it was!”
CPIT, New Zealand

“Program content ease of study option.”
Nestle, South Africa

“The content of the program made up my mind.”
Transportadora de gas del Norte, Argentina

“Their programs are standard and program material as well as lecture are okay.”
Shell, UK

“Its international recognition with body endorsing certification. Easy to attend lessons after work hours. Easy way of program payment.”
Kinyara Sugar Ltd, Uganda

“The most practical and technical offerings by the most qualified lecturers for distance learning.”
Encana Natural Gas

“On line references, price, and various time frames available to sit in on the class. Also, one more important item was being able to converse with the lecturer and class instead of working totally on my own.”
Mitchell Technical Institute

“Program content. Accreditation of the training institution. Cost.”
MODEC

“Offer the correct program, timing and affordable cost.”
Folec, Brunei

“Possibly the most recognised online institution within my industry.”
DRA, South Africa
Frequently Asked Questions

What are the advantages of studying online?
We know that many potential students have part or full-time employment as well as family commitments, so finding the time to study a classroom-based program is not always possible. Many students also have geographical, travel and time limitations and do not have an accessible institution or training provider. We have taken this into consideration and developed an affordable, flexible, online approach to training. This means that you can study from anywhere, with minimum downtime from work – but still have the necessary interactive learning experience. The software we use does not require very fast internet connection or a sophisticated computer. A basic connection and hardware are sufficient.

What are the fees?
EIT provides distance education to students located almost anywhere in the world – it is one of the very few truly global training institutes. Program fees are paid in a currency that is determined by the student’s location. A full list of fees in a currency appropriate for every country would be too complex list here and, with today’s exchange rate fluctuations, difficult to maintain.
To find out the fees for your location, contact us at enquiries@eit.edu.au.

What do I need?
An adequate Internet connection, speakers and a microphone. A headset is recommended. The necessary software and program materials are provided by us.

Doesn’t it get boring? How can an eLearning program be interactive?
Boredom can be a real risk in any form of learning; however, we use an interactive approach to our eLearning – with live sessions (instead of recordings) for most presentations. The webinar software allows everyone to interact and involves participants in group work, including hands-on exercises with simulation software and remote laboratories where possible. You can communicate with text messages, or live VoIP speech, or can even draw on the whiteboard during the sessions. This all helps to keep you motivated and interested.

What do live webinars involve?
These are live, interactive sessions over the Internet. You will join the lecturer and other participants from around the world in an online ‘virtual classroom’ where you are able to watch a presentation, and communicate with the lecturer and other students via audio, text messaging or drawing on the whiteboard. Each webinar is between 60 and 90 minutes in duration and the sessions may be scheduled at 2 or 3 different times, depending on class size, during the presentation day. This allows you to select the session which is most convenient.

What if I cannot join or I miss a live webinar?
Webinars are recorded and available to students upon request. One requirement of the program is that you join at least 70% of the live sessions. The live webinars offer the opportunity to interact with the lecturer and other participants from around the globe – an essential yet enjoyable part of the learning process.
Circumstances such as on-site work can make attendance difficult at times. These situations need to be clearly communicated with your eLearning coordinator. Feedback from the recordings may be required and assignment submission maintained.

When will the sessions take place? When will I receive a webinar schedule?
The webinar schedule is not put together until after registrations close. The reason for this is that the program is promoted globally and we often have participants from several time zones. When you enrol you will receive a questionnaire which will help us determine your availability. When all questionnaires are returned we create a schedule which will endeavour to meet everyone’s requirements.
Each webinar may run 2 or 3 times during each presentation day and we try our best to ensure that at least one session falls into your requested time frames. This is not always possible, however, due to the range of locations of both lecturers and students. If you are unable to attend the webinars scheduled, we do have some options available. Contact EIT for more details.

Can I complete the program in less time?
Our programs actually require ‘attendance’ and participation at the live webinars. The interaction which takes place is an important part of the learning process. Our experience has shown that the interactive classes work exceptionally well and students are far more likely to stay motivated, enjoy the program, and complete the program successfully. See also ‘What if I cannot join or I miss a live webinar?’. In addition, accelerating the program would be quite onerous for most students.

How much time do I need? How long is the program?
Successful students tell us that 10 to 15 hours per week is required in order to earn good grades. This will include the weekly webinar plus program reading, assignments, practical work. This will vary depending on the program subject matter and your existing knowledge.
EIT does not use a traditional semester-based system, which means that you can complete the qualification faster without long breaks. Each advanced diploma program is delivered over an intensive 18 months. We do break for about 4 weeks per year for traditional festive seasons.
Your team of professional lecturers and facilitators are drawn from experts in their field. They will work closely with you for the duration of the program. Please note: Program lecturers are subject to change. Students will be notified in the event new lecturers join the faculty.

**LECTURER**

**Behrouz Ghorbanian**  
BSc, MSc, MIEAust

Behrouz completed his degrees in Telecommunications and Electrical Engineering in 1985 and 1993 respectively, and then concluded his studies in Electrical Utility Engineering at Curtin University (Perth) 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.

**LECTURER**

**Braam Burchardt**  
BSc (Elec. Eng), Pr Eng, MDP, MIEEE Elect & Mech. Cert of Comp Mines

Braam started his career in Electrical Engineering by serving an apprenticeship on the Zambian copper mines. After qualifying, he moved to South Africa where he obtained Government Certificates of Competency, in both Electrical and Mechanical Engineering, and worked for a number of years as an Engineer on various gold, diamond, platinum, coal and titanium mines.

He was subsequently recruited by the Department of Mineral Resources (DMR), where he attained the rank of Principal Inspector. His work entailed investigating serious mine accidents involving mechanical and electrical plant and equipment. He was also often called to present evidence in criminal and civil courts. Braam studied for a degree in Electrical Engineering with a DMR bursary.

Braam is the Principal Member of the consulting firm, Burchardt Technical Services cc, which he established in 1998. He is also the owner of an electrical construction company, RB Electrical. In the past two decades Braam has worked on major mining projects for Rio Tinto, both in South Africa and abroad.

Braam has a passion educating young engineers and freelances as an lecturer for mining companies, IDC Technologies and others. He also has an interest in writing and late in his career obtained a diploma in journalism.

**LECTURER**

**Deepak Pais**  
BE(Electrical & Electronics)

Deepak started his career within the Zinc mining & smelting industry as Project Engineer in Substation & Distribution Greenfield project. He then worked in a Marine and Logistics firm in the Bahamas as Maintenance and Commissioning Engineer. Following this he worked with Japanese and German automobile firms as Maintenance Engineer for Distribution and Utility related systems. He currently works as an Engineer in a regional NSW electricity Distribution utility.

Deepak has hands on experience in Distribution, Utility and Substation related systems. He has a particular interest in the consistent interpretation and implementation of Greenfield and Brownfield Standards with an emphasis on safety, reliability, economy and whole of life cost analysis.

**LECTURER**

**Hashemi Ford**  
BE (Honrs)[Elec] ME[Elec]  Principal Engineer

Hashemi has over 20 years international experience in electrical power industry with a focus on modelling, analysis, planning and operation of power systems including distribution, sub-transmission and transmission networks. He has been involved in modelling and analysis of major projects including HVDC interconnectors and Wind farms. Currently Hashemi is working as a Principal Engineer for a power utility in Australia as well as teaching as a part time lecturer for EIT.
George Marx  
Pr Eng, BSc [Eng] Senior Engineer

With over 25 years experience since earning his electrical engineering degree, George commenced in Power System Protection and then migrated to EMC and Power Systems. George’s portfolio of achievements includes EMC design of Power Systems, Switch Mode Power Supplies, UPS and high precision Servo Amplifiers for high reliability military applications. Other projects he has engaged in include: Battery and Inverter Design for industrial systems, such as solar panel applications, vehicle management, specialised computer systems and high current starter for vehicle plants. Video systems for UAV’s and the design of a high resolution IR Camera for industrial and military application.

George has developed and presented several programs for Technikon SA [now UNISA] and has founded an IT company which specialize in Wireless Internet and networks – ICT consultation. When George takes a break from his hectic schedule of electrical engineering design, he enjoys wildlife photography, and outdoor activities in the African bush. An experienced and enthusiastic lecturer and professional engineer, with a wealth of knowledge under his belt, you will gain much from his practical approach and entertaining style.

John Piperides  
BE [Electrical]

John is a professional electrical engineer with over 25 years experience in industrial maintenance, production, management, sales and improvement. He has held management positions in several manufacturing and sales companies. His diverse responsibilities have included contract negotiation, authoring and responsibility of departmental budgets, daily management of over 20 reports, practice of cGMP, auditing in a pharmaceutical plant, and system administration and programming of diverse IT and embedded systems. He has been directly involved with industries including building management, pest control, mining, power utilities, food, pharmaceutical, steel, building products, sugar, paper and pulp, rail and airports.

John has completed many years of further education including developing, writing and delivering many work based programs and seminars. He has spent 10 years as a part time teacher at TAFE in electrical engineering, and 15 years delivering structured programs in thermography, power quality, instrument safety, motor drive theory, PLC, SCADA, and pest inspection.

Robert Holm  
PhD, MEng, BSc [hons], BEng

Robert commenced his career as a Power electronics design engineer where he worked on the design and testing of sinusoidal inverters, battery chargers and stator winding designs for automotive alternators. He later worked as a PhD researcher, involved in the development of a flywheel energy storage system which later became formed the basis of machines now used in public transport busses in the Netherlands. He has also spent 5 years as an Associate Professor at a prominent university where he lectured on subjects such as Electrical Systems, Electromagnetics, advanced electrical machines and drives.

Robert currently works as an Innovations engineer in Electromagnetics where he is involved in the design of a shunt regulator for a traction drive system; a ruggedised data logger for robots and locomotives, an electric drill [to replace pneumatic drills] as well as guiding to colleagues regarding power electronics, circuits, battery management, and researching novel power sources for mining robots and new possibilities for hub motors for mining robots.

Nagendra Gangadharan  
Pr Eng, BSc (Eng) Senior Engineer

Nagendra received the ME degree in Electrical and Electronics Engineering from the University of Auckland, New Zealand, in 1995. In 1991, he joined the Biomedical Engineering Services, School of Medicine, University of Auckland, New Zealand to work as an Electronics Engineer. In 1994, he joined the School of Electrical and Electronic Engineering, Singapore Polytechnic, Singapore as a lecturer. He was appointed as the program manager for the Biomedical Engineering option for two diploma programs, and the chairman of department program management team for the Specialist Diploma in Biomedical Engineering program. He taught medical instrumentation and industrial automation programs and carried out numerous research works. He received two ‘Excellence in R&D’ awards for his research work in biomedical instrumentation and an ‘Excellence in R&D’ award for his work in computerised structural simulation software. In 2005, he joined a multi-national company in New Zealand, specialising in baggage handling systems. He worked as a software design engineer and developed PLC programs for a few international airports in New Zealand and two major parcel handling systems for Australia Post in Sydney and Melbourne, Australia. In 2007, he joined a multi-national company in New Zealand, specialising in manufacture of fruit sorting/packaging solutions. He developed PLC, HMI programs for a few turn-key projects in Australia, New Zealand and US. 2010-2013 worked as VET lecturer at the Charles Darwin University, Australia. In late 2013 he joined EIT as a senior lecturer.

He is a member of IEEE Power Electronics society and IEEE Industrial Applications society.
International Expert Lecturer Faculty

LECTURER
Justin Schute
Justin has over 32 years electrical engineering experience and holds an advanced diploma in electrical engineering, associate degree electrical-electronic engineering and is a fully qualified electrician. Justin has spent time working for Power & Water Northern Territory, Minara Resources and Cockburn Cement and up until recently has been working in catastrophic HV design for Nilsen as their High Energy Engineering Manager. Justin specialises in high voltage design and solutions and also lectures for the Engineering Institute of Technology.

PROGRAM DESIGNER AND LECTURER
G. Vijayaraghavan  BE(Hons) Electrical
G. Vijayaraghavan is an electrical engineer with over 35 years experience in the Steel Industry and Engineering Consultancy. He is the author of several of IDC’s technical books including Practical Earthing, Bonding, Shielding and Surge Protection which has been published and sold internationally by Elsevier (UK).

He regularly designs training workshops for IDC and lectures on their behalf to engineers and technicians world-wide. He is a very knowledgeable lecturer and his programs are extremely interesting with many ideas, anecdotes and tips drawn from his rich experience.

LECTURER
Greg Bell  BSc (Elec Eng), BCSE Solar Design
Greg Bell has been working with computers in technology companies since he was 16 years old. He obtained a Bachelor of Science in Electrical Engineering from the University of California at, San Diego and spent ten years designing digital integrated circuits for large and small companies before jumping careers into the renewable energy industry.

He has been teaching for four years and continues to write computer programs as a contractor.
Module 1: Electrical Circuits

Duration: 3 WEEKS

You will learn to:

- Examine DC and AC circuits
- Examine single and multipath circuits
- Examine polyphase and three-phase circuits

Overview

This module covers basic electrical circuit fundamentals to understand and solve problems on DC, AC circuits, single and multipath circuits, polyphase and three-phase circuits.

THE PROGRAM

**Topic 1.1**
SINGLE AND MULTIPATH DC CIRCUITS

- Ohm’s Law
- Electrical power in resistive circuits
- Resistors in series/parallel
- Kirchoff’s Current and Voltage Laws
- Mesh current analysis
- Inductors and capacitors in series/parallel
- Time constant (tau) for RL and RC circuits

**Topic 1.2**
SINGLE AND MULTIPATH AC CIRCUITS

- Sine wave quantities
- Complex numbers and phasors
- Capacitive and inductive reactance
- Complex impedances
  - Series: RL, RC
  - Parallel: RL, RC, LC
- Power in AC circuits

**Topic 1.3**
THREE-PHASE SYSTEMS

- Polyphase supply systems
- Types of 3-phase systems
  - Balanced star, 3/4 wire
  - Delta
  - Related phasor diagrams
  - Current and voltage: relationship between line and phase quantities
- Balanced 3-phase loads
- Unbalanced loads
Module 2: Basic Electrical Engineering

Duration: 3 WEEKS

You will learn to:

- Examine and discuss the fundamentals of power systems and electric power generation
- Describe the equipment for power transmission and distribution, and related issues
- Examine and discuss the basics of insulators, conductors and electromagnetism

Overview

This module gives an overview of basic electrical engineering principles and various equipment used for generation, transmission, transformation, distribution and utilization of electrical energy. It also covers the issues involved in operating electrical equipment and machinery such as electric power quality and safety. It is intended to serve as an introduction to the modules which follow in this program and enable the participants to develop an appreciation of the principles involved and facilitate easy understanding of the ensuing modules.

THE PROGRAM

Topic 2.1
CONDUCTORS, INSULATORS AND ELECTROMAGNETISM
- Conductors and Insulators
  - Conductors
  - Semiconductors
  - Superconductors
  - Electrical insulators
- Electromagnetism
  - Electromagnets
  - Electromagnetic strength
  - Electromagnetic induction
  - Magnetic quantity characteristics

Topic 2.2
FUNDAMENTALS OF POWER SYSTEMS AND ELECTRIC POWER GENERATION
- Concepts behind electric power generation, transmission, distribution and utilization
  - Historical overview
  - Electricity production and use
  - Generation: non-renewable and renewable sources
  - AC and DC systems: comparison in respect of generation, transmission and distribution
  - Relationship between frequency and poles in a generator
- Electric power and energy
  - Electric power and energy
  - Active and reactive power
  - Power triangle
- Fundamentals of electrical networks
  - Transmission and distribution
  - Electrical networks

Topic 2.3
ELECTRICAL EQUIPMENT FOR POWER TRANSMISSION AND DISTRIBUTION AND RELATED ISSUES
- Electrical equipment used in transmission, distribution and utilization
  - Transformers
  - Isolators
  - Fuses
  - Circuit breakers
- Electrical utilization, basics of power quality and electrical safety
  - AC and DC electrical rotating machines
  - Power electronics applications
  - Power quality problems
  - Protection of electrical systems
  - Electrical safety, legislation and compliance
Module 3: Fundamentals of Professional Engineering

You will learn to:

- Demonstrate the ability to self-manage
- Demonstrate familiarity with key project management issues
- Communicate in a technical environment
- Demonstrate professional and global awareness
- Administer the basics of project finance
- Demonstrate awareness of workplace health and safety-related issues

Overview

This module covers project management principles and various non-technical aspects of engineering education in compliance with the stage 1 competency standards for the Engineering Associate as required by Engineers Australia. The broad aims of this unit are to enable the student to:

- Assess personal strengths, weaknesses and preferences
- Implement personal development strategies that align with Engineers Australia’s professional standards
- Undertake complex ill-defined engineering projects and report appropriate solutions
- Investigate, develop and articulate technical knowledge required to undertake engineering projects
- Articulate and demonstrate personal development of time management skills, project management skills and team management skills
- Analyze and assess the viability of engineering projects using sustainability frameworks
- Present technical engineering information to peers and superiors
- Continue to develop a portfolio to demonstrate development of a professional attitude, problem solving skills, technical knowledge and productive work practices
- Provide evidence of a professional capacity to communicate, work and learn productively, both individually and in teams

THE PROGRAM

Topic 5.1
- TIME MANAGEMENT
- PORTFOLIO OF SKILLS

Topic 5.2
- PROJECT MANAGEMENT BASICS
- LAUNCH OF FUNDAMENTALS OF PROFESSIONAL ENGINEERING (FPE) PROJECT

Topic 5.3
- COMMUNICATION SKILLS
- PROBLEM SOLVING AND DECISION MAKING

Topic 5.4
- TECHNICAL WRITING AND SPECIFICATIONS
- GROUP DYNAMICS

Topic 5.5
- PROJECT COSTING AND CASH FLOW MODELLING
- DISCOUNTED CASH FLOW

Topic 5.6
- LEADERSHIP AND PROFESSIONAL CONDUCT
- ETHICS IN ENGINEERING

Topic 5.7
- RESPONSIBILITIES OF THE ENGINEERING ASSOCIATE
- ENGINEERING STANDARDS AND CODES OF PRACTICE

Topic 5.8
- GLOBAL AND ENVIRONMENTAL ISSUES
- SUSTAINABLE ENGINEERING

Topic 5.9
- WORKPLACE HEALTH AND SAFETY ISSUES
- PRESENTATION SKILLS

Topic 5.10
- TECHNICAL SKILLS AND CAREER PLANNING

Topic 5.11
- PRESENTATION OF FUNDAMENTALS OF PROFESSIONAL ENGINEERING (FPE) PROJECTS BY GROUPS

Topic 5.12
- PRESENTATION OF FUNDAMENTALS OF PROFESSIONAL ENGINEERING (FPE) PROJECTS BY GROUPS - CONTINUED

Duration: 4 WEEKS* (AND INTEGRATED THROUGHOUT PROGRAM)

* There will be two 1-hour webinars delivered for 2 weeks at the start of this module and two 1-hour webinars over 2 weeks at the end of the program plus eight 1-hour webinars throughout the duration of the program.
Module 4: Electrical Drawings

Duration: 3 WEEKS

You will learn to:

- Examine and discuss drawing types, attributes and symbols
- Interpret engineering drawings
- Examine and discuss Computer Aided Drafting (CAD) and drawing management

Overview

It is often said that drawing is the engineers’ language for communicating effectively. Drawings are used to communicate and share information between different teams of engineers; the design engineer who conceptualizes equipment or an entire system, the production engineer who plans the steps in manufacturing the required components and subsystems, the assembly engineer who puts the components together, the testing engineer who tests the complete system, the installation engineer who installs the system or equipment and the maintenance engineer who is responsible for its upkeep.

A drawing should convey precise and identical information to all these engineers with diverse backgrounds and expertise. This calls for standardized methodologies, conventions and approach in preparing drawings. This module covers all these aspects with respect to engineering drawings in general and electrical drawings in particular. Various types of electrical drawings and their application, the steps in planning a drawing, selection of drawing size and scale, use of standardized symbols etc. are described in detail with commonly used examples from industry practice.

THE PROGRAM

Topic 4.1 DRAWING TYPES, ATTRIBUTES AND SYMBOLS
- Fundamentals of electrical and electronic engineering drawings
  - Drawing standards
  - 2 and 3-dimensional representation
  - Components of an engineering drawing
  - Drawing sizes
  - Scales and sheet sizes
- Symbols
  - Electrotechnology symbols

Topic 4.2 ENGINEERING DRAWINGS
- Single-line and 3-line diagrams
- Control schematics
- Logic gates and logic diagrams
- Cabling and wiring drawings
- Layout drawings for different applications

Topic 4.3 COMPUTER AIDED DESIGN (CAD) AND DRAWING MANAGEMENT
- CAD
  - 2D and 3D CAD applications
  - GIS related applications: linking imagery with drawings
- Drawing management
  - Revision control and drawing ownership
  - Drawing process flow
  - Redlining in CAD drawings
- CAD drawing features
  - Symbols, attributes and symbol libraries
  - Automated BoM generation from a CAD drawing
  - Concept of layers and their use in sharing information
  - Automation of drawing through programming
- Management of drawings
Module 5: Electrical Power Distribution

Duration: 6 WEEKS

You will learn to:
- Examine common distribution system alternatives
- Plan and configure power distribution systems
- Examine fault level in electrical system and its role in the choice of equipment
- Evaluate fault current of simple power distribution systems
- Outline maintenance and asset management in distribution systems

Overview
Power is a critical input to any industry and availability of uninterrupted, good quality power is essential for production. It is therefore necessary that an engineer regardless of his or her function must understand the basics of electrical power distribution. This module provides participants with a detailed study of planning, selecting, testing and maintenance procedures of an industrial power distribution system. It covers various elements of a power distribution system such as, equipment sizing, equipment selection, planning of power distribution system, fault level in electrical systems, power distribution system automation maintenance and asset management.

No two industries are alike. The power requirement can vary from less than 100 kilowatts for small manufacturing units to several hundreds of megawatts in the case of large facilities such as an integrated steel plant or an aluminium smelter plant. Correspondingly, the complexities of power distribution systems within the facility may vary considerably. However, the basic governing principles are valid for all cases and will thus be very useful regardless of the type of industry in which you work.

THE PROGRAM

Topic 5.1 COMMON DISTRIBUTION SYSTEM ALTERNATIVES
- Characteristics of typical industrial distribution systems
- Equipment used in distribution systems
- Electrical safety and power security issues
- Voltage classifications
- Distribution types
- The use of transformers

Topic 5.2 PLANNING OF POWER DISTRIBUTION SYSTEMS
- Planning of industrial power distribution networks including embedded generation
- Distribution system alternatives

Topic 5.3 FAULT LEVELS IN ELECTRICAL SYSTEMS AND THEIR ROLE IN THE CHOICE OF EQUIPMENT
- Electrical faults
- Asymmetrical fault behaviour

Topic 5.4 FAULT CURRENT EVALUATION OF SIMPLE POWER DISTRIBUTION SYSTEMS
- Equivalent impedance diagram of a power system

Topic 5.5 IN-PLANT GENERATION REQUIREMENTS AND ALTERNATIVES
- Distribution equipment
- Conductor size vs. short circuit current

Topic 5.6 MAINTENANCE AND ASSET MANAGEMENT IN DISTRIBUTION SYSTEMS
- Power distribution system automation
- Condition based maintenance vs. reliability centred maintenance
- Diagnostic techniques
- Problems found during maintenance
Module 6: Transformers, Circuit Breakers and Switchgear

Duration: 5 WEEKS

You will learn to:

- Examine theory, types, construction and characteristics of power transformers
- Outline the procedures for the installation, maintenance and testing of power transformers
- Examine and discuss the basics medium voltage and low voltage switchgear
- Examine and discuss the basics medium voltage and low voltage circuit breakers
- Select batteries for substations

Overview

This module covers some of the power distribution components. It covers a detailed study of transformer principles and their applications. Topics cover transformer configurations and vector group, off circuit and on load tap changers, transformer cooling, dry type and VPI type construction, specifying a transformer, testing and maintaining a transformer, failure prevention, residual life estimation. Further it covers the topics in circuit breaker and their operating principles, specification of MV, LV circuit breakers, switchboard configurations, interlocking within switchgear for safe operation, testing and maintenance of circuit breakers and switchgear.

THE PROGRAM

Topic 6.1
THEORY, TYPES, CONSTRUCTION AND CHARACTERISTICS OF POWER TRANSFORMERS
- Fundamentals of power transformers
- Power transformer construction
- Power transformer types
- Methods of transformer protection

Topic 6.2
INSTALLATION, MAINTENANCE AND TESTING OF POWER TRANSFORMERS
- Power transformer installation
- Power transformer oil quality
- Electrical tests and preventive measures

Topic 6.3
MEDIUM VOLTAGE AND LOW VOLTAGE SWITCHGEAR
- MV and LV switchgear specifications
- MV and LV switchgear applications
- MV and LV switchgear construction
- Metering, protection and control of MV and LV switchgear

Topic 6.4
MEDIUM VOLTAGE AND LOW VOLTAGE CIRCUIT BREAKERS
- Circuit breaker basics
- Circuit breaker specifications and ratings
- MV and LV circuit breaker construction

Topic 6.5
BATTERIES FOR SUBSTATIONS
- Basics of batteries
- Battery Types
- Charging and discharging of batteries
- Selection and sizing of batteries
- Battery installation, maintenance, failure and disposal

You will learn to:

- Examine theory, types, construction and characteristics of power transformers
- Outline the procedures for the installation, maintenance and testing of power transformers
- Examine and discuss the basics medium voltage and low voltage switchgear
- Examine and discuss the basics medium voltage and low voltage circuit breakers
- Select batteries for substations
Module 7: Electrical Machines

Duration: 4 WEEKS

You will learn to:

- Examine basic principles of operation of electrical machines
- Examine AC and DC machines and their applications
- Examine motor control, protection, testing and maintenance
- Conduct motor failure analysis
- Examine new electrical machine technologies and developments

Overview

It is estimated that electrical drives and other rotating equipment consume about 50% of the total electrical energy consumed in the world today (and this figure increases to 70% if you consider only industrial loads). Though DC machines were the first to be developed, the use of AC motors has become substantially higher with the growth of AC power distribution. DC motors find applications in selected and niche areas only mainly due to their higher maintenance requirements. Though originally DC machines offered the sole choice when high torque and speed control were required by an application, the advancements in power electronics has resulted in a new generation of drives offering torque and speed control over a large range.

The cost of maintaining electrical motors can be a significant amount in the budget item of manufacturing and mining industries. This module gives you a thorough understanding of electrical motor protection, control and maintenance and gives you the tools to maintain and troubleshoot electrical motors. The concluding section gives you the fundamental tools in troubleshooting motors confidently and effectively.

THE PROGRAM

Topic 7.1
PRINCIPLES OF ELECTRICAL MACHINES
- Principles of operation
- Torque calculations
- Torque vs. speed
- AC vs. DC machines

Topic 7.2
AC AND DC MACHINES AND THEIR APPLICATIONS
- Types of AC and DC machines and their applications
- Faults and fault-finding
- Components of 3-phase induction machines
- Limitations of single-phase AC motors
- Special types of electrical machines
- New technologies and developments

Topic 7.3
MOTOR CONTROL, PROTECTION, TESTING
- Motor control methods
- Protection methods for motors
- Performance testing of motors

Topic 7.4
MOTOR FAILURE ANALYSIS
- Common causes of motor failure
- Effects of excessive loading
- Motor and bearing failure analysis
- Maintenance requirements to prevent failure
Duration: 3 WEEKS

You will learn to:

- Examine power cable types and classifications
- Outline the methods of cable jointing and termination practices
- Examine cable installation and maintenance requirements

Overview

Cables are one of the most expensive assets in a power distribution network. Technical staff need to have expert knowledge in selection, application, installation and tools available for fault location combined with experience in order to achieve outstanding service reliability. This module is designed to ensure that those responsible for the selection, laying, operation, maintenance and monitoring of power cables understand the technical issues involved and comply with relevant specifications and requirements.

Termination and joints are the usual weak areas in any cable system and most electrical failures take place due to improperly executed joints and terminations. Faults in underground cables cause loss of supply to customers and loss of revenue for electricity suppliers. It is imperative that the fault location process is efficient and accurate to minimise excavation time, which results in reducing the inconvenience to all concerned. These topics cover accessories in detail and discusses the reasons of failures so that the participant gains a good knowledge of incorrect practices and their impact on cable reliability.

THE PROGRAM

Topic 8.1
POWER CABLE TYPES AND CLASSIFICATIONS
- Types of cable
- Cable types for given applications
- Cable sizing
- Sheath bonding for MV and HV cables

Topic 8.2
JOINING AND TERMINATION
- Requirements for outdoor terminations
- Mechanical protection for joints and terminations
- Jointing and terminating procedures
- Testing of cables after jointing/termination

Topic 8.3
INSTALLATION METHODS, TYPES OF CABLE FAULTS AND LOCATING FAULTS
- Storage, handling and unreeling
- Installation methods of cables and impact on ratings
- Cable laying on structures, ducts and directly in soil
- Cable failures and fault location (Loop method, fault-burning, signal injection and use of TDR equipment)
You will learn to:

- Outline the various methods of earthing electrical systems and the applicable national standards
- Examine and discuss the purpose of earthing and bonding
- Outline the correct methods for shielding sensitive communications cables and electronic equipment
- Examine and discuss lightning protection methods
- Outline surge protection methods and systems

Overview

Few topics generate as much controversy and argument as that of earthing and the associated topics of surge protection, shielding and lightning protection of electrical and electronic systems. Poor earthing practice can be the cause of continual and intermittent difficult-to-diagnose problems in a facility. This module looks at these issues from a fresh yet practical perspective and enables you to reduce expensive downtime on your plant and equipment to a minimum by correct application of these principles.

This is designed to demystify the subject of earthing and presents the subject in a clear, straightforward manner. Installation, testing and inspection procedures for industrial and commercial power systems are examined in detail. Essentially this module is broken down into earthing, shielding and surge protection for both power and electronics systems. Earthing and surge protection for telecommunications and IT systems are examined in detail. Finally, the impact of lightning and simple techniques for minimizing its impact are discussed.

THE PROGRAM

**Topic 9.1 ELECTRICAL EARTHING AND APPLICABLE STANDARDS**

- Power supply system earthing methods
- Comparative merits and applications
- Effects of electric shock
- Role of protective earthing in safety against electric shock

**Topic 9.2 EARTH ELECTRODES**

- Earth electrodes and their role
- Influence of soil resistivity on earth resistance
- Measurement of soil resistivity and earth resistance
- Earth electrode system maintenance

**STATIC ELECTRICITY**

- Static electricity basic definitions
- Problems caused by static electricity in industrial operations
- Mitigation of adverse effects by static electricity

**Topic 9.3 EARTHING OF SUBSTATIONS, SWITCHYARDS AND APPLICABLE STANDARDS**

- Substation earthing-basic principles
- Earth grid design approach
- Steps for obtaining an effective earthing system

**Topic 9.4 LIGHTNING EFFECTS AND PROTECTION**

- Lightning physics and statistical distribution
- Lightning risk assessment
- Lightning protection of structures, electrical lines and substations
- Lightning Protection of marine electrical Systems and other special structures

**Topic 9.5 SURGE PROTECTION**

- Surges: Types and methods of coupling
- Protection of electrical components against surges
- Surge protection zones and protection grading

**ELECTRICAL NOISE AND MITIGATION**

- Types of noise and coupling
- Problems caused by noise in sensitive electronic circuits
- Control of noise at source, avoiding earth loops
- Mitigation by shielding/screening
- Proper earthing and role of ZSRG, SGTP in noise reduction
Module 10: Power System Protection

Duration: 6 WEEKS

You will learn to:

- Outline the fundamentals of electrical power protection and applications
- Discuss protection system components
- Examine and discuss relay settings and the principles of unit protection
- Outline the different types of protection systems specific to equipment

Overview

This module has been designed to give a better appreciation of the role played by power system protection components. An understanding of power systems along with correct management, will increase your plant efficiency and performance as well as increasing safety for all concerned. Any power system is prone to ‘faults’, (also called short-circuits), which occur mostly as a result of insulation failure and sometimes due to external causes. The high current resulting from a fault can stress the electrical conductors and connected equipment thermally and electrodynamically. Arcs at the fault point can cause dangerous or even fatal burn injuries to operating and maintenance workers in the vicinity.

This module aims to provide excellent understanding on both a theoretical and practical level. It starts at a basic level so as to serve as a refresher to those who are more familiar with the basic topics covered and then moves onto more detailed applications. It gives an introduction covering the need for protection, fault types and their effects, and how system earthing affects protection design. This module also includes some practical work, simple to complex fault calculations, relay settings and how to interpret a current transformer magnetisation curve.

THE PROGRAM

Topic 10.1
NEED FOR PROTECTION AND BASIC PROTECTION APPROACH
- Need for protection
- Characteristics of protection and components of protection systems
- Faults in systems and its impact on protection
- Relevance of earthing to protection

Topic 10.2
PROTECTION IN INDUSTRIAL DISTRIBUTION SYSTEMS
- Fuse-the basic protective device
- Protection based on releases
- Tripping power sources, trip failure alarm
- Typical protection approach in industrial distribution systems
- Protection application in special cases such as mining systems

Topic 10.3
INSTRUMENT TRANSFORMERS AND ITS APPLICATION TO PROTECTION
- Role of instrument transformers in protection
- Voltage transformers
- Current transformers
- Selection and application of instrument transformers for electrical protection

Topic 10.4
PROTECTIVE RELAYS AND RELAY COORDINATION AND UNIT PROTECTION
- Relays used in protection and basic types
- Importance of current relays in protection
- DMT and IDMT characteristics
- Static relays and IED
- Protection coordination
- Unit protection, basic principles

Topic 10.5
PROTECTION OF TRANSFORMERS AND MV SWITCHGEAR
- Transformer protections-different approaches
- Protection based on current relays [DMT and IDMT]
- Differential protection of transformers
- REF and standby earth fault protection
- Switchgear (busbar) protection methods

Topic 10.6
PROTECTION OF MOTORS, GENERATORS AND PROTECTION MANAGEMENT
- Faults in motors
- Protection of motors against internal faults
- Protection against load-related problems
- Generator-protection for stator faults and special protections
- Protection management
Module 11: Electrical Safety and Wiring Regulations

Duration: 5 WEEKS

You will learn to:
- Explain electrical safety and hazards
- Select and design electrical safety systems
- Examine substation and battery installation safety requirements
- Examine organisational aspects of safety and safety regulations

Overview
Safety in general, and electrical safety in particular are subjects of various legislative and statutory provisions in every country/state in the world. Electrical accidents take a heavy toll every year in terms of loss of human life, financial liabilities due to death or injuries, loss of industrial output and so on. The interesting part is that most accidents need not happen at all, if everyone concerned complies with the safety enactments and safety codes. In other words, electrical accidents are mostly avoidable. The fact that accidents continue to happen simply means that we have not fulfilled the goal of creating and sustaining a climate of safety awareness among the employers and the workforce. To understand the underlying concern behind any safety regulation, one must be able to appreciate the common principles and physical laws on which the regulations are based. The module explains the theoretical as well as the practical principles behind electrical safety. The legal framework for occupational and electrical safety is also explained by covering the broad structure of the rules or regulations applicable in different countries.

THE PROGRAM

Topic 11.1
ELECTRICAL SAFETY AND HAZARDS
- Introduction to electrical hazards and safety measures
- Risk assessment and hazard control principles
- Electric shock hazard
- The role of protective earthing in mitigating shock hazard
- Types of protective equipment

Topic 11.2
ARC FLASH
- Arc flash definitions
- Causes of electric arcs
- Consequences of arc flash
- Arc flash hazard assessment procedure
- Mitigation and avoidance of arc flash incidents

Topic 11.3
ELECTRICAL SAFETY ASPECTS IN DESIGN, OPERATION AND MAINTENANCE
- Insulation, enclosure
- Isolation, voltage check and earthing
- Operational and safety locking mechanisms and requirements
- Safety aspects in electrical circuit design
- Selection of safety equipment
- Safe operation and maintenance issues

Topic 11.4
SUBSTATION AND BATTERY SAFETY REQUIREMENTS
- Substation safety checklist
- Hazards related to working with compressed fluids
- Hazards in battery installations

Topic 11.5
ORGANIZATIONAL ASPECTS OF SAFETY AND SAFETY REGULATIONS
- Organizational aspects of safety
- Wiring regulations
- Occupational Health and Safety regulations
- Codes and practices for power systems
Module 12: Testing, Troubleshooting and Maintenance of Electrical Equipment

Duration: 5 WEEKS

You will learn to:

- Examine the fundamentals of testing and testing equipment
- Examine the various types of testing methods
- Outline various electrical equipment testing and maintenance procedures

Overview

Testing is an essential activity in any engineer's career. Whatever your role in industry - electrical designer, purchase engineer, manufacturer, installation contractor or maintenance engineer - a solid knowledge of tests to be carried out on a given piece of electrical equipment and interpretation of results obtained is a necessity. This module is designed to examine good industry practice in performing the tests, testing of MV and HV electrical equipment, various types of HV equipment encountered in industry, stage wise testing performed on electrical equipment, testing equipment, good record keeping on tests conducted, national test labs and their importance in quality assurance, the role of standards on testing approach, test basis and interpretation of results.

Examples are cited from various international standards regarding the procedure for conducting tests and interpreting the test results. The need for keeping proper records of tests conducted both in the initial stages and later during routine maintenance is discussed. Some of the tests are too complex to be performed on a routine basis or may require specialised equipment which may not be normally available to users in industries or even manufacturers. This is where the services of an independent and accredited test lab is useful. The role of such labs is briefly discussed.

THE PROGRAM

Topic 12.1 FUNDAMENTALS OF TESTING
- Various types of tests
- Role of insulation in electrical equipment
- Insulation resistance measurement and interpretation

Topic 12.2 VARIOUS METHODS OF TESTING (PART 1)
- High potential tests
- Oil testing
- TAN Delta Testing

Topic 12.3 VARIOUS METHODS OF TESTING (PART 2)
- Partial Discharge (PD) Testing
- Impulse testing
- Measuring of low resistances as part of testing

Topic 12.4 TESTING OF ELECTRICAL EQUIPMENT 3
- Transformer testing
- Cable testing during operation and fault detection
- Testing of Alternators during maintenance
- Testing of other HV equipment including protection tests, CT/VT testing

Topic 12.5 ORGANISATIONAL ASPECTS OF TESTING
- Testing for troubleshooting
- Testing as an essential maintenance of electrical equipment
- Test equipment for comprehensive testing
- Documentation of testing
- Setting up a testing group in a large organisation
Module 13: Energy Efficiency and Energy Use

Duration: 5 WEEKS

You will learn to:

- Plan energy saving strategies
- Examine and discuss forms of energy and their usage
- Examine and discuss energy efficient calculations
- Prepare and conduct an energy audit of a facility

Overview

Reducing the energy costs at one’s facility must surely be one of the most effective and achievable strategies for lowering operating costs. This section gives you the practical tools to identify and implement programs and projects to reduce energy consumption in the most effective and practical ways.

You will be greatly surprised at the levels of energy losses and poor efficiency of some of the devices in your facility that consume power when the facility is operational and also the energy consumption of your facility when it is not operational. Did you know that a typical microwave oven consumes more electricity power in the digital clock than it does heating food? Both of these factors impose a huge cost on your organisation, considering that energy bills are generally at least 20% of the running costs of a business. So reductions in these bills can directly lead to better profits.

This module covers fundamental principles of energy efficiency by way of looking for points of wastage, assessment of the cost of energy usage and benefits accruing from improved energy efficiency in the facility. This section also discusses how to quickly and effectively perform an energy audit of your facility, demonstrating the use of installed instrumentation as well as measuring equipment deployed during the audit.

THE PROGRAM

Topic 13.1 ENERGY SAVING STRATEGIES
- The concept of energy efficiency
- Energy efficiency in processes using fuel directly
- Alternative energy sources
- Power systems environmental and sustainable energy management policies and procedures

Topic 13.2 FORMS OF ENERGY AND THEIR USAGE
- Main forms of energy
- Electrical energy generation
- Electrical energy usage

Topic 13.3 ENERGY EFFICIENT PRACTICES
- Energy efficient practices in electricity use
  - Lighting systems
  - Energy efficient motors
  - VSDs for energy saving
  - PFC for energy savings
- Energy efficiency in climate control applications
- Energy cost structures

Topic 13.4 CASE STUDIES
- Case studies involving process optimisation for overall energy saving (Ex: Cogeneration, waste heat recovery)
- Case studies involving energy savings through retrofitted equipment/appliances

Topic 13.5 ENERGY AUDITS
- Basic principles of energy audits
- Energy audit instruments
- Energy audit areas
- Financials and costings
- Procedure for conducting an energy audit
Module 14: Power Quality

Duration: 4 WEEKS

You will learn to:

- Examine basic principles of earthing and harmonics issues
- Examine the methods to protection equipment from surge and transient issues
- Identify and troubleshoot of power quality issues

Overview

Inadequate power quality is one of the main reasons for unsatisfactory operation and failure of electrical equipment. In this module, you will learn what is meant by power quality and the factors that make the power quality less than perfect. It covers the various parameters that determine power quality, the impact of these parameters when they go beyond specified limits. This module also discusses the different aspects of power quality and measures to be adopted to mitigate the effects of poor power quality.

A reasonable definition of quality power can be:

Power made available at stipulated voltage and frequency without distortion of waveform or loss of symmetry and with minimum instances/duration of variations beyond the specified limits or unscheduled interruptions. From this definition, a few aspects would be clear. The first is that it is generally accepted that any electrical parameter cannot remain absolutely constant and some variations will occur. So also, an unscheduled interruption is a possibility that has to be anticipated. What is therefore possible is to accept the inevitable and plan for it. The measures adopted for mitigation should depend upon the sensitivity of the connected equipment to the disturbances and the demands of the process which is being supplied by a power system.

THE PROGRAM

Topic 14.1
BASIC PRINCIPLES OF EARTHING AND HARMONICS ISSUES
- Power quality overview
- Dealing with power interruptions
- Voltage variations
- The role of earthing in maintaining power quality
- Surges and surge protection
- Electrical noise

Topic 14.2
VOLTAGE ASYMMETRY AND HARMONICS
- Voltage asymmetry
- Harmonics in power systems
- Harmonic effects and mitigation

Topic 14.3
IDENTIFICATION AND TROUBLESHOOTING OF POWER QUALITY ISSUES
- System planning and installation guidelines
- Survey of power quality problems and solutions
- Power quality site study
- Power quality from a utility perspective

Topic 14.4
CASE STUDIES
- Power quality problems and solutions – case studies
Module 15: Power Electronics and Variable Speed Drives (VSD)

Duration: 5 WEEKS

You will learn to:

- Outline the basic principles of power electronics and devices used in power electronic equipment
- Design SMPS and their components
- Examine variable speed drives for motor speed control
- Examine the control and protection of variable speed drives
- Examine electromagnetic compatibility issues
- Examine troubleshooting procedures for VSD equipment

Overview

Power electronic circuits have revolutionised almost every device that we use today from PCs to TV’s, microwave ovens and heavy industrial drives. Switch Mode Power Supplies (SMPS) and Variable Speed Drives (VSD) have thus become an important part of equipment design in all types of industrial equipment and an understanding of the different types and designs has become essential for reliable operation of complex equipment. Variable speed drive technology is a cost effective method to match driver speed to load demands and is an excellent opportunity to reduce operating costs and improve overall efficiencies in your application.

This module gives you a fundamental understanding of the basic components that form a SMPS design and the installation, operation and troubleshooting of variable speed drives. You will understand how the selection of components affects the different performance parameters and operation of the SMPS. Typical practical applications of VSDs in process control and materials handling, such as those for pumping, ventilation, conveyers, compressors and hoists are covered in detail. It also covers the basic setup of parameters, control wiring and safety precautions in installing a VSD. The various drive features such as operating modes, braking types, automatic restart and many others are discussed in detail. The module covers the four basic requirements for a VSD to function properly with emphasis on typical controller faults, their causes and how they can be repaired. Even though the focus is on the direct application of this technology, you will gain a thorough understanding of the problems that can be introduced by SMPSs and VSDs such as ripple, harmonics, electrostatic discharge and EMC/EMI problems.

THE PROGRAM

Topic 15.1
POWER ELECTRONICS CIRCUITS AND DEVICES
- Basic principles of power electronic circuits
- Power electronic devices
- Commutation in electronic circuits due to device-switching
- Inverter circuits and their applications
- Types and characteristics of switch mode power supplies used in power electronics equipment
- Comparison with linear regulators

Topic 15.2
SWITCH MODE POWER SUPPLIES
- Switch mode power supply design
  - Input rectifier/filter section
  - Switching converter/transformer
  - Output rectifier/filter
- Switch mode power control and stability
  - Controller principles/protoces
  - Control methods and stability

Topic 15.3
VARIABLE SPEED DRIVES FOR MOTOR SPEED CONTROL
- Principles of motor speed control (DC and AC motor applications)
- Review of AC motors-types and construction
- AC motor theory and performance characteristics
- Advantages of using VSD for AC motors
- PWM control variable speed AC motor drive applications
- Application of VSD (focussing on starting, acceleration and braking)

Topic 15.4
CONTROL AND PROTECTION OF VARIABLE SPEED DRIVES
- Different control approaches for AC VSD
  - Open loop control by fixed V/F variation
  - Closed loop approach by sensorless vector control
  - Cascaded closed loop approach by field oriented flux vector control
- Protection requirements for drives
- Selection and application of AC converters for Variable Speed Drive applications

Topic 15.5
EMI ISSUES OF VARIABLE SPEED DRIVES AND CONTROL
- Converters used for VSD and their impact on the power supply Electromagnetic Compatibility (EMC) issues of PWM type Variable Speed Drives
- Mitigating EMI issues arising from VSD equipment

TROUBLESHOOTING OF VSDs
- Good practice in VSD installation
- Testing of VSDs
- Troubleshooting of VSDs
Module 16: DC and AC High Reliability Power Supplies

Duration: 6 WEEKS

You will learn to:

- Plan power supply systems for high reliability installations
- Describe the basic building blocks of UPS systems
- Examine and discuss the operation of UPS systems
- Discuss the maintenance and testing of lead acid, nickel cadmium and lithium ion batteries
- Describe safe working practices for UPS and batteries

Overview

Power is fast becoming a commodity that cannot be taken for granted. The reasons differ from country to country. It may be due to resource scarcity or uneconomical fuels. It can be aging equipment, which is not replaced due to capital constraints; or it may be simply that the interconnected power system has become so complex that its reliable operation has become uncertain. On the other hand, our dependence on electricity is growing and even a few hours of power disruption has become unthinkable. An unscheduled interruption can cause immense damage besides accidents and loss of life. While it is impossible to guarantee 100% availability of power at all points in any system, vulnerable sections can be provided with emergency power alternatives to ensure more reliable power, thereby avoiding the problems of power interruption. This module covers the basic design of a power supply system for high-reliability installations, the building blocks of UPS Systems, typical Power Quality problems, operation of UPS systems, maintenance and testing of lead acid and nickel cadmium batteries, apply safe working practice for servicing and maintenance of UPS’s and batteries, substation auxiliary power supplies, auxiliary transformers, earthing.

THE PROGRAM

Topic 16.1
PLANNING POWER SUPPLY SYSTEMS FOR HIGH RELIABILITY INSTALLATIONS
- Critical power needs and solutions
- Typical power quality problems and solutions
- Critical power supply options
- Configuration of power distribution systems for critical loads
- Large capacity AC critical power systems using engine-based uninterrupted systems
- Battery-based AC uninterrupted AC power options

Topic 16.2
BASIC BUILDING BLOCKS OF UPS SYSTEMS
- Refresher on applicable semiconductors
- Rectifiers
- Inverters
  - Synthesis of AC waveforms-different approaches
  - Pulse width modulation technique adopted in UPS equipment

Topic 16.3
OPERATION OF UPS SYSTEMS
- Static UPS systems
  - Passive
  - Line interactive
  - Double conversion
- Static transfer systems for critical power supplies

Topic 16.4
BATTERIES FOR UPS SYSTEMS
- Basics of lead acid, nickel cadmium and lithium ion batteries [review]
- Charging and discharging of batteries [review]
- Selection of batteries for DC high reliability power supplies
- Sizing of batteries as per IEEE 485
- Selection and sizing of batteries for UPS applications

Topic 16.5
HIGH RELIABILITY DC POWER SUPPLIES
- Redundant DC power supply for high reliability systems such as HV substation control
- DC power distribution in electrical installations
- Common battery for both DC and AC reliable power supplies
- Battery monitoring using conductivity measurements
- Continuous monitoring using conductivity measurements
- Challenges in using SMF batteries in critical installations

Topic 16.6
SAFE WORKING PRACTICES FOR UPS AND BATTERIES
- Battery installation
- Battery maintenance
- Battery failures
- Battery disposal
- Hazards while working on UPS systems and precautions