WHAT YOU WILL GAIN:

- Skills and know-how in the latest electrical and instrumentation technologies used in mining operations all over the world
- Practical guidance from mining experts in the field
- ‘Hands-on’ knowledge from the extensive experience of the lecturers, rather than from only the theoretical information gained from books and college reading
- Credibility as a mining expert in your firm
- Networking contacts in the industry
- Improved career prospects and income
- An Advanced Diploma of Electrical and Instrumentation (E&I) Engineering in Mining

**A note regarding recognition of this program in the Australian education system: The EIT is the owner of this program. The program 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 the EIT in all Australian states. The EIT delivers this program to students worldwide.**

Visit our website: www.eit.edu.au

START DATE:

For upcoming start dates, please view our program schedule at:

http://www.eit.edu.au/schedule
Introduction

Mining equipment has come a long way since the days of mule-drawn carriages for haulage, and canaries or Davy lamps for safety. In terms of high-voltage equipment, large AC and DC motors are still at the order of the day, but with increased sophistication. Load-haul-dump trucks operate in hazardous environments without a driver on board. Sophisticated motor control centers now house variable speed drives and soft-starters, and the motor control equipment is often networked via Ethernet.

It is, however, on the low-voltage side where the developments are almost breathtaking. In certain parts of the world all mines in the region are monitored centrally on a SCADA system, with backhauls (fiber and wireless) to all mines in the region, forming a large Wide Area Network.

At the mine sites Ethernet networks, both wired and wireless, are at the order of the day both above and below ground level. Leaky Feeder wireless systems are still to be found, but nowadays they support Ethernet and TCP/IP, making them suitable for voice and data. IEEE802.11 wireless [a.k.a. Wi-Fi], suitably adapted for the mining environment, is making vast inroads into mining operations. Wi-Fi-based systems are used for both data and voice [VoIP], and with suitable radio frequency ID interfaces they also provide the infrastructure for monitoring personnel and vehicle movement. Some 802.11-based systems can even be configured in mesh topologies, delivering military-grade reliable communications between moving personnel and vehicles in an open mine environment.

Industrial field buses such as HART, AS-i, Proibus, Foundation Fieldbus and DeviceNet are widely used in the mining industry. As is the case with most other electronics, they are increasingly moving towards a co-existence with Ethernet, and augmentation with wireless. And, of program, some of them can perform safety functions as well as operate in intrinsically safe environments.

SCADA and distributed control is at the order of the day, and data from these systems are used as inputs to expert systems. These systems are used for various purposes such as providing data for optimized mine management, safety, and advanced process control. It is, in many cases, not even necessary for control room staff to understand anything about PID control in order to optimize a given control loop; the advanced process control system will heed their ‘operator’ inputs and optimize the process on their behalf.

Personal safety has not lagged behind. For example, ground radar can detect sub-millimeter ground movements, UWB and Wi-Fi systems are teamed up to avoid collisions between people and vehicles, and integrated headlamps for miners not only have built-in radio communications facilities, but also Ultra-Low Frequency ground-to-surface pagers for emergency location.

In short, the mining industry is attracting the best of the best cutting-edge commercial and industrial electrical and electronics technologies. The question is are you capable of dealing with it? Welcome to the EIT Advanced Diploma of Electrical and Instrumentation (E&I) Engineering in Mining.

“"If you want to improve career prospects and be trained by excellent trainers with a thorough knowledge of the industry and train at your own pace then I would recommend this program.”

Gary Burrowes, BHPBilliton

“This has been the best study process I have gone through and for advancing the career it is a must. The program content is extremely good and practical as I have baffled my engineers with some of the questions in the assignments making them question the content they actually studied.”

Henk Barnard

To apply, please contact enquiries@eit.edu.au
Accreditation & International Standing

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
EIT is registered and accredited to offer both degree and vocational [diplomas and certificates] programs. EIT is authorized by the Australian Government Tertiary Education Quality and Standards Agency (TEQSA) as a Higher Education Provider (www.teqsa.gov.au/national-register with registration number PRV14008). EIT is a Registered Training Organization (RTO) in the Vocational Education and Training (VET) sector – provider number 51971. EIT is thus registered with and regulated by the Australian Skills Quality Authority (ASQA) and the Tertiary Education Quality and Standards Agency (TEQSA). ASQA is the national regulator for Australia's vocational education and training [VET] sector. TEQSA is Australia's independent national regulator of the higher education sector. They both 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) [for VET qualifications] or on the National Register [for Higher Education qualifications]. TGA is the official National Register of Information on VET Training Packages, Qualifications, Programs, Units of Competency and R registered Training Organizations (RTOs). EIT VET 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.

The purpose of the Higher Education National Register is to be the authoritative source of information on the status of registered higher education providers in Australia. Information on EIT and our accredited higher education courses can be viewed at http://teqsa.gov.au/national-register/provider/prv14008.

Please note that many additional programs are also in the process of accreditation.

The Advanced Diploma of Electrical and Instrumentation [E&I] Engineering in Mining (52727WA) is a nationally accredited and recognized qualification under the AOF. The Australian Qualifications Framework (AQF) is the national policy for regulated qualifications in the Australian education and training system. Members of Engineers Australia (EA) - are entitled to claim CPD hours for private study, short programs, and learning activities at the workplace. CPD hours can be claimed for our programs in most cases, but we would always advise individual members to check with EA regarding specific programs.

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. Their 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 curriculum 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 ECCIT Ltd (see http://www.eccitis.co.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/SAO 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 EIT, so your EIT 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 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.
Program Structure

This program is composed of 19 modules, covering 5 main streams:

- Power Engineering
- Communications
- Control
- Analytics and Management Systems
- Safety

The modules will be completed in the following order:

1. Electrical and Electronic Engineering Drawings
2. Electrical Power Distribution
3. Circuit Breakers and Switchgear
4. Power Systems Protection
5. Fundamentals of Professional Engineering
6. Motor Control
7. Data Communications
8. Ethernet
9. TCP/IP and VoIP
10. Terrestrial Microwave and Satellite Communications
11. Leaky Feeder Systems
12. Wireless LANs
13. Wireless Mesh Networks
14. Field Buses
15. SCADA Systems, Data Acquisition and OPC
16. Process Control Systems
17. Programmable Logic Controllers
18. Distributed Control Systems
19. Analytical, Management and Personal Safety Systems

For detailed information on the content and breakdown of modules, see pages 13 to 32

Who Will Benefit

This program would be ideal for you if you are seeking to get know-how and expertise in the mining industry and are an:

- Instrument and process control technician or technologist
- Instrument fitter
- Mining engineering supervisor
- Sales engineer
- Chemical, mining or mechanical engineer
- Electrical engineers and electricians
- Maintenance engineers and supervisors
- Design engineers
- Project managers
- Consulting engineers
- A recent graduate electrical, instrumentation or mechanical engineer

Even if you are highly experienced you will find this a great way to become familiar with mining technology as quickly as possible.

Presentation Format

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

The program consists of 22 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 22 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. Contact us for details of webinar session scheduling. 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

Successful students are likely to spend between 10 and 15 hours per week in order to cover the material adequately and to gain sufficient knowledge in each program topic. This includes the preparatory reading, attendance at each webinar [1 hour plus 15-30 minutes for discussion], which runs once a week, and the time necessary to complete the assignments and laboratory work. 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 EIT Advanced Diploma of Electrical and Instrumentation (E&I) Engineering in Mining

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 and instructors, 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 presenters are highly skilled at presenting challenging concepts and ideas to students of varying levels and abilities.
- As shown in the 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 eBooks and Associated Documentation

You will receive 30 of our up-to-date technical e-Books 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.

1) Electrical Drawings and Schematics
2) Practical Power Distribution
3) Safe Operation and Maintenance of Circuit Breakers and Switchgear
4) Practical Project Management for Engineers and Technicians
5) Practical Power System Protection for Engineers and Technicians
6) Practical Motion Control for Engineers and Technicians
7) Practical Troubleshooting and Problem Solving of Industrial Data Communications
8) Practical Troubleshooting and Problem Solving of Ethernet Networks
9) Practical TCP/IP and Ethernet Networking for Industry
10) Practical Fieldbus and Device Networks for Engineers and Technicians
11) Practical SCADA and Telemetry Systems for Industry
12) Practical Process Control
13) Practical Programmable Logic Controllers (PLCs) for Automation and Process Control
14) Practical Data Communications & Networking for Engineers & Technicians
15) Practical Industrial Wireless for Engineers and Technicians
16) Practical Fibre Optics for Engineers and Technicians
17) Practical Troubleshooting and Problem Solving of Modbus Protocols
18) Practical Routers and Switches (including TCP/IP and Ethernet) for Engineers and Technicians
19) Practical Arc Flash Protection for Electrical Safety Professionals
20) Operation and Maintenance of Diesel Power Generating Plants
21) Troubleshooting, Maintenance and Protection of AC Electrical Motors and Drives
22) Practical Energy Efficiency, Design, Engineering and Auditing
23) Practical Earthing, Bonding, Lightning and Surge Protection
25) Electrical Maintenance for Engineers and Technicians
26) Wind and Solar Power - Renewable Energy Technologies
27) Practical Power Transformers: Operation, Maintenance and Testing
28) Practical Analytical Instrumentation in On-Line Applications
29) Best Practice in Process, Electrical and Instrumentation Drawings and Documentation
30) Practical Hazardous Areas for Engineers and Technicians

Please Note: Students who choose to pay upfront will receive all 30 e-Books in advance. If you opt to pay by installments you will receive e-Books periodically throughout the program. e-Books are available in hard copy at 50% of the recommended retail price. Contact us for pricing details.

Visit our website: www.eit.edu.au

Entrance Requirements

This Engineering Institute of Technology advanced diploma is an accelerated, practical, work-oriented program. It is designed for engineers and technicians who have some background in the field. This includes those who have technical or ‘trade’ qualifications who want to move to the next career step, those with substantial relevant work experience who need to formalise and enhance their achievements, and those with higher level qualifications in a related field who wish to develop specialist knowledge. Practical work experience in related areas of engineering would help enormously. It would not be suitable for a student with no relevant work experience. We will review your enrolment application and may recommend pre-program studies if required.

Advanced Diploma Preparation Program

If you are unsure if you have a strong enough grasp of the fundamental knowledge required for this program, or you simply want to refresh your skills and experience e-learning in a shorter program, we recommend that you consider EIT’s engineering studies preparation program. This intensive 4-month program covers the fundamentals of engineering maths, physics and chemistry. Please ask your advisor for the brochure. On completion of this program, 50% of the program fees can be used as a credit towards your fee for an EIT Advanced Diploma program.

Hardware and Software Requirements

All you need in order to join the webinars once registered for the program is an adequate internet connection, PC, speakers and a microphone. The software package and setup details will be sent to you prior to the program.

We are Flexible With Your Commitments

We understand that personal circumstances can make it difficult to complete the program in the time available. We will be flexible about the time you require to complete the program. You can “pause and restart” by joining a subsequent intake [a rejoining fee may apply]. We will allow up to 3 years from your original start date to complete the program.

You can withdraw from the program at any time and receive a Statement of Attainment for the topics you have completed. However, completion of all 30 topics will earn you the EIT Advanced Diploma of Electrical and Instrumentation (E&I) Engineering in Mining.
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.” Netafirm

“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 e-learning program be interactive?
Boredom can be a real risk in any form of learning; however, we use an interactive approach to our e-learning — 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 program 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 depending on class size 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?
The program reading and assignments may consume anywhere from 10 to 15 hours per week. 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 normally delivered over an intensive 18 months. We do break for about 4 weeks per year for traditional festive seasons.
International Expert Speaker Faculty

Your team of professional presenters and facilitators are drawn from experts in their field. They will work closely with you for the duration of the program. Please note: Lecturers are subject to change. Students will be notified in the event new lecturers join the faculty.

GUEST PRESENTER

RICHARD E. MORLEY

Richard E. Morley, best known as the father of the Programmable Logic Controller (PLC), is a leading visionary in the field of advanced technological developments. Mr. Morley (Dick) is a member on the Board of Directors of various companies across the United States and has worked in high tech industries since the beginning of solid-state electronics.

He is currently Chairman of the Board of NCMS (National Center for Manufacturing Sciences) and has a proven track record in the founding of successful high-tech companies for where he provides initial product concept and a continuing technological presence.

He is a nationally recognized expert in the field of computer design, artificial intelligence, automation and is an authority on the factory of the future. Mr. Morley is an engineer, consultant and inventor. His inventions include the PLC (Programmable Logic Controller), which now stands in the Smithsonian Institute. He holds more than twenty United States and foreign patents. Mr. Morley is well known as a lecturer, has written extensively for such publications as Manufacturing Systems magazine and Manufacturing Automation magazine. He has published many works of his own. His latest book, 'Out of the Barn', was published in October 2002 and another book, 'The Technology Machine', was published in September 1999. Mr Morley founded the angel investment group, the Breakfast Club. He is currently an active member with this group of investors having participated in more than 100 startup companies in the New Hampshire area.

He was the former Director of Advanced Technologies for Gould, Inc. He is a Gould Fellow of Science and Engineering, a Fellow of SME, Bios LP and ICS. In addition, he was awarded the 1990 Entrepreneur of the Year by Inc. magazine, Merrill Lynch and Ernst and Young.

He is a 1991 recipient of The Franklin Institute’s Howard N. Potts Medal, and holds the Prometheus Medal placing him into the Automation Hall of Fame. International IEN ranked him 3rd in the “Top 100 Most Significant Industrial Products of the 20th Century” for his work with the PLC.

In October 1999, ISA (Instrumentation, Systems and Automation Society) honored him with the “Life Achievement Award” and Fortune magazine awarded him their “Heroes of Manufacturing Award” in March 2000.

Recognized as one of the giants in the field by the Engineering Society of Detroit, he has extensive experience in high-tech consulting and is involved in new product development at the highest management levels. Currently he works out of his barn in New Hampshire where he and his wife have been home to more than two dozen foster children.

PROGRAMME DESIGNER AND PROGRAM LEADER

Deon Reynders  BSc Eng [Hons][Elec], MBA

Deon has had over 25 years experience in automation, data communications [with a focus on industrial applications] and Ethernet TCP/IP networks. He has specific experience in Systems Engineering, Project Management and software and hardware development. Currently he is retained as a consultant to industry in the TCP/IP, industrial Ethernet networking, OPC and the industrial data communications areas.

Deon is a practical, hands-on person and a highly entertaining speaker. He has received excellent reviews from his thousands of program participants in regions ranging from Europe, North America, Africa and Australia. He takes great pride in demystifying difficult concepts and presents them in a simple-to-understand manner. He is a passionate, enthusiastic and knowledgeable professional engineer. You will walk away from this workshop with a wealth of know-how which you can immediately apply to your work.

LECTURER

John Lawrence  BSc [Hons], MSc, BCom [Hons]

In today’s hyped up world, one is hesitant to describe anyone as ‘outstanding’, but John Lawrence has distinguished himself over the last 15 years with excellent program reviews.

John has 20 years of experience as a project and departmental manager for a multinational oil company, focusing on designing and managing the infrastructure of the telecommunications, data communications and IT systems. In the past 5 years, John has worked extensively for a number of multi-national clients, managing projects including facilities management, budgeting and financial forecasting.

When John is not consulting or lecturing, he enjoys increasing his own skills by reading and writing about state-of-the-art technology topics and how to optimise Return On Investment (ROI) for the overall IT infrastructure. John is a dedicated professional who has trained engineers and technicians throughout the world.
International Expert Speaker Faculty

**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**

**Geoff Bottrell**  HNC, DMS, MIEE

Geoff has been working in the instrumentation, measurement and control fields for over twenty-five years and has spent the past fifteen years specialising in Hazardous Areas, Intrinsic Safety and Instrumentation Drawings. Geoff began his career at Kent Instruments, as a service engineer working in both the UK and East Africa. His experience ranges from systems design functions, on-site trouble shooting to technical and commercial customer support.

Recently Geoff has taken on the responsibility of mentoring engineers in training, in addition to the presentation of engineering workshops in the process control and measurement field. His positive interactive style to teaching has made him popular with program attendees worldwide.

**LECTURER**

**Edwin Wright**  BSc, BE (Hons) | Elec | MIPENZ  Senior Staff Engineer

Edwin has over 35 years of practical experience in the planning, design, construction and operation of telecommunications systems, data networks, SCADA and Ethernet systems. He has also been involved as Project Manager on many projects and has a passion for technology topics.

Edwin has published numerous papers, and consulted widely on Ethernet, data communications and telecommunications issues in the USA, Canada, UK, Australia and New Zealand. Over the past eleven years more than 15,000 engineers and technicians have attended his workshops worldwide. Delegates attending his workshop will benefit from his tremendous knowledge and enthusiasm for the topics and his entertaining instructing style. When not working in the communications world he relaxes by reading and writing on technology issues at his beachside home.

**LECTURER**

**Brian Hobby**  BE (Electrical and Electronic) Auckland University

Brian has 20+ years of engineering experience. He thinks in systems and the connections between them as a result of his time as a Naval Weapons Electrical Engineering Officer.

As a design, commissioning and project engineer with Rio Tinto Alcan he oversaw the first application of devicenet in an aluminium smelting environment and assisted with piloting fully automated anode changing.

More recently he has been involved with collecting data from process using the OSIsoft historian and using their toolset for analysis. His experience with networking goes back to becoming the accidental sysadmin for a Novell Netware system in the early 1990’s and has been a part of his roles ever since.

Currently he works for Griffith University as a Technical Lead/Project Manager where he is assisting in collecting and analysing data in support of their sustainability initiatives.

**LECTURER**

**Deepak Pais**  BE [Electrical & Electronics]

Deepak started his career within the Zinc mining and smelting industry as Project Engineer in Substation and 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.
International Expert Speaker Faculty

LECTURER

Terry Cousins  BSc [Elec Eng]

Terry Cousins was educated at La Salle College in Discovery, and obtained a BSc Electrical Engineering degree from Wits in 1977. He has over 30 years of experience in electrical power and distribution systems in various South African industries including the mining and steel sectors, with national companies such as ISCOR and Chamber of Mines Research.

He is currently a director of TLC Engineering Solutions who develops a wide range of instrumentation and measurement systems for industries. He also presents numerous programs on electrical power distribution and power quality, both in South Africa and abroad.

Terry is a Senior Member of the SAIEE, and a Member of the IEEE (USA) and has also served on the South African National Standards committee for power quality instruments [SANS 1816]. Terry is an accredited professional with the Green Building Council of Australia, and has BComm and MBL degrees from UNISA.

With his extensive experience electrical engineering, you will walk away from this program with valuable know-how that you can apply immediately to your work.

LECTURER

Ian Verhappen  BSc, PEng, ISA Fellow, ISA Certified Automation Professional

Ian has been involved in digital communications since 1994 installing the first multi-vendor Foundation Fieldbus project in 1996. Since then, Ian has served as both a leading Project Engineer/Designer and an external/cold eyes review consultant for a number of companies and in pulp and paper, mining, food processing, water and wastewater, oil sands processing, petrochemical and refining industries. Ian is co-author, with Augusto Pereira, of ISA’s popular “Foundation Fieldbus Pocket Guide”. Also under Ian’s guidance as editor, is the Foundation Fieldbus End User Advisory Council’s “Engineering Design Guide, Foundation Fieldbus document AG-181”. This is the definitive guide for the complete life cycle for Fieldbus projects. The “Guide” has been translated into German, Japanese, Chinese and Russian, demonstrating how widely it is used as the basis for many corporate and project specifications.

Ian is also an active volunteer with ISA, serving as Vice-President of the Standards and Practices 2005/6 and was the person responsible for the formation of the ISA-100 Industrial Wireless committee on which he continues to participate. Ian is also heading up the Fieldbus Foundation’s High Speed Ethernet Remote I/O development team. Ian is known as a digital communications evangelist and his passion for the topic has taken him around the world to share his experiences.

Ian has accumulated over 20 years experience in oil sands mining where he used standard mining operations of slurry transport, flotation / separation cells and multiphase flow. He is also experienced in truck and shovel operations with associated crushing and solids transport including real time maintenance/operating data for this mobile equipment via wireless communications.

Ian has the ability to explain technology in simple terms that can be understood by others without the same level of theory or experience, a rare quality!

LECTURER

Ivan Fair  PhD, PEng

Ivan Fair has extensive industrial and academic experience in telecommunications and data networking. He has been a research & design engineer for both Bell Northern Research [now part of Nortel Networks] and MPR TeTelTech Ltd. furthering their development of advanced fibre optic systems. It was during this industrial experience that he became interested the area of coding for data communication networks, and returned to the academic environment to focus on this topic. After receiving his doctorate, he joined Dalhousie University in Halifax before moving to the University of Alberta where he is now a Professor in the Department of Electrical and Computer Engineering. In addition to teaching communications and data networking programs, he supervises research projects and graduate students in these areas which has resulted in over 90 publications.

Ivan has held various administrative positions at university, and continues to be active in volunteer professional activities. He recently assisted Engineers Canada with their development of an Electrical Engineering syllabus, and is currently a member of the Board of Examiners for the Association of Engineers, Geologists, and Geophysicists of Alberta.

LECTURER

Justin Shute

Justin has over 20 years electrical engineering experience and holds an advanced diploma in electrical engineering and is a fully qualified electrician. Justin has spent time working for Power & Water in Alice Springs, 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.
International Expert Speaker Faculty

**LECTURER**

**Dr. Stanislaw Paul Maj**

In 1990, Paul was appointed Adjunct Professor at the Technical University of Denmark's Institute of Automatic Control Systems. The Technical University of Denmark is one of the leading universities in Europe. He was responsible for teaching the industrial applications of microprocessors and networking technologies and after winning a competitive grant commissioned a pilot plant with the associated control systems.

As Associate Professor in the Australian University sector he was responsible for teaching computer and network systems engineering. In this capacity he twice won a university teaching award for excellence – one of only three staff to have achieved this distinction. In addition to this he received a National Carrick Citation Award for the development of world class curriculum.

As Deputy Chairman on the educational sub-committee of the Institute of Instrumentation & Control in Western Australia (IICA-WA) he was instrumental in the development of first degree in Instrumentation and Control in Australia.

His work received international recognition. Paul was invited to collaborate with some of the world's leading organisations responsible for defining international standards and educational best practices.

He was the first Australian invited to be a reviewer for the American National Science Foundation (NSF) program and curriculum improvement program held in Washington, DC. Paul was the first Australian to be a judge for three IEEE International Education Awards for Academics. The IEEE is the world's largest professional body for the advancement of technology.

**LECTURER**

**John Piperides**

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.

**LECTURER**

**Roland Green**  Mechanical Engineer / Estimator

Roland brings more than 20 years of experience in engineering and estimating fields, gained mostly in South Africa. He has worked on many projects spanning the minerals industry, including power stations, coal stockyards and manganese. Over the past two years Roland has been extensively involved with major projects across Western Australia ranging from $460 Million to projects of more than a few Billion dollars.

Key projects include: Kusile Power Station Coal Stockyard, Kalagadi Manganese, Medupi Power Station, Minproc RIO TINTO Ramp Conveyor

**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 substations 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.
Module 1: ELECTRICAL AND ELECTRONIC ENGINEERING DRAWINGS

Duration: 3 WEEKS

You will learn how to:

- Read drawings for electrical and electronic schematic diagrams
- Use symbols to represent electrical and electronic devices schematically
- Plan and execute schematic drawings using universally understood conventions
- Make the best use of CAD packages and their extensions
- Manage a drawing office and organize suitable workflow procedures
- Carry out version control, storage and retrieval of CAD drawings

Overview

Drawings are used to communicate and share information between different teams of engineers; the design engineer who conceptualizes equipment or systems, 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. To all these individuals, with diverse backgrounds and expertise, a drawing should convey precise and identical information. This calls for standardized methodologies, conventions and approaches 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 1.1 – Introduction to Drawings 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 1.2 – Engineering Drawings

- Single-line and 3-line diagrams
- Control schematics
- Logic gates and logic diagrams
- Cabling and wiring drawings
- Layout drawings for different applications
- P&I diagrams and their importance in process control

Topic 1.3 – Computer Aided Drafting (CAD) and Drawing Management

COMPUTER AIDED DRAFTING (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
You will learn how to:

- Determine short-circuit ratings
- Assess the influence of fault levels on switchgear ratings
- Select the correct type of switchgear for a specific application
- Recognize the different applications for various cable insulation types
- Know when and how to use single-core cables vs. three-core cables
- Specify correct power cable installation methods
- Correctly utilize and protect power transformers
- Assess and specify correct earthing/grounding throughout an electrical network
- Determine the need for Power Factor Correction

Overview

Electricity distribution refers to the final stage in the delivery of electricity to end users. A distribution network carries electricity from the main transmission system, and delivers it to consumers. In general, such a network includes medium-voltage (under 50 kV) power lines, electrical substations, pole-mounted transformers, low-voltage (under 1 kV) distribution wiring, and, in some cases, electricity meters. This module will focus on the distribution systems for mines, both above and below ground.

THE PROGRAM

Topic 2.1 – Fundamentals of AC Electrical Power
- AC waveform, single phase and 3 phase systems
- Star and delta connections
- Calculation of power in 3 phase and single phase systems
- Power factor and power triangle
- Power quality, transients and harmonics

Topic 2.2 – Power Distribution in the Mining Industry
- Elements of a power distribution network
- Fundamentals of power distribution
- Basic design considerations
- Voltage considerations and improvement of voltage conditions
- Equipment generally used in modern power networks
- Importance of short-circuit current calculations
- Software for power system design

Topic 2.3 – Power Transformers and Power Factor Compensation in Mining Distribution Systems
POWER TRANSFORMERS
- Classification and specifications
- Connections and voltage taps
- Transformer impedance
- Insulation and cooling methods
- Accessories and protection

COMPENSATION AND POWER FACTOR CORRECTION
- Causes and effects of low power factor
- Methods to improve power factor, and benefits thereof

Topic 2.4 – Cables and Accessories for the Mining Industry
- Insulation types and their applications
- Cable losses and voltage drop
- Cable ratings and short-circuits
- Single-core vs. three-core cables
- Mining cables
- Installation, splicing and termination
- Connectors for mobile mining equipment
- Earth continuity, pilot core and their importance

Topic 2.5 – Power System Earthing/Grounding
- System and equipment earthing/grounding
- Electrical safety earthing/grounding
- Static earthing/grounding
- Lightning protection
- Ground resistance measurement and soil resistivity issues

Topic 2.6 – Power generation using Diesel Engines
ON-SITE POWER GENERATION FOR MINING OPERATIONS
- Various alternatives for power supply to mine sites
- Need for on-site generation
- Diesel Engine generators
- Engine principle and components
- DG package and support systems
Module 3: CIRCUIT BREAKERS AND SWITCHGEAR

Duration: 5 WEEKS

You will learn how to:

- Selection appropriate types and ratings of switchgear
- Draw up purchase specifications
- Understand switchgear components [CTs, VTs, relays, cable terminations]
- Adopt safe operational policies including safety rules and safety documents
- Use diagnostic tools and test equipment

Overview

Switchgear plays an important role in electricity distribution and its performance significantly affects the overall performance of the system. Failure to efficiently disconnect faults elsewhere in the network or failure in switchgear itself is costly, resulting in additional loss of supply, damage to equipment, and possibly fatal injury to personnel. It is therefore critically important that switchgear is operated and maintained correctly, within an overall asset management regime that is both economic and effective in securing a high level of system reliability. This module focuses on medium voltage switchgear, which comprises by far the bulk of switchgear on most electricity distribution systems. The emphasis is primarily on oil, air blast, SF6 and vacuum circuit breakers, but other forms of MV switchgear, for example ring main units and auto-reclosers, will also be discussed.

THE PROGRAM

Topic 3.1 – MV and LV Switchgear Basics

- Switchgear definition
- MV switchgear-types and construction
- Air-insulated and gas insulated switchgear
- Internal Arc proofing
- LV switchgear and its variants
- Motor control centres and starters
- Main distribution and sub-distribution equipment

SWITCHGEAR RATING AND SPECIFICATION

- Switchgear ratings
- Switchgear ancillaries [measurement CTs, VTs, relays]
- Cable terminations
- Substation and switch room layouts and design
- Testing methods

Topic 3.2 – Circuit breakers for MV and LV applications

- Principles of current interruption in a circuit breaker
- MV Circuit breaker types
- Fuses
- Auto-reclosers
- Disconnectors and applications
- LV circuit breakers [ACB, MCCB and MCB]
- Current limiting LV circuit breakers and cascading
- Switchgear standards

Topic 3.3 – Safety and Operation

- General safety precautions, safety rules and personnel authorization
- Isolation in a circuit breaker context
- Safety documentation

- Safe working in a substation environment
- Safety interlocks
- Arc flash safety and mitigation

Topic 3.4 – Asset Management, Diagnostics and Maintenance

- Time and condition based asset management
- Asset management systems
- Switchgear diagnostics
- Principles of circuit breaker maintenance
- Maintaining oil circuit, vacuum and SF6 breakers

TROUBLESHOOTING OF ELECTRICAL CIRCUITS

- Possible problems in power circuits
  - Insulation failures, open circuits, neutral failures
- Control circuit troubleshooting
  - Continuity checks in control wiring, voltage checks at terminals in energised control circuits, verification of control circuit behaviour
- Problems due to unbalanced supply voltage
- Problems due to harmonics

Topic 3.5 – Electrical equipment in hazardous areas

- Hazardous gas mixtures and dust
- Fire triangle
- Hazardous area classification
- Electrical equipment as ignition sources
- Enclosure types for ignition prevention [Ex categories]
- Hot surfaces and explosion
- Surface temperature classifications for explosion prevention
Module 4: POWER SYSTEMS PROTECTION

Duration: 4 WEEKS

You will learn how to:

- Explain the operation of fuses, current and voltage transformers, circuit breakers, tripping batteries and relays
- Use the abovementioned devices for the protection of feeder lines, transformers, busbars, switchgear, motors, generators and overhead lines
- Identify the additional challenges posed by underground mining operations

Overview

Power system protection is a branch of electrical power engineering that deals with the protection of electrical power systems from faults, through the isolation of faulted parts, from the rest of the electrical network. The objective of a protection scheme is to keep the power system stable by isolating only the components that are under fault, whilst leaving as much of the network as possible still in operation. Thus, protection schemes must apply a very pragmatic and pessimistic approach to clearing system faults. For this reason, the technology and philosophies utilized in protection schemes can often be old and well-established because they must be very reliable. This module will primarily deal with more established methods of protecting motors, generators, switchgear and transformers.

THE PROGRAM

Topic 4.1 – Protection System Fundamentals
- The need for protection
- Fault types and their effects
- Simple calculation of short circuit currents
- System earthing/grounding
- Protection system components

Topic 4.2 – Protection System Components
- Instrument transformers
- Circuit breakers
- Tripping batteries
- Relays
- Applications co-ordinated by time grading

Topic 4.3 – Feeder, Transformer and Busbar Protection
- Underground mine distribution protection
- Principles of unit protection
- Feeder protection
- Transformer protection
- Switchgear (busbar) protection

Topic 4.4 – Motor, Generator and Overhead Line Protection
- Motor protection
- Generator protection
- Overhead line protection
- Management of protection
Module 5: FUNDAMENTALS OF PROFESSIONAL ENGINEERING

Duration: 4 WEEKS
(AND INTEGRATED THROUGHOUT PROGRAM)

You will learn how 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

For the detailed assessment criteria of each learning outcome, please contact your EIT Learning Advisor or Program Coordinator.

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 team

* 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.

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
You will learn how to:

- Specify protection requirements for motors
- Maintain electrical motors
- Specify speed control requirements for motors
- Understand essentials of motors and drives
- Detail the main issues with testing of motors
- Prevent, or at least minimize, motor bearing failure
- Troubleshoot and fix faults on motors and drives
- Interface control circuits of motors with PLCs/DCSs
- Reduce downtime on electrical motors
- Improve plant safety
- Improve plant throughput
- Reduce your spares usage and requirements

Overview

It is estimated that electrical drives and other rotating equipment consume about 50% of the total electrical energy consumed in the world today. The cost of maintaining electrical motors can be a significant amount in the budget item of manufacturing and mining industries. This module will give you a thorough understanding of electrical motor protection, control and maintenance and provide you with the tools to maintain and troubleshoot electrical motors. You will gain a fundamental understanding of the protection, control and maintenance of electric motors and drives. Typical applications of electric motors in mining, manufacturing, materials handling and process control will be covered in detail.

THE PROGRAM

Topic 6.1 – AC Motors
- Fundamentals of 3-phase AC motors
- 3-Phase induction motor construction and ratings
  - Squirrel cage
  - Wound rotor
- 3-Phase synchronous motor construction and ratings
- Mining applications

Topic 6.2 – DC Motors
- Fundamentals of DC motors
- DC motor construction and ratings
  - Brushed
  - Brushless
- Mining applications

Topic 6.3 – Variable Speed Drives (VSDs)
- Basic concept
- Mechanical, hydraulic and electrical VSDs
- Power electronic converters
- Electrical protection of VSD components
- VSD control systems

Topic 6.4 – Other Control Methods and Drive Components
- Gearboxes
- Brakes
- Motor control
  - Phase vector drives
  - Direct torque controllers
  - SCR (thyristor) drives
  - PWM (chopper) drives
  - Ward-Leonard control
- Motor Control Centers (MCCs)
Module 7: DATA COMMUNICATIONS

Duration: 4 WEEKS

You will learn how to:

- Describe the OSI and TCP/IP protocol stack models, and how they relate to each other as well as to the various wired and wireless communication technologies covered in this program
- Perform basic troubleshooting on RS-232 and RS-485
- Explain the difference between synchronous and asynchronous communication
- Explain the basics of protocols
- Perform basic protocol analysis on serial data communication systems
- Describe the advantages, disadvantages and application of the various conductive media (copper and fiber)

Overview

This module introduces the 7-layer OSI and 4-layer TCP/IP models as overall frameworks in which to appraise all available wired and wireless communication technologies. It also describes the various conductive media (copper and fiber) that underpin these frameworks.

In addition, it describes some of the more common Layer 1 technologies such as RS-232 and RS-485. It also introduces the concept of protocols, their functionality, and their relationship with the OSI model. These protocols include asynchronous character-based (ASCII) protocols, asynchronous hexadecimal protocols and synchronous hexadecimal protocols.

THE PROGRAM

Topic 7.1 – Data Communication Basics
- The 7-layer OSI and 4-layer TCP models
- Standards and regulatory bodies
- Number systems
- Encoding vs. modulation
- Physical vs. logical channels
- Full vs. half-duplex

Topic 7.2 – Wired Serial Communication Standards
- RS-232
- RS-422/485
- Bell-202

Topic 7.3 – Communication Protocols
- Definition of a protocol?
- Protocol functions vs. the OSI model
- ASCII-based protocols
  - Allen Bradley DF-1
- Hex-based protocols
  - MODBUS RTU

Topic 7.4 – Conductive Media
COPPER MEDIA
- Coax
- UTP/STP
- Connectors
FIBER MEDIA
- Multi-mode
- Single-mode
- Graded Index
Module 8: ETHERNET

Duration: 4 WEEKS

You will learn how to:

- Distinguish between all the Ethernet variants
- Choose the most appropriate variant for your application
- Understand the issues addressed by 'Industrial' Ethernet
- Select the correct hardware (e.g., switches) for your application
- Design a basic Ethernet network
- Perform basic troubleshooting on Ethernet

Overview

World-wide, and in virtually all industries, Ethernet has become the networking technology of choice. Mining is no exception and here Ethernet is increasingly to be found both above and below ground. It is being integrated with data as well as voice communications, and is even being integrated with Leaky Feeder and other wireless systems. It is even finding its way into Intrinsically Safe environments. This module takes an in-depth view at Ethernet, its method of operation, the various speed options and hardware components (switches, routers etc) and its application in the Mining industry.

THE PROGRAM

Topic 8.1 – Legacy (Half-duplex) Ethernet
- Ethernet II vs. IEEE 802.3
- 10 Mbps variants
- Medium Access Control (CSMA/CD)
- Ethernet frames
- MAC addresses

Topic 8.2 – High-speed Ethernet Versions
- Full-duplex and auto-negotiation
- 'Fast' (100 Mbps) Ethernet variants
- Gigabit Ethernet variants
- Ten Gigabit Ethernet variants

Topic 8.3 – Networking Components and Switch Applications
- Networking COMPONENTS
- Repeaters/hubs
- Bridges/switches
- Routers/gateways
- Terminal servers
- Media converters

- SWITCH APPLICATIONS FOR VLANS AND HIGH AVAILABILITY
  - IEEE802.1p/0 VLANs
  - Switched rings for high availability

Topic 8.4 – Industrial Ethernet Hardware and Application
- HARDWARE
  - Packaging
  - Cabling and connectors
  - SHDSL range extension
  - Power over Ethernet (PoE)
  - Intrinsic safety (IECEx.ia)
  - Determinism
  - Hardened devices

- APPLICATION
  - Mining applications
You will learn how to:

- Perform IP configuration on IP devices
- Check TCP connections
- Use TCP/IP utilities for troubleshooting
- Use a protocol analyzer for troubleshooting
- Explain the basics of VoIP

Overview

The TCP/IP protocol suite was originally designed for what was to become the Internet, but it has since been embraced by Industry, world-wide, because of its open (non-proprietary) nature and its robustness. It is therefore also ubiquitous in the mining industry, both above and below ground and on wired as well as wireless systems. In addition, there has been a rapid convergence between conventional voice telephony systems and networking (such as TCP/IP over Ethernet), with the result that Voice over IP (VoIP) is becoming commonplace in mines.

THE PROGRAM

**Topic 9.1 – Internet Layer Protocols**
- IPv4
  - Header structure
  - Classful vs. classless addressing
  - Subnet masking
  - Private addresses
  - Basic routing principles and NAT
- ARP
- ICMP
- IPv6
  - Header structure
  - Address types

**Topic 9.2 – Host-to-Host Layer Protocols**
- TCP
  - Header structure
  - Ports and sockets
  - Connection setup and teardown
- UDP

**Topic 9.3 – Application Layer Protocols and TCP/IP Diagnostics**
- Application Layer Protocols
  - FTP
  - HTTP
  - BootP
  - DHCP
  - Telnet
  - SSH
- TCP/IP diagnostics
  - Command line (DOS) utilities
  - Windows utilities

**Topic 9.4 – Voice over IP (VoIP)**
- Codecs
- Protocols
  - RTP and RTCP
  - H.323
  - MGCP and SIP
- QoS issues
- Mining applications
THE PROGRAM

**Topic 10.1 – Wireless Communications Basics**
- Frequency bands and associated propagation methods
- Spread Spectrum (FHSS, DSSS)
- UWB
- Modulation techniques
  - Amplitude Modulation (AM, SSB, DSB, ASK)
  - Phase modulation (PM, BPSK, QAM)
- Frequency modulation (FM, FSK)

**Topic 10.2 – Terrestrial Microwave Links**
- Terrestrial microwave link design
  - Path profile and mast height calculation
  - Link budget
  - EIRP
  - Availability vs. fade margin
  - Antenna and feeder selection
- Legal issues
  - EIRP limitations imposed by regulatory bodies

**Topic 10.3 – Terrestrial Applications [LO3]**
- Topologies
  - Point-to-Point
  - Point-to-Multipoint
- Hardware
  - Multiplexers
  - Wireless Ethernet modems/repeaters
  - Wireless Ethernet range extenders
  - Wireless backhaul modems
- Terrestrial microwave applications
  - Telemetry
  - Mining applications

**Topic 10.4 – Satellite Systems**
- Satellite basics
- Very Small Aperture Terminal (VSAT)
- Satellite applications
  - Telemetry
  - Tracking
  - Communications
  - Mining
Module 11: LEAKY FEEDER SYSTEMS

Duration: 2 WEEKS

You will learn how to:

- Explain the concept of Leaky Feeder operation
- Select appropriate feeder cable
- Design a basic Leaky Feeder system with commercially-available components

Overview

Leaky Feeder is a communications system used in underground mining and other tunnel environments. It consists of a coaxial cable run along passageways, which emits and receives radio waves. The cable is 'leaky' in that it has gaps in its outer conductor along its entire length to allow signal to leak into or out of the cable. Because of this leakage, amplifiers are inserted at regular intervals to boost the signal back to operational levels. In recent years Leaky Feeder systems have been augmented with Ethernet, so that data and even voice (VoIP) can be accommodated.

THE PROGRAM

Topic 11.1 – Leaky Feeder Fundamentals

- Leaky feeder concept
- Typical system specifications
- Topologies
- Leaky coax
- System components

Topic 11.2 – Leaky Feeder Implementation

- VHF vs. UHF
- Intrinsic safety issues
- Ethernet over leaky feeder
- Voice and data over leaky feeder
- Mining applications
Module 12: WIRELESS LANs

You will learn how to:

- Describe the inherent operating mechanism (frame structure, medium access control etc.) of IEEE 802.11 WLANs
- Predict the performance of the various implementations in terms of raw and actual data speeds
- Compare various 'Industrial WLAN' offerings in the marketplace, and understand their differences from conventional WLANs
- Design a basic industrial WLAN with Access Points and Clients, with or without redundancy considerations
- Perform basic configuration of an industrial AP

Overview

A Wireless Local Area Network (WLAN) links devices via a wireless infrastructure (typically one or more Access Points) and often provides a connection to the wider Internet through a router. This gives users the mobility to move around within a local coverage area whilst maintaining their connection to the network. WLANs have become popular in the home due to ease of installation and the increasing popularity of laptop computers. In industrial applications, they simplify the deployment of movable client devices (e.g., on fork-lift trucks in warehouses) and eliminate the need for costly wiring.

In mining applications, WLANs are increasingly being deployed underground, and are used for data as well as voice management and other services such as RFID tagging for vehicle and personnel management.

THE PROGRAM

Topic 12.1 – Basic WLAN Concepts
- WLAN terminology
- WLAN concepts
  - Wireless bridging
  - Wired and wireless Distribution Systems
  - Client roaming (MAC-and IP-level)
  - Forced roaming
  - Association and authentication

Topic 12.2 – IEEE802.11 WLAN Standards/Amendments
- Overview of the IEEE802.11 specifications
- 2.4 and 5 GHz channels, frequencies and spacing
- IEEE802.11 variants
  - IEEE802.11a
  - IEEE802.11b
  - IEEE802.11g
  - IEEE802.11n
  - IEEE802.11ac
- Co-existence between variants

Topic 12.3 – WLAN Security
- Modes of unauthorized access to WLANs
  - IEEE802.11i
- Encryption
  - WEP
  - TKIP
  - AES
- Authentication
  - Open systems
  - Shared key
  - WPA/WPA2-PSK
  - WPA/WPA2 with authentication server

Topic 12.4 – IEEE802.11 Industrial LANs
- Industrial/mining WLAN components
- Redundant wireless rings
- Real-time operation and QoS
- Wireless LANs
- Mining applications
You will learn how to:

- Explain the basics of mesh networks in general
- Explain the specifics of IEEE 802.11 (Wi-Fi) based mesh networks
- Compare commercially-available wireless mesh solutions for mining applications

Overview

A Wireless Mesh Network (WMN) is a communications network made up of wireless nodes organized in a mesh topology, and can be seen as a special type of wireless ‘ad hoc’ network. WMNs usually consist of mesh clients, mesh routers and gateways. The mesh clients may include sensors, flow controllers, laptops, mobile phones and other wireless devices, depending on the application, while the mesh routers forward traffic to and from the gateways which may (optionally) connect to the Internet or to a larger wired network. The coverage area of the wireless nodes working as a single network is sometimes called a mesh cloud. A mesh network is reliable because of redundancy. All nodes communicate with each other directly or through intermediate nodes. When one node can no longer operate, the rest of the nodes will reconfigure around it, and still communicate with each other, directly or indirectly. Wireless mesh networks can be implemented with various wireless technologies including IEEE 802.11, IEEE 802.15.4, or proprietary variations of the aforementioned. Recent years have seen more and more mesh systems in mining applications, especially on open mines.

THE PROGRAM

Topic 13.1 – Mesh Basics
- Basic mesh concepts
- Mesh network components
- Mesh deployment modes
- Design considerations
- Combining mesh with LANs and WLANs
- Mesh routing algorithms

Topic 13.2 – Mesh Implementations
- IPv6 over mesh (6LoWPAN)
- Standardized mesh implementations
  - IEEE802.11s
  - IEEE802.15.4
  - ISA 100 Wireless
- Proprietary mesh implementations
- Mining applications
You will learn how to:

- Identify mining applications that can be automated with a field bus
- Be aware of the pros and cons of the various field bus offerings
- Select the most appropriate system for your application
- Perform basic diagnostics on various field buses

Overview

Profibus is a standard for field bus communication in automation technology and was first promoted (in 1989) by the German Department of Education and Research. Profibus DP uses RS-485 or fiber optics at the Physical Layer, and Profibus PA. DeviceNet is a field bus used in the automation industry to interconnect control devices for data exchange. Typical applications include information exchange, safety devices, and large I/O control networks. The HART protocol (Highway Addressable Remote Transducer protocol) is a digital industrial automation protocol. It’s most notable advantage is that it can communicate over legacy 4-20 mA analog instrumentation wiring, sharing the pair of wires used by the older system. It uses Bell 202 signaling over a current loop. Foundation Fieldbus is an all-digital, serial, two-way communications system, similar to Profibus PA, that serves as the base-level network in a plant or factory automation environment. All these systems are used in the Mining industry, and also perform safety functions.

THE PROGRAM

Topic 14.1 – HART and AS-INTERFACE
- Definition of a field bus
- Field bus standards
  - IEC 61158
  - IEC 62028/EN 50295
- Field bus applications in Mining
- HART
  - The HART concept
  - Media, physical layer and topologies
- Actuator Sensor-interface (AS-i)
  - The AS-i concept
  - Media, physical layer and topologies

Topic 14.2 – DeviceNet
- Media
- Supported topologies
- Physical layer implementation
- Message structure
- Medium access control
- Device power

Topic 14.3 – Profibus DP/PA
- Media
- Supported topologies
- Physical layer implementation
- Message structure
- Medium access control
- Device power

Topic 14.4 – Foundation Fieldbus
- Media
- Supported topologies
- Physical layer implementation
- Message structure
- Medium access control
- Device power

Topic 14.5 – Ethernet, Wireless and Safety on Field Buses
- Ethernet-based field buses
  - Ethernet/IP
  - Profinet
  - Foundation Fieldbus HSE
- Wireless extensions to field buses
  - WirelessHART
  - Wireless Profibus
  - Wireless DeviceNet
- Safety systems
  - ASIsafe
  - DeviceNet Safety
  - ProfiSafe
Module 15: SCADA, DATA ACQUISITION AND OPC

Duration: 4 WEEKS

You will learn how to:

- Design a basic SCADA system
- Choose a suitable WAN link from your local Service Provider
- Choose an appropriate device for your SCADA data acquisition
- Integrate OPC with your SCADA application

Overview

SCADA has traditionally been used to create a window into the process of a plant, or to gather data from devices in the field, but now the focus is on integrating this process data into the actual business, and using it in real time. The current emphasis is on using open communication protocols such as IEC 60870, DNP3 and TCP/IP, and commercial off-the-shelf [COTS] hardware and software to keep the costs down. This module covers four major aspects of SCADA, namely (1) the overall SCADA system design, (2) the long-distance WAN links that convey data from the point of acquisition to the central station, (3) the systems and methods of remotely acquiring plant data, and (4) OPC, which is increasingly used in SCADA applications.

THE PROGRAM

Topic 15.1 – SCADA Basics
- Typical SCADA architectures
- SCADA hardware and software
- SCADA networking
- SCADA security
- Redundancy issues
- Good practice for SCADA system implementation

Topic 15.2 – Wide Area Network (WAN) Technologies for SCADA
- Landlines
- Digital hierarchies (T/E)
- X.25
- Frame Relay
- ATM
- SDH/SONET
- Cellular (3G/4G)

Topic 15.3 – Data Acquisition Systems and Components
- Data acquisition devices
  - Standalone
  - PC based
- SDI-12
- Linking data acquisition devices to the central station
- Signal sources
  - Temperature
  - Flow
  - Pressure
- Signal conditioning
- Input/Output
  - Digital I/O
  - Analog I/O

Topic 15.4 – OPC
- The role of OPC in SCADA systems
- Infrastructure
  - DCOM
  - (dot) NET
- Specifications
  - Legacy specifications
  - Unified Architecture (UA)
Module 16: PROCESS CONTROL SYSTEMS

Duration: 4 WEEKS

You will learn how to:
- Tune PID control loops
- Connect cascade loops
- Explain cascade loops and feed-forward control
- Correct long dead-times in a loop
- Specify and design the analog loop requirements for a plant using PID control
- Identify and apply the essential building blocks in automatic control
- Explain concepts used by major process control equipment vendors

Overview
To succeed in process control, a designer must first establish a good understanding of the process to be controlled. Since we do not wish to become too deeply involved in the process itself, we need to find a way of simplifying the representation of the process. This is done by adopting a technique of block diagram modeling of the process.

All processes have some basic characteristics in common and, if we can identify these, the job of designing a suitable controller is relatively easy. The trick is to make a reasonably accurate mathematical model of the process and use this model to find out what typical control actions we can use to make the process operate at the desired conditions.

The first part of this module deals with the modeling process, resulting in a system block diagram. From this analytical result an accurate selection of the type of measuring transducer as well as the final control element can be made. The rest of the module deals with other aspects of Process Control, namely the controller(s), functions, actions and reactions, function combinations and various modes of operation.

THE PROGRAM

Topic 16.1 – Process Control Basics
- Reasons for process control
- Definitions of PV, SP, CV, Gain, Lag and DT
- Types of Feedback control
- Set point tracking
- Proportional or Gain action of PID control

Topic 16.2 – Stability, Algorithms and Cascade Control
- Stability
- Ideal vs. real algorithms
- Cascade control
- Integral or Reset action of PID control

Topic 16.3 – Action, Feedforward and the Effects of Dead Time
- Direct vs. Indirect action of a controller
- Derivative or Reset action of a controller
- Feedforward control
- Combined feedforward and feedback control
- Effects of dead time on a controlled process

Topic 16.4 – Loop Tuning
- Objectives of tuning
- Open loop tuning
- Closed loop tuning
- Tuning with some overshoot
- Tuning with no overshoot
Module 17: **PROGRAMMABLE LOGIC CONTROLLERS**

**Duration:** 4 WEEKS

**You will learn how to:**
- Specify PLC hardware and installation criteria
- Describe PLC software structure
- Write medium-level PLC programs (using ladder logic)
- Troubleshoot a typical PLC system
- Specify PLC systems

**Overview**

This module provides up-to-date information on the application of PLCs to the automation and process control of plants and factories. It is suitable for people who have little or no previous exposure to PLCs, but expect to become involved in some or all aspects of PLC installation. You will receive practical advice from experts in the field in order to assist you to correctly plan, program and install a PLC with a shorter learning curve and more confidence. While the program is ideal for electricians, technicians and engineers who are new to PLCs, much of the content will be of value to those who already have some basic skills, but need a wider perspective for larger and more challenging tasks ahead. The accompanying material includes contributions from a number of experts and will become a valuable reference document in your work.

**THE PROGRAM**

**Topic 17.1 – PLC Hardware**
- Programming devices
- Processors, power supplies
- Memory systems and I/O interaction
- Digital and analog I/O systems
- Special function I/O and serial communication interfacing

**Topic 17.2 – PLC Programming I**
- Data acquisition
- Analog and digital control
- Fault tolerance
- Peripheral equipment

**Topic 17.3 – PLC Programming II**
- High Security PLC systems
- Simulation and testing of systems
- Best documentation practice
- HMI (Human Machine Interface)

**Topic 17.4 – PLC System Specification, Configuration, Installation and Commissioning**
- Functional specification
- System configuration, installation and commissioning
- Working examples of PLC programs
- PLC applications in Mining
Module 18: DISTRIBUTED CONTROL SYSTEMS

Duration: 2 WEEKS

You will learn how to:

- Understand the concept of distributed control
- Identify the various components of a DCS system
- Identify processes that lend themselves to DCS automation
- Evaluate DCS offerings from the major vendors
- Design a basic DCS system

Overview

DCS [Distributed Control System] is a broad term for a type of system used in a variety of industries to monitor and control distributed equipment. DCSs are used in manufacturing systems, processes, or any kind of dynamic system in which the controller elements are not centrally located but are distributed throughout the system. Each component sub-system is controlled by one or more controllers. The entire system of controllers is connected by networks for communication and monitoring. DCSs are very similar to SCADA systems except for the fact that the data processing in a SCADA system is usually centralized, and SCADA performs high-level [supervisory] control only. DCSs are widely used in the mining industry.

THE PROGRAM

Topic 18.1 – DCS Basics
- Definition of distributed control
- DCS vs. SCADA
- DCS system components
- DCS data communications
- The basic controller
- The operator interface

Topic 18.2 – DCS Operation
- Basic DCS controller configuration
- Programming of DCS systems
- DCS alarm system management
- DCS reporting
- DCS configuration
- Advanced control strategies maintenance
- DCSs for the mining industry
Module 19: ANALYTICAL, MANAGEMENT AND PERSONAL SAFETY SYSTEMS

Duration: 4 WEEKS

You will learn how to:

• Become aware of state-of-the-art in analytical and management systems for the mining industry
• Identify the most appropriate system for your requirements

Overview
The advent of expert systems and technologies such as GPS, WLANs, wireless mesh systems and RFID have enabled rapid strides in the development of systems that enhance safety and optimize mine productivity. Vehicles and individuals can now be tracked with pinpoint accuracy, while dangerous operations such as draglines and load-haul-dump can now be run without the presence of a human being. Expert systems can extract data from SCADA systems and make long-term mining optimization decisions. This module deals with current technology in this regard.

THE PROGRAM

Topic 19.1 – Mining Robotics and Tracking Applications

MINING ROBOTICS
• Rock breaking
• Shovel loading automation
• Dragline automation
• Load haul dump automation
• Excavator guidance
• Blast hole charging

PERSONNEL, VEHICLE AND ASSET TRACKING SYSTEMS
• RFID tracking
  - UWB-based
  - Wi-Fi-based
• GPS-based tracking
  - Basic GPS-based
  - DGPS (differential GPS)-based
• On-board vehicle management systems
• Software suites for asset, vehicle and personnel tracking/management

Topic 19.2 – Specialised Hardware and Software

SPECIALISED INSTRUMENTS, DEVICES AND SYSTEMS
• Portable XRF analysers
• Conveyor belt XRF analysers
• Mine radar
• Electronic detonators
• Remote blasting systems
• Automatic pH monitoring systems

SPECIALISED SOFTWARE
• Expert systems
• Digital (3D) terrain imaging
• Drilling/blasting software
• Terrestrial communications modelling
• Haulage fleet analysis
• Dragline operations simulation
• Longwall face configuration and cutting cycle analysis

Topic 19.3 – Personal Protection Systems and Devices

• Ultra-Low Frequency (ULF) pagers
• Personal Protective Equipment (PPE) for miners
• Proximity Detection (Collision Avoidance) Systems for underground mines
• Gas detectors
• Slope stability monitoring systems
• Ventilation monitoring systems