Ensure you and your company remain at the forefront of Industrial Automation
Join the next generation of automation engineers
Through innovative e-learning, participate from your home or office

WHAT YOU WILL GAIN DURING THIS 18 MONTH PROGRAM:
• Skills and know-how in the latest technologies in instrumentation, process control and industrial automation
• Practical guidance from industrial automation experts in the field
• Knowledge from the extensive experience of lecturers, rather than from only the theoretical information gained from books and college
• Credibility as the local industrial automation expert in your firm
• Networking contacts in the industry
• Improved career prospects and income
• An EIT Advanced Diploma of Industrial Automation

Visit our website: www.eit.edu.au

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

Join the next generation of automation engineers. Embrace a well paid, intensive yet enjoyable career by taking this comprehensive and practical program. It is delivered by live distance learning and presented by some of the leading automation, instrumentation and control engineering lecturers in the world today.

There is a shortage of automation, instrumentation and control engineers around the world now due to retirement, restructuring and rapid growth in new industries and technologies. The respected ISA organization estimated that at least 15,000 new automation engineers are needed annually in the US, alone. Many industrial automation businesses throughout the world comment on the difficulty in finding experienced automation engineers despite paying outstanding salaries. For example, about five years ago a gaping hole appeared and remains with control valve specialists being few and far between.

Often universities and colleges do not teach industrial automation as a core subject and much of the key training material [E.g. practical instrumentation and valve topics] necessary to arm you when commencing work as a successful automation, control and instrumentation engineer is missing from their curriculums. However, there are a few notable exceptions with some highly dedicated practitioners. Many of those universities and colleges that do teach industrial automation and control do so mainly from a theoretical point of view. Furthermore, lecturers often have little experience in industry due to the difficulty in attracting good engineers from the highly paid private sector.

The aim of this 18 month e-learning program is to provide you with core industrial automation skills.

The topics that will be covered are derived from the acclaimed IDC Technologies’ programs attended by over 500,000 engineers and technicians during the past 20 years. There are seven threads running through the program to give you maximum, practical coverage in the field of industrial automation. These threads comprise of Instrumentation, Automation and Process Control, Electrical Engineering, Electronics, Industrial Data Communications, Process Plant Layout, Project and Financial Management and Chemical Engineering. This practical program avoids too much emphasis on theory. This is rarely needed in the real world of industry where time is short and immediate results, with hard-hitting and useful know-how, are required as a minimal requirement.

The lecturers presenting this advanced diploma are highly experienced engineers from industry who have done the hard yards and worked in the trenches in the automation, instrumentation and control areas. The format of presentation — live, interactive distance learning with the use of remote labs — means that you can hit the ground running and be of immediate benefit to your company or future employer.

Job Outcomes, International Recognition and Professional Membership

A range of global opportunities awaits future graduates of the Advanced Diploma of Industrial Automation. Pending full accreditation your qualification will be recognised through the Dublin Accord by leading professional associations and societies in Australia, Canada, Ireland, Korea, New Zealand, South Africa, United Kingdom and the United States.

The Dublin Accord is an agreement for the international recognition of Engineering Technician qualifications. Signatories that have full rights of participation in the Accord are listed here:

• Australia – Engineers Australia (2013)
• Canada – Canadian Council of Technicians and Technologists (2002)
• Ireland – Engineers Ireland (2002)
• Korea – Accreditation Board for Engineering Education of Korea (2013)
• New Zealand – Institution of Professional Engineers NZ (2013)
• United States – Accreditation Board for Engineering and Technology (2013)

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

You will be qualified to find employment as an Engineering Associate in public and private industry including transportation, manufacturing, process, construction, resource, energy and utilities industries. Engineering Associates often work in support of professional engineers or engineering technologists in a team environment. If you prefer to work in the field you may choose to find employment as a site supervisor, senior technician, engineering assistant, or similar.

VALUE plus!

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

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

OR

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

PLUS

• A library of 30 technical eBooks

All of this is valued at over US$5000! You may also be eligible for a tax deduction on your personal income tax – contact your tax advisor for more information.

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

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

EIT Program Delivery Methodology

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

Click on the link below: www.eit.edu.au/eit-program-delivery-methodology
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. EIT is both recognized by 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 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.

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

This professional recognition greatly improves the global mobility of graduates, and offers you the opportunity of a truly international career. 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 (ADF) 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 and IDC courses. Members can check details on the ECSA website. ECSA is also a signatory to the Dublin Accord, an international agreement which provides international professional recognition of selected programs.

South African students who successfully complete an EIT Advanced Diploma and other qualifications have the option to apply for recognition within the education system by SAQA (http://www.saqa.org.za/show. php?id=5741). On application by past graduates SAQA has previously assessed the EIT Advanced Diploma as a “foreign qualification” at Level 6 (the same level that it is in Australia). With the new levels (http://www.saqa. org.za/show.php?id=556a) announced by SAQA from April 2014 we expect that applicants may gain alignment at the new Level 7, but this has to be completed “case-by-case” by individuals and it is not guaranteed.

UNITED STATES
IEEE is the world’s largest professional association advancing innovation and technological excellence. EIT is an IEEE Continuing Education Provider. IEEE Continuing Education Programs are peer-reviewed by content experts. This peer review guarantees both quality of the technical content of learning materials, as well as adherence to IEEE’s strict criteria for educational excellence. All programs that pass this strict process are entitled to award IEEE Continuing Education Units (CEUs), recognized as the standard of excellence for_nummering 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 journals, sponsors conferences and exhibits for automation professionals. ISA has reviewed the curricula of the programs offered by EIT as they relate to the instrumentation, control and automation discipline and has endorsed them. EIT is an endorsed partner of the ISA.

UNITED KINGDOM
Nationally recognized 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 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/SAQA 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/SVO Level 4.

For additional information please see www.eit.edu.au/accreditation-international-standing-for-online-engineering-training
Program Structure

The program is composed of 72 topics, within 21 modules. These cover the following seven engineering threads to provide you with maximum practical coverage in the field of industrial automation.

- Instrumentation, Automation and Process Control
- Electrical Engineering
- Electronics
- Industrial Data Communications and Networking
- Mechanical Engineering
- Project Management
- Chemical Engineering

The modules will be completed in the following order:

1. Practical Instrumentation for Automation and Process Control
2. Practical Fundamentals of Chemical Engineering (for non-Chemical Engineers)
3. Control Valve Sizing, Selection and Maintenance
4. Fundamentals of Process Plant Layout and Piping Design
5. Fundamentals of Professional Engineering (integrated throughout program)
6. Best Practice in Industrial Data Communications
7. Practical Process Control for Engineers and Technicians
8. Practical Tuning of Industrial Control Loops for Engineers and Technicians
9. Practical Distributed Control Systems (DCS)
10. Practical Programmable Logic Controllers (PLCs) for Automation and Process Control
11. Practical Advanced Process Control for Engineers and Technicians
12. Practical Boiler Control and Instrumentation for Engineers and Technicians
13. Practical Hazardous Areas for Engineers and Technicians
15. Practical HAZOPS (Hazard and Operability Studies) for Engineers and Technicians
16. Practical Shielding, EMC/EMI, Noise Reduction, Earthing and Circuit Board Layout of Electronic Systems
17. Practical Wireless Ethernet and TCP/IP Networking
18. Practical Radio Telemetry Systems for Industry
19. Practical SCADA Systems for Industry
20. Motor Protection, Control and Maintenance Technologies
21. Practical Power Distribution for Engineers and Technicians

For detailed information on the content and breakdown of modules, see pages 15 to 35

Who Would Benefit

Anyone who wants to gain solid knowledge of the key elements of industrial automation to improve their work skills and to further their job prospects:

- Electrical Engineers and Electricians
- Maintenance Engineers and Supervisors
- Energy Management Consultants
- Automation and Process Engineers
- Design Engineers
- Project Managers

- Instrument Fitters and Instrumentation Engineers
- Consulting Engineers
- Production Managers
- Chemical and Mechanical Engineers
- Instrument and Process Control Technicians

Even those who are highly experienced in industrial automation may find it useful to gain know-how in a very concentrated but practical format.

Presentation Format

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

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

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

Live Webinars

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

Prior Learning Recognition and Exemptions

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

Time Commitment for the Program

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'
- Revisit recordings of webinars whenever and as often as you wish
- Receive an EIT Advanced Diploma of Industrial Automation

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

Program Fees

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

You will receive 30 of our up-to-date technical eBooks to add to your library. Together these texts contain over 5000 pages of valuable know-how distilled from years of experience in presenting these programs throughout the world.

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

1. Practical Instrumentation for Automation and Process Control
2. Practical Control Valve Sizing, Selection and Maintenance
3. Practical Fundamentals of Chemical Engineering
4. Fundamentals of Process Plant Layout and Piping Design
5. Practical Tuning of Industrial Control Loops
6. Practical Programmable Logic Controllers (PLCs) for Automation and Process Control
7. Practical SCADA Systems for Industry
8. Practical Boiler Control and Instrumentation for Engineers and Technicians
9. Practical Hazardous Areas for Engineers and Technicians
11. Practical Hazops for Engineers and Technicians
12. Best Practice in Industrial Data Communications
13. Practical Wireless, Ethernet and TCP/IP Networking
14. Practical Power Distribution
15. Practical Project Management for Engineers and Technicians
16. Setting Up, Understanding and Troubleshooting of Industrial Ethernet and Automation Networks
17. Troubleshooting and Problem Solving of Modbus Protocols
18. Practical Earthing, Bonding, Lightning & Surge Protection
19. Electrical Drawings and Schematics
20. Practical Electrical Substation Safety
21. Power System Harmonics, Earthing and Power Quality - Problems and Solutions
22. Electrical Maintenance for Engineers and Technicians
23. Variable Speed Drives for Instrumentation and Control Systems
24. Practical Analytical Instrumentation in On-Line Applications
25. Introduction to the Selection, Installation, Commissioning and Maintenance of Fiscal Flow and Metering Equipment
26. Practical Industrial Flow Measurement for Engineers and Technicians
27. Process Control for Engineers and Technicians
29. Practical Hydraulic Systems: Operation and Troubleshooting
30. Best Practice in Process, Electrical & Instrumentation Drawings and Documentation

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

We are Flexible with your Commitments

We recognise 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 72 topics will earn you the EIT Advanced Diploma of Industrial Automation.

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 formalize 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 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. If you don’t currently have an existing qualification and/or experience, please contact us for advice. Most important, however, is a determination to persist and complete this program.

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 start of the program.
WHAT OUR STUDENTS HAVE TO SAY

QUOTES FROM PAST STUDENTS

on a recent EIT survey to the following question:

What made you choose an EIT program(s)?

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

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

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

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

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

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

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

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

“Covered all my criteria and gave me recognised qualifications on completion.” 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 lecturers and facilitators is 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 Speaker and Advisory Panel**

**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.

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**Program Designer and Advisory Panel**

**Dr Steve Mackay**  PhD, BSc(ElecEng), BSc(Hons), MBA, MMR CP Eng, FIE (Aust)

Steve has worked in engineering throughout Australia, Europe, Africa and North America for the past 30 years. A registered professional engineer in electrical, mechanical and chemical engineering, he believes university engineering programs need to be strongly focused in industry. He has presented numerous industrial automation and industrial data communications programs worldwide to over 18,000 engineers and technicians, and has a particular interest in practical and leading edge aspects of marketing, business and engineering practice. He is a fellow of Engineers Australia. He has acted as the author or editor of over 30 engineering textbooks sold throughout the world. He feels that all engineering businesses need to think globally and keep experimenting with new approaches. Currently, he is actively involved in research and implementation of remote lab technology.

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**LECTORER**

**Dr Ivan Fair**  PhD, PEng

Ivan Fair has extensive industrial and academic experience in telecommunications and data networking. He has been a research and design engineer for both Bell Northern Research [now part of Nortel Networks] and MPR TeiTech Ltd. furthering their development of advanced fiber optic systems. It was during this industrial experience that he became interested in the area of coding for data communications 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.
International Expert Speaker Faculty

**LECTURER**

**Geoff Bottrill**  
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**

**Dr. Stanislaw Paul Maj**  
PhD, MSc[Computer & Network Systems Eng], BSc(Hons)(Combined Sciences)

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**  
BE (Electrical)

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

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

**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

Ian Verhappen  BSc, PE, 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” now in its fourth edition. Ian is also an active volunteer with ISA, serving as Vice-President of the Standards and Practices 2005/6 and is presently Canadian Chair of IEC TC65, SC65B and SC65E. 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 supported plant operations using standard mining processes 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

Deon Reynders  MBA, BSc, BEng [Electro-technical], BSc Eng [Hons] [Electronics]

Deon is an Electronics Engineer with over 40 years postgraduate experience encompassing middle management, engineering consulting, management consulting, hardware and software development, systems engineering, project management, marketing, and industrial relations. He has experience of both large and small business environments. He also is an experienced teacher with HOD and Governing Board experience at University level.

His current areas of specialization include Information Technology [IT] with an industrial focus, Radio Telemetry Systems, Industrial Networking [LAN technology], and Internet technologies and applications including TCP/IP, the use of Web technologies for process control and OPC. Over the past 15 years he has provided consulting and training services to clients in the USA, Canada, Ireland, the UK, South Africa, Botswana, Trinidad, Australia, New Zealand, Indonesia, Singapore, Malaysia, Thailand, Malaysia, Myanmar, Saudi Arabia, Oman and Egypt.

He is co-author of several technical books, of which two [Industrial Data Networks and Modern SCADA Protocols] have been published by Butterworths [Newnes]. Deon has prepared course material and presented to thousands of engineers and technicians all over the world. Topics include industrial data communications, industrial networking [including fieldbuses and device networks], radio telemetry systems, Ethernet, TCP/IP, OPC, network security, and financial management for engineers and technicians.

LECTURER

Hashemi Ford  ME (Elec), BE (Hons)

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

LECTURER

George [Frikkie] Marx  BSc (Eng), PE

Frikkie has over 20 years of experience in the fields of power electronics from design to industrialization. Starting his career on the power system protection side, he migrated to EMC and power supply systems. Frikkie’s portfolio of achievements includes the design of power systems, switch mode power supplies, UPS, high precision servo amplifiers, battery and inverter design solar panel applications, vehicle management, specialized computer systems and high current starter for vehicle plants. He is a lecturer and program developer of industrial and power electronics for Technikon SA (UNISA). He is also a project manager/system engineer for the development of electro-optical systems which include video systems for UAV’s and high resolution infra-red camera.

Other training activities include the mentorship programs of Kentron, industrial electronics, rockets and robots training programme for the Denel Youth Foundation Bridging Program as well as training consultant. He has also successfully started and managed an IT company specializing in wireless Internet and networks. In this new venture he has done strategic technical research, business development with regard to new services/products, wireless management system for reposessed properties, electrified palisade as well as development and presentation of wireless and VoIP technical programs. An enthusiastic lecturer with a wealth of knowledge under his belt, you will gain much from his entertaining style, as thousands of others have benefited from his knowledge. Don’t miss this excellent workshop presented by a leading engineer in PE, EO subsystems and EMC/EMI.
International Expert Speaker Faculty

**LECTURER**

**John Lawrence**  MSc, BSc(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.

**LECTURER**

**Robert Snaith**  HND (Mech.Eng)

With over 30 years of experience in fluid transport systems and associated equipment, Rob has done the hard yards. After graduating he commenced work immediately in Fluid System Applications Engineering. In later years, Rob expanded his focus to the management of the national and international distribution networks of a major international fluid sealing and transport equipment manufacturer.

In the past decade as a private consultant, he has worked extensively in designing and troubleshooting complex fluid transport systems and equipment.

When not working long hours on the design, commissioning and troubleshooting of pumps, pipelines and associated equipment, Rob squeezes some time in for his Harley Davidson motorbike and scuba diving expeditions. He has done many presentations and workshops throughout the world and was placed in the world’s top three in an international, ‘Train the Trainer’ exam during a workshop in Boston, Massachusetts in 1998.

One of his passions and sources of enjoyment is instructing technical programs and he is in constant demand both locally and internationally. No matter whether you have very little knowledge or are a veritable guru; you will be sure to take away valuable information from his programs.

**LECTURER**

**Behrouz Ghorbanian**  MIEAust, MSc, BSc(Eng)

Behrouz completed his degrees in Telecommunications and Electrical Engineering in 1985 and 1993 respectively, and then concluded his studies in Electrical Utility Engineering at Curtin University (Perth) in 2004.

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

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

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

**LECTURER**

**Tristan Holland**  M EngSc (Advanced Process), BEng (Chem)

Tristan has been working within the Australian water industry for the past 13 years after graduating with his engineering degree. His engineering experiences have taken him from the humble port of Adelaide to all areas of Australia and around the world including Africa, PNG, India and Canada. Tristan started off in commissioning and operations of water and wastewater treatment facilities, and then moved to designing, construction and commissioning.

Over the years the technology that Tristan has been involved with has been as varied as his engineering experiences, including pipework design for water treatment, air pollution treatment systems, and wastewater treatment systems in remote challenging environments. Two years ago Tristan decided to expand his qualifications and started a Masters of Advanced Process Design, providing an advanced ability to adapt other engineering technologies to water and wastewater treatment systems.
International Expert Speaker Faculty

LECTURER

Haresh S. Khemani  BEng (Mechanical)

Haresh Khemani is passionate about Mechanical Engineering, and teaching and writing. In a career spanning over 17 years he has gained extensive industrial experience in the area of utilities, which provides him command in this field to teach and provide consultancy. Haresh has worked in the installation, erection, and commissioning of utility plants, such as air compression plants, water chilling plants, central air conditioning systems, chlorine liquefaction plants, diesel generators, and payloader etc. He has been responsible for the maintenance and operations of the above plants, along with boiler plants, and various types of pumps and blowers.

As a lecturer at the SSVPS College of Engineering, Haresh has taught his favorite subjects including Refrigeration and Air Conditioning (HVAC), Thermodynamics, Automobile Engineering, Power Plant Engineering and Industrial Instrumentation. He has written program materials on HVAC and other subjects for multiple companies including IDC.

One of his major involvements has been with www.brighthub.com, where he and his team have published more than 2500 articles covering various areas of engineering. He has personally written more than 400 articles for the website.

Over the years, Haresh has specialized in the fields of utilities of which HVAC is the major part. He has worked in the industry as HVAC consultant and has also written a number articles and program materials in this field.

LECTURER

Brian Hobby  BEng [Electrical and Electronic]

Brian has 25 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 analyzing data in support of their sustainability initiatives.

LECTURER

Terry Cousins  MBL, BSc[Elec Eng], BComm, PEng

Terry 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 industry. He also presents numerous programs on electrical power distribution and power quality, both in South Africa and throughout the world.

Terry is a Senior Member of the SAIEE, and a Member of the IEEE (USA) and has also has 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.
LECTURER

**Kobus Harmse**  BEng(Chem Eng), BEng Hons

One word describes Kobus. Passionate! He loves his work in chemical engineering. He has worked in a number of roles at Sasol [one of the largest oil and gas processing companies in the world] in the chemical engineering area ranging from the ammonia business, to ultra high purity hydrogen and solvents. Latterly he’s been responsible for optimization support in the Monomers and Polymers business. He spent a year doing detail engineering in Texas which he found a tremendously positive influence on his career.

Kobus has received outstanding reviews with many commenting on his strong practical bias thanks to his experiences in chemical engineering over the past 20 years.

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LECTURER

**Danie Stoop**  M Eng (Electronics), PEng

Danie was born in South Africa in 1964 and obtained the B. Eng. Electrical and Electronic degree from the former Potchefstroom University for Christian Higher Education [PU for CHE] in 1987.

After lecturing at the PU for CHE’s School for Electrical and Electronic Engineering for three years he began his own electronic consultancy business, Dantron, in 1992. In 1997 he won the University’s VERKA competition for best lecturer in the Faculty of Engineering. During that time he conducted research in TCP/IP based digital communications for which he obtained a Masters degree Cum Laude in 1999. He also pioneered a programmable logic laboratory, sponsored by Xilinx from the USA.

Danie's design experience includes many facets of embedded systems and -programming for applications such as protocol converters between TCP/IP and industrial protocols, MODBUS/TCP/IP interfaces for soft-PLC's, CAN-bus, I2C, smart telephone systems, ISDN and computer data communications.

Danie was awarded for the most innovative contribution towards the Northwest University’s management systems in 2011 and currently holds the position as Head of Electronic Services at the university, where he gained extensive experience in specifying, installing and maintaining corporate-wide electronic systems.

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"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
Module 1: Practical Instrumentation for Automation and Process Control

Duration: 6 WEEKS

You Will Learn How To:

1. Demonstrate understanding of the methods of measuring pressure, level, temperature and flow in a plant environment.

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

Overview

These topics are designed for engineers and technicians who need to have practical knowledge of selection, installation and commissioning of industrial instrumentation and control valves.

In many respects a clear understanding and application of these principles is the most important factor in an efficient process control system. You can only achieve excellent control of your process when your instrumentation provides the correct information. You will learn how to achieve effective results for the industrial processes you are responsible for, including the design, specification and implementation of control and measurement equipment. The material focuses on real applications, with attention to special installation considerations and application limitations when selecting or installing different measurement or control equipment.

THE PROGRAM

Topic 1.1

INTRODUCTION
- Basic concepts
- Definitions
- Overview of pressure, level, temperature and flow
- Overview of valves

Topic 1.2

PRESSURE MEASUREMENT
- Principles
- Sources
- Transducers and elements
- Specifications
- Installation issues

Topic 1.3

LEVEL MEASUREMENT
- Principles
- Simple sight glasses
- Buoyancy tape systems
- Hydrostatic pressure
- Ultrasonic measurement
- Radiation measurement
- Electrical measurement
- Density measurement
- Installation issues

Topic 1.4

TEMPERATURE MEASUREMENT
- Principles
- Thermocouples
- Resistance temperature detectors
- Thermistors
- Liquid-in-glass, filled, bimetallic
- Pyrometers
- Installation issues

Topic 1.5

FLOW MEASUREMENT
- Principles
- Differential pressure flowmeters
- Open channel flow measurement
- Oscillatory flow measurement
- Magnetic flow measurement
- Positive displacement
- Ultrasonic flow measurement
- Mass flow measurement
- Installation issues

Topic 1.6

PROCESS CONSIDERATIONS
- Transmitters
- Noise
- Material of construction

INTEGRATION OF THE SYSTEM
- Individual instrument error and total error
- Testing and commissioning
Module 2: Practical Fundamentals of Chemical Engineering (for Non-Chemical Engineers)

Duration: 2 WEEKS

You Will Learn How To:
1. Examine and illustrate the basics of:
   - Process diagrams
   - Stoichiometry
   - Fluid mechanics
   - Heat transfer
   - Mass transfer and its applications
   - Chemical engineering thermodynamics
   - Chemical kinetics
   - Process equipment design

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

Overview

These topics will cover the fundamental concepts of chemical engineering and provide you with a solid working knowledge associated with it. If you are a non-chemical engineer this program will enable you to confidently talk to and work effectively with chemical engineers and process equipment.

Many technical professionals today find themselves working with large scale chemical processes even though they don’t have formal training in chemical engineering. This program intends to fill these gaps and provide you with knowledge of chemical engineering fundamentals along with the ability to apply this knowledge. By the end you will be familiar with the fundamentals of chemical engineering, process design considerations and troubleshooting of process equipment.

THE PROGRAM

Topic 2.1

INTRODUCTION: THE CHEMICAL PROCESS
- Process Flow Diagrams (PFDs)
- Piping and Instrumentation Diagrams (Pand IDs)
- Process legends used in flow sheets

STOICHIOMETRY
- Dimensions and units
- Processes and process variables
- Basic chemical calculations
- Material and energy balance
- Combustion

FLUID MECHANICS
- Fluid statics and its applications
- Basic equations and fluid flow
- Flow of compressible fluids
- Transportation and metering of fluids
- Agitation and mixing

HEAT TRANSFER AND ITS APPLICATIONS
- Heat transfer by conduction in solids
- Principles of heat flow in fluids
- Heat transfer to fluids
- Radiation heat transfer
- Heat-exchange applications
- Evaporation

MASS TRANSFER AND ITS APPLICATIONS
- Distillation
- Leaching and extraction
- Principles of diffusion
- Absorption
- Drying of solids

CHEMICAL ENGINEERING THERMODYNAMICS
- Fundamental quantities
- Thermodynamics
- Volumetric properties of pure fluids
- Heat effects
- Phase equilibria
- Chemical reaction equilibrium
- Conversion of heat into work by power cycles
- Refrigeration and liquefaction

Topic 2.2

CHEMICAL KINETICS
- Basic definitions
- Introduction to reactor design
- Design for single reactions
- Mixing of fluids
- Fluid particle reactions
- Solid-catalyst reactions

PROCESS EQUIPMENT DESIGN
- Storage vessels
- Pressure vessels
- Heat exchangers
- Evaporators and crystallisers
- Agitators
- Filters
- Dryers
- Process hazards and safety measures

PROCESS CONTROL AND INSTRUMENTATION
- Process instrumentation
  - Temperature
  - Pressure
  - Level
  - Flow
- Process control fundamentals

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For the detailed assessment criteria of each learning outcome, please contact your EIT Learning Advisor or Program Coordinator.
Module 3: Control Valve Sizing, Selection and Maintenance

You Will Learn How To:

1. Select control valves for a given application
2. Examine valve sizing for high pressure drop applications
3. Select appropriate materials and actuators for control valves
4. Examine the installation and maintenance procedures for control valves

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

Overview

It is claimed that the majority of control valves throughout the world have not been correctly sized and that large numbers operate on manual mode. Whether this is true or not is difficult to establish but we do know that the method of sizing and selecting a control valve for a specific application is generally not well understood. Although there are many factors that need to be taken into account the subject is not difficult to understand if dealt with in a logical manner. We also find that many maintenance problems result from people treating the symptoms of a problem rather than tackling the true cause - a basic understanding of the principles is all that is usually needed to solve the problem for good.

Training Methodology

The latest educational methods and strategies will be employed. This module is designed to maximise benefits from the outset. Questions are encouraged throughout to provide you with the opportunity to discuss with the lecturer and others, specific problems and appropriate solutions.

THE PROGRAM

Topic 3.1

INTRODUCTION TO CONTROL VALVE THEORY
- Introduction
- Definition of a control valve
- Energy types
- What is happening inside a control valve
- Cavitation
- Flashing
- Choked flow
- Valve Coefficient Cv

DIFFERENT TYPES OF CONTROL VALVES
- Globe valves
- Butterfly
- Eccentric disk
- Ball
- Rotary Plug
- Diaphragm and pinch

CHARACTERISTICS
- Equal percent
- Linear
- Quick opening
- Selection method

Topic 3.2

HIGH PRESSURE DROP APPLICATIONS
- Cavitation control
- Cavitation elimination
- Low noise
- Diffuser plates
- Chokes
- Disk stack technology
- Pressure balanced trim

USE OF COMPUTER PROGRAM FOR VALVE SIZING EXAMPLES OF HIGH PRESSURE DROP APPLICATIONS
- Water - pump bypass
- Steam - turbine bypass
- Gas - pressure reducing
- Oil - choke valve

ACTUATORS
- Pneumatic
- Hydraulic
- Electric
- Sizing on rotary valves
- Sizing on linear valves
- Mounting considerations
- Manual overrides
- Accessories

POSITIONERS
- Basic principles
- Conventional pneumatic
- Conventional electro-pneumatic
- Smart positioners
- Feedback options

PNEUMATIC CIRCUITS
- Volume tank fail system
- Fail fix
- Volume boosters

MATERIALS
- Body materials and pressure ratings
- Trim
- Packing
- Guides and gaskets

QUALITY STANDARDS
- ASME
- NACE
- ISO 9000/2000
- PED
- NAMUR

INSTALLATION / MAINTENANCE
- Installation
- Commissioning
- Routine maintenance
- Fault finding
- Modes of failure
Module 4: Fundamentals of Process Plant Layout and Piping Design

You Will Learn How To:

1. Interpret plant layout and associated documentation
2. Outline the equipment used in process plants
3. Interpret and create plant and piping drawings/documentation
4. Outline the basics of pipe and piping system components

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

Overview

Process plants such as refineries and petrochemical plants are complex facilities consisting of equipment, piping systems, instruments, electrical systems, electronics, computers, and control systems. The design, engineering and construction of process plants involves multidisciplinary team effort. Plant layout and design of piping systems constitute a major part of the design and engineering effort. The objective is to design safe and dependable processing facilities in a cost effective manner. The fact is that there are few formal training programs with a focus on plant layout and design of piping systems, therefore most of the required skills are acquired while on the job, reducing productivity and efficiency.

These topics will cover the fundamental principles and concepts used in process plant layout and piping design. You will have an opportunity to learn and discuss the techniques and procedures used in the design and engineering of complex process plants, including fundamentals of plant layout, the equipment used, design principles and procedures. You will also understand fundamentals of piping system components and the specification and design of these components. Practical examples from actual projects will be used extensively to illustrate the principles and drive home the point. You will also be provided with high quality technical materials that will prove useful for many years.

THE PROGRAM

Topic 4.1

INTRODUCTION TO PROCESS PLANT LAYOUT AND PIPING DESIGN
- Plant layout fundamentals
- Procedures and workflow methods
- Physical quantities and units

INTRODUCTION TO CHEMICAL PROCESSING METHODS
- Basic principles of chemical technology - unit operations and unit processes
- Process Flow Diagrams (PFDs), process variables and stream information
- Process utilities

PROCESS AND INSTRUMENTATION DIAGRAMS (P&IDs)
- Fundamentals of P&IDs
- Use of P&IDs in plant and piping design
- Instruments and instrument symbols
- Components of control valve manifolds
- Meter runs for flow meters

Topic 4.2

EQUIPMENT USED IN PROCESS PLANTS
- Process equipment - reactors, towers, exchangers and vessels
- Mechanical equipment - pumps, compressors and turbines
- Equipment drawings, nozzle specifications and vendor drawings
- Equipment foundations and supports

PLANT AND PIPING DESIGN DOCUMENTATION AND TOOLS
- Equipment arrangement drawings
- Equipment lists
- Piping and Instrumentation Diagrams (P&IDs)
- Piping line lists
- Piping specifications and codes
- Piping isometrics
- Bill of materials
- 3D models

PLANT LAYOUT AND PLOT PLANS
- Plant layout specifications
- Guidelines and codes for plant layout
- Safety considerations
- Plot plans
- Equipment arrangement drawings

Topic 4.3

FUNDAMENTALS OF PIPE
- Piping materials
- Pipe dimensions and pipe data
- Pipe joining methods
- Pipe representation
- Common abbreviations

PIPING SYSTEM COMPONENTS
- Fittings - elbows, tees, reducers and end caps
- Fitting makeup and dimensions
- Flanges and flange ratings
- Valves, instrumentation, instrument connections and drains
- Pipe racks, pipe supports, anchors and guides

PIPE ROUTING
- Piping isometrics
- Piping plans, sections and elevations
- 3D representation

Duration: 3 WEEKS
You Will Learn How To:

1. Demonstrate the ability to self-manage
2. Demonstrate familiarity with key project management issues
3. Communicate in a technical environment
4. Demonstrate professional and global awareness
5. Administer the basics of project finance
6. 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.
Module 6: **Best Practice In Industrial Data Communications**

**You Will Learn How To:**

1. Examine modern cabling solutions as well as methods of dealing with industrial environments
2. Troubleshoot serial communications networks [RS-232/485] at the physical layer
3. Outline the basic purpose, structure and functionality of the TCP/IP, MODBUS Serial and DNP3 protocols
4. Troubleshoot MODBUS Serial at packet level
5. Compare the structure and functionality of some of the older ['first generation'] Industrial networks
6. Compare the structure and functionality of some of the later ['second generation'] Industrial networks i.e. field buses
7. Compare the structure and functionality of some of the newer ['third generation'] Industrial networks i.e. Ethernet-based field buses

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

**Overview**

These topics will outline best practice in designing, installing, commissioning and troubleshooting industrial data communications systems. In any given plant, factory or installation there are a myriad of different industrial communications standards used and the key to successful implementation is the degree to which the entire system integrates and works together. With so many different standards on the market today, the debate is not about what is the best - be it Foundation Fieldbus, Profinbus, Devicenet or Industrial Ethernet but rather about selecting the most appropriate technologies and standards for your plant based on your requirements; doing the design of the overall system, installing the cabling and then commissioning the system. Fibre optic cabling is generally accepted as the best approach for physical communications but there are obviously areas where you will be forced to use copper wiring and indeed, wireless communications. These topics outline the critical rules followed in installing the data communications physical transport media, ensuring trouble free installation for years to come. The important point to make is that with today’s wide range of protocols available, you only need to know how to select, install and maintain them in the most cost effective manner for your plant or factory - knowledge of the minute details of the protocols is not necessary.

**THE PROGRAM**

**Topic 6.1**

**CABLING INFRASTRUCTURE**

- Noise, earthing and shielding
- Ingress Protection
- Copper/fibre cables
- Cable and connector standards
- Grounding and termination
- Transient protection

**Topic 6.2**

**PHYSICAL LAYER STANDARDS**

- RS-232
- RS-485

**Topic 6.3**

**INDUSTRIAL PROTOCOLS**

- Overview of the TCP/IP protocol suite
- Modbus Serial
- DNP3 Serial

**Topic 6.4**

**FIRST GENERATION INDUSTRIAL NETWORKS**

- Modbus Plus
- Data Highway Plus
- HART

**Topic 6.5**

**SECOND GENERATION INDUSTRIAL NETWORKS**

- DeviceNet
- PROFINET
- FOUNDATION Fieldbus H1

**Topic 6.6**

**ETHERNET-BASED VERSIONS OF SECOND GENERATION FIELDBUSES**

- Ethernet/IP
- FOUNDATION Fieldbus HSE

**ETHERNET-BASED FIELDBUSES FOR REAL-TIME APPLICATIONS**

- PROFINET SRT/HRT
- EtherCAT
- Sercos III
- Ethernet Powerlink [EPL]
- CC-Link
Module 7: Practical Process Control for Engineers and Technicians

Duration: 3 WEEKS

You Will Learn How To:

1. Examine the basic process control concepts
2. Identify and correct stability issues in closed loops
3. Compare alternative closed loop configurations
4. Examine peripheral issues in process control

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

Overview

These topics cover all the essentials of process control and tools to optimise the operation of your plant and process, including the ability to perform effective loop tuning. Practical process control is aimed at engineers and technicians who wish to have a clear understanding of the essentials of process control and loop tuning, as well as how to optimise the operation of their particular plants or processes. Mathematical theory has been kept to a minimum with the emphasis throughout on practical applications and useful information.

THE PROGRAM

Topic 7.1
INTRODUCTION

BASIC CONTROL CONCEPTS
- Typical manual control
- Feedback and feedforward control
- Block diagrams

BASIC PRINCIPLES OF CONTROL SYSTEMS
- On/Off control
- Modulation control
- Principles of closed loops control
- PID of control moves

Topic 7.2
STABILITY AND CONTROL MODES OF CLOSED LOOPS
- Cause of instability in control loops
- Change of stability through PID control modes
- Methods to improve stability
- Principles of closed loop control tuning

IDEAL PID vs REAL PID
- Non-field-interactive or ideal PID
- Field-interactive or real PID
- Distinguish between process noise and instability
- Selection of ideal or real PID

CASCADE CONTROL
- Equation types for cascade control
- Initialisation and PV-tracking
- Use of multiple outputs in cascade control
- Tuning procedure for cascade control

Topic 7.3
FEEDFORWARD CONTROL
- Feedforward balance - a control concept
- Tuning procedure for feedforward control

COMBINED FEEDBACK AND FEEDFORWARD CONTROL
- Concept of combined control with incremental algorithms
- Tuning procedure for combined control

LONG DEAD-TIME IN CLOSED LOOP CONTROL
- The problem of long dead-time in closed loops
- Use of process simulation for process variable prediction
- Tuning procedure for control loops with long dead-time

ALARM HANDLING AND PROCESS SECURITY

RANGE OF CONTROL AND INSTRUMENTATION IN INDUSTRIAL PROCESS CONTROL

PRACTICAL APPLICATIONS
- PLC systems
- Stand alone loop controllers

EXPERT SYSTEM AND MODEL BASED SELF TUNING CONTROLLERS
- Basic auto tuning
- Expert system control
- Model based adaptive
Module 8: Practical Tuning of Industrial Control Loops for Engineers and Technicians

Duration: 3 WEEKS

You Will Learn How To:

1. Examine the fundamentals of loop tuning
2. Evaluate various tuning rules
3. Examine the process of tuning valve controllers
4. Outline the procedures for automated tuning
5. Examine and illustrate the issues related to the tuning of more complex systems

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

Overview

This section is designed to train you in the latest procedures for the tuning of Industrial Control Loops using a minimum of mathematics and formulas. Loop Tuning refers to the complex skill of adjusting PID controller parameters so that the control loop performs satisfactorily under all the operational conditions it is expected to cope with. This skill cannot be acquired by merely reading books or manuals, it requires practice and practical experience and this program will provide you with the solid fundamentals in this area. You will gain the skills required to tune a controller for optimum operation.

An optimally tuned processed loop is critical for a wide variety of industries ranging from food processing, chemical manufacturing, oil refineries, pulp and paper mills, mines and steel mills. Although tuning rules are designed to give reasonably tight control, this may not always be the objective. Some thought needs to be given when retuning a loop as to whether the additional effort is justified as there may be other causes of the poor control. These issues will be discussed in some detail. By the end of this module you will have the skills to troubleshoot and tune a wide variety of process loops.

THE PROGRAM

Topic 8.1

FUNDAMENTALS OF TUNING LOOPS
- Processes, controllers and tuning
- PID controllers - P, I and D modes of operation
- Load disturbances and offset
- Speed, stability and robustness
- Gain, dead time and time constants
- Process noise
- Feedback controllers
- How to select feedback controller modes

FUNDAMENTALS OF TUNING
- Open loop characterisation of process dynamics
- Default and typical settings
- General purpose closed loop tuning method
- Quick and easy open loop method
- Fine tuning for different process types
- Simplified lambda tuning

Topic 8.2

THE DIFFERENT TUNING RULES
- Ten different rules compared
- Tables of typical tuning settings
- When to use them/when not to use them
- 28 rules of thumb in tuning

TUNING OF VALVES
- Hysteresis
- Stiction

Topic 8.3

AUTOMATED TUNING
- Self tuning loops
- Adaptive control

TUNING OF MORE COMPLEX SYSTEMS
- Cascade systems - tuning of them
- Feedforward, ratio, multivariable systems
- Interactive loops tuning
- Dead time compensation
- Practical limitations

GOOD PRACTICE
- Good practice for common loop problems
- Flow control loop characteristics
- Level control loop characteristics
- Temperature control loop characteristics
- Pressure control loop characteristics
- Other less common loops
Module 9: Practical Distributed Control Systems (DCS)

Duration: 4 WEEKS

You Will Learn How To:

1. Examine the fundamentals of DCS
2. Examine the alternatives for DCS data communications
3. Examine the DCS controller and its programming / configuration
4. Examine the attributes of the DCS operator interface
5. Examine the DCS alarm management and reporting functions
6. Examine DCS maintenance issues

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

Overview

This module will cover the practical application advantages of the modern distributed control system (DCS) and how to maximise your return on this significant investment in both hardware and software. This includes the monitoring of the effectiveness and return on the on-line process and control system performance including due diligence on system alarm management. A variety of causes and cures for how these situations occur and can be corrected will be addressed as part of the program curriculum.

Most of the process control functionality that should be in a DCS can be configured in terms of well tried and virtually standard combinations of function blocks. All DCSs have a comprehensive library of these function blocks but few operations outside the hydrocarbon industries implement the control schemes required for reasonably comprehensive process stabilisation (“straight lines on screens”) and constraint compliance (“operating hard up against the limits”) capabilities on which control systems are justified.

This module will provide you with the tools to realise how to effectively use an integrated distributed control system and consequently optimise your process and profitability.

THE PROGRAM

Topic 9.1
INTRODUCTION

SUMMARY OF TYPICAL DISTRIBUTED CONTROL SYSTEMS DCS VERSUS SCADA VERSUS PLCs

- Comparison
- The Smart Instrument as a key component in a DCS system

DCS SYSTEM ELEMENTS

- Main differences between a Distributed Control System and PLC/SCADA systems.
- Requirements of the operator interface within the DCS
- Layout of a DCS system with data highway communications paths
- Redundancy in the DCS

DATA COMMUNICATIONS IN A DCS

- Overview of DCS and SCADA communications (field/operator/long distance)
- Network topologies
- Digital field communications
- Industrial Ethernet
- Industrial network security
- Links to MES and ERP

Topic 9.2
THE BASIC CONTROLLER

- Function of the Central Processing Unit (CPU)
- Discrete and logic control
- Sequential and batch control

BASIC DCS CONTROLLER CONFIGURATION

- Control algorithms
- The use of diagnostics

PROGRAMMING OF DCS SYSTEMS

- Block Configuration
- IEC 61131-3 “open” programming languages (structured text, function block, ladder, sequential)

THE OPERATOR INTERFACE

- The operators process ‘window’
- The various operator display configurations
- The requirement for keyboard entry of data
- Ergonomic requirements in the operator environment

Topic 9.3
ALARM SYSTEM MANAGEMENT FOR DCSs

- Philosophies of alarm management
- Human and ergonomic factors
- Structure of good alarm system
- Safety Integrity Level (SIL)
- Design of alarm system
- Measurement of performance

DISTRIBUTED CONTROL SYSTEM REPORTING

- Alarm reporting, types of alarms generated and acceptance of alarms
- The different types of logs and reports which can be configured on a DCS system
- Data history use in logs, reports and trend displays

Topic 9.4
DISTRIBUTED CONTROL SYSTEM CONFIGURATION

- The organisation of system data files
- The need for different security levels attached to various operating parameters

ADVANCED CONTROL STRATEGIES MAINTENANCE CONSIDERATIONS

- Maintenance requirements of system and system elements
- The requirements for in-built diagnostics and for maintenance diagnostic routines
- The requirements for installation of UPS system
- Recovery of a DCS following a power outage
Module 10: Practical Programmable Logic Controllers (PLCs) for Automation and Process Control

Duration: 3 WEEKS

You Will Learn How To:

1. Examine the fundamentals of PLC hardware and software
2. Apply ladder logic to the development of PLC programs
3. Apply IEC 61131-3 to the development of PLC programs
4. Examine the use of PLCs in advanced applications

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

Overview

These topics are designed to benefit you with practical up-to-date information on the application of PLCs to the automation and process control of plants and factories. They are suitable for people who have little or no 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, 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 information contained advances from the basics to challenge even the most experienced engineer in the industry today.

THE PROGRAM

Topic 10.1

INTRODUCTION
- Introduction and brief history of PLCs and alternative control systems
- Why PLCs have become so widely accepted
- Lingering concerns about PLCs

FUNDAMENTALS OF PLC HARDWARE
- Block diagram of typical PLC
- PLC processor module - memory organisation
- Input and output section - module types

FUNDAMENTALS OF PLC SOFTWARE
- Methods of representing Logic, Boolean Algebra, instruction code and graphical presentation
- Fundamental ladder logic instruction set
- Comparison of different manufacturers, memory and data representation and instruction code

USING LADDER LOGIC FOR SIMPLE DIGITAL FUNCTIONS
- The basic rules
- Comparison of relay ladder diagrams
- The concept of the 'scan' and how to apply it
- Contact 'normal' states
- Positive and negative logic
- Basic Boolean functions

USING REGISTERS (WORDS)
- Number systems
- Types of register data
- Timers and counters
- Bit shift and rotate
- Table functions
- Register [Matrix] logic functions

Topic 10.2

GOOD PROGRAMMING HABITS
- Keeping track of addresses and data used
- Looking ahead - how will programs be maintained?
- Practical methods to improve quality: organisation of code, thorough documentation and simplifying changes

GOOD INSTALLATION PRACTICE
- Location of hardware
- Good wiring practice
- Cable spacing, power distribution and wire numbering
- Reducing noise and interfere

ADVANCED CONTROL WITH PLCs
- The concept of reusable logic
- Examples, drive logic and alarm handling
- Use of advanced programming functions
- Matrix logic
- Example: simple display driver

BATCH PROCESSES AND SEQUENTIAL CONTROL
- Step advance
- Fault detection and recovery
- Multiple recipes or alternative paths
- Sequential function charts

PID CONTROL
- The importance of timing and scan time
- When PID is not always appropriate:
  - Intermittent measurements
  - Long transport delays

SAFETY PROGRAMMABLE SYSTEMS
- Why regular PLCs should not be used for safety functions
- Programmable electronic logic solvers
- Safety certification
- Certified programming systems
- Application examples
- Growth of networked safety devices and certified networks
- Integrated safety systems

Topic 10.3

DATA COMMUNICATIONS
- Interface standards, RS-232, RS-422/423 and RS-485
- Protocols, Modbus and DH+
- Local Area Networks, Ethernet
- Monitoring communication links and simple watchdog timers

INTRODUCTION TO IEC 61131-3
- Concepts
- Common elements
- Programming languages: structured text
- Function block diagrams
- Ladder diagrams
- Instruction list
- Sequential function chart

SYSTEM CHECKOUT AND TESTING
- Development and verification of code
- Factory acceptance testing
- Testing procedures
- Emulating missing hardware
- Emulating process responses
Module 11: Practical Advanced Process Control for Engineers and Technicians

Duration: 3 WEEKS

You Will Learn How To:

1. Examine Internal Model Control (IMC)
2. Examine Model Predictive Control (MPC)
3. Outline the use of Reference Models
4. Formulate the control problem
5. Examine the process of MPC steady state optimization

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

Overview

In today’s environment, the processing, refining and petrochemical business is becoming more and more competitive and every plant manager is looking for the best quality products at minimum operating and investment costs. The traditional PID loop is used frequently for much of the process control requirements of a typical plant. However there are many drawbacks in using these, including excessive dead time which can make the PID loop very difficult (or indeed impossible) to apply. Advanced Process Control (APC) is thus essential today in the modern plant. Small differences in process parameters can have large effects on profitability; get it right and profits continue to grow; get it wrong and there are major losses. Many applications of APC have pay back times well within a year.

APC does require a detailed knowledge of the plant to design a working system. Considerable attention needs to be given to the operators to ensure that they can apply these new technologies effectively.

THE PROGRAM

Topic 11.1

JUSTIFICATION OF ADVANCED CONTROL
- Advanced vs. classical control
- Advanced on-line control vs. statistical process control
- Comparison of pay back time on real examples

FUNDAMENTALS OF PROCESS CONTROL
- Processes, controllers and tuning
- PID Controllers - P, I and D modes of operation
- Load disturbances and offset
- Speed, stability and robustness
- Gain, dead time and time constants
- Process noise and feedback controllers

FUNDAMENTALS OF TUNING PID LOOPS
- Open and closed loop tuning
- Ziegler Nichols
- Fine tuning for different process types
- Lambda tuning
- Ten different rules compared
- Cascade systems
- Feedforward control and deadtime
- Models and disturbances

Topic 11.2

INTERNAL MODEL CONTROL (IMC)
- Open loop model in parallel with the process
- Control system in two blocks
- Equivalence with a classical controller
- Disturbances rejection and control
- IMC and delays and feed forward

MODEL PREDICTIVE CONTROL (MPC)
- Single input / output vs. multivariable control
- Example on a binary column Causality graph
- Constraints and planning ahead
- Different models

MPC : MODEL REPRESENTATIONS
- State space and transfer function representation
- Impulse response representation

MPC : MODEL IDENTIFICATION
- Identification - what and how?
- Black and grey box models
- Causality graph of the unit

MPC : OBSERVERS
- Overall formulation and purpose
- Study of Kalman algorithm

MPC : CONTROL
- Overall formulation
- Hard constraints on manipulated variables
- Set values and soft constraints on control variables
- The notion of Horizon

Topic 11.3

REFERENCE MODELS
- Handling setpoints on controlled variables
- Measured and unmeasured disturbances rejection
- Handling soft constraints on controlled variables
- Rejection of disturbances

CONTROL FORMULATION PROBLEM
- Quadratic criterion vs. geometric control
- Importance of the horizon length
- Use of the weight matrix
- Handling output constraints along the horizon
- Projection of measured and unmeasured disturbances along the horizon
- Final quadratic problem formulation and resolution
- Off-line pre-processing
- On-line calculations

MPC STEADY STATE OPTIMISATION
- Degrees of freedom and rationale for optimisation
- Economic output submitted to setpoint
- Slogans to maximise or minimise
- Bridge from optimisation to control
- Reachable targets for economic variables
- Interpretation of the horizon for economic variables
- Change of the control formulation problem

APPLICATION OF THE THEORY TO THE CONTROL OF TWO DIFFERENT UNITS ON A PROCESS SIMULATOR
- Complete application (identification, controller design, control and optimisation)
Module 12: Practical Boiler Control and Instrumentation for Engineers and Technicians

Duration: 2 WEEKS

You Will Learn How To:

1. Examine the essentials of boiler processes and their control functions
2. Examine the principles of the main boiler control functions

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

Overview

You will gain knowledge on two subjects that are essential for anyone involved in using or applying controls to boilers. These are a basic knowledge of boiler and combustion processes and a basic knowledge of those control and instrumentation practices relevant to most boiler plant applications. The control training includes a review of the SAMA and ISA symbol standards used for depicting control system details. The training then proceeds in a series of topics to describe the basic requirements and typical control solutions for the main control and safety functions in boilers. These functions are structured into individual topics allocated to feedwater supply and drum level, furnace air and the control of draft pressure, combustion controls, steam pressure and temperature controls. The combustion control module addresses the issues of dynamic response of the fuel and air feeds with examples of how ratio control, feedforward signals and cross limiting methods are applied to ensure good load following.

The program includes a study of the basic principles of burner management systems and includes the measures used to support furnace safety through the enforcement of start up procedures and purge sequences. The requirements for burner management systems to be engineered as safety instrumented systems to IEC 61511 are examined and the implications for equipment design are discussed. The topics are supported by a series of practical study exercises with answers provided to assist the understanding of key issues.

Introduction

These topics introduce the basic practices of controls systems and safety controls for industrial steam generating boilers. The focus is on the control and safety requirements applicable to most types of boilers from small gas-fired units to large multi-fuel installations. This module will provide you with training in how control and instrumentation is designed to manage the main variables such as drum water level, furnace draft, combustion fuel and air conditions. Burner management systems are introduced with their principal features including flame safety systems. The essential safety requirements for boilers and burners are identified and the corresponding safety interlocks are explained as practical solutions in accordance with the latest safety standards.

THE PROGRAM

Topic 12.1

ESSENTIAL OF BOILER PROCESSES AND THEIR CONTROL FUNCTIONS

- Objectives of boiler controls
- Boiler processes in block diagrams to show key inputs and output variables
- Hazards of boiler operations
- The main control functions in boilers and furnaces
- Furnace air and draft controls

Topic 12.2

PRINCIPLES OF THE MAIN CONTROL FUNCTIONS

- Principles of drum level measurement
- Principles of drum level controls and protection systems
- Principles of combustion controls
- Master pressure controls for multiple units
- Basic steam temperature control
- Essential of burner management systems
Module 13: Practical Hazardous Areas for Engineers and Technicians

You Will Learn How To:

1. Examine the concept of hazardous areas
2. Examine the standards, certification, and approvals for hazardous areas
3. Examine the protection concepts for hazardous areas
4. Examine the installation, inspection and maintenance issues for hazardous areas

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

Overview

This module will provide you with an understanding of the hazards involved in using electrical equipment in potentially explosive atmospheres. It is based on the international IEC79 Series of Standards. Explosion-protected installations can be expensive to design, install and operate. The wider approaches described in these standards can significantly reduce costs whilst maintaining plant safety. The module will explain the associated terminology and its correct use. It covers area classification through to the selection of explosion-protected electrical apparatus, describing how protection is achieved and maintained in line with these international requirements. Standards require that engineering staff and their management are trained effectively and safely in Hazardous Areas and these modules are designed to help you fulfill that need.

THE PROGRAM

Topic 13.1 HAZARDOUS AREAS

- Introduction: explosion consequences
- Risk assessment
- Properties of flammable materials
- Definitions
- Classification system: sources of release and zoning
- Classification of apparatus: grouping and temperature

Topic 13.2 STANDARDS

- British standards
- European
- North American
- International

Topic 13.3 PROTECTION

- Theory and definitions
- Practical aspects and limitations of use
  - Flameproof Ex d
  - Increased Safety Ex e
  - Non-Incendive Ex n
  - Pressurisation Ex p
  - Oil-Immersion Ex o
  - Sand-filling Ex q
  - Encapsulation Ex m
  - Intrinsic Safety Ex i
  - Special Ex s

Topic 13.4 INSTALLATION

- General requirements for all types of protection
- Selected specific requirements
- Earthing and bonding
- Operation and maintenance of apparatus

CERTIFICATION and APPROVALS

- Marking and identification
- Notified bodies
- Authorities
- IEx, EEx and AEEx schemes
- ATEX directives in Europe
- Principles of Ex protection
- Component, apparatus and systems certification

INSPECTION AND MAINTENANCE

- Requirements
- Visual close and detailed types
- Use of tools and test equipment
- What to look out for
Module 14: Practical Safety Instrumentation and Emergency Shutdown Systems for Process Industries Using IEC 61511 and IEC 61508

Duration: 4 WEEKS

You Will Learn How To:

1. Examine and discuss safety instrumented systems from a managerial perspective
2. Outline the procedures for specifying safety requirements
3. Outline the procedures for selecting safety system equipment
4. Outline the procedures for performance evaluation, testing, and maintenance of safety systems

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

Overview

For project managers and engineers involved with hazardous processes, this module of the program focuses on the management, planning and execution of automatic safety systems in accordance with IEC 61511, the newly released international standard for process industry safety controls. IEC 61511 has been recognized by European safety authorities and by USA based process companies as representing the best practices available for the provision of automatic safety systems. The content is structured into two major parts to ensure that both managers and engineering staff are trained in the fundamentals of safety system practices.

THE PROGRAM

Topic 14.1
AN OVERVIEW OF SAFETY INSTRUMENTED SYSTEMS FOR MANAGERS

- The principles of safety-instrumented systems including the concepts of risk reduction, safety integrity levels and the essential design and performance requirements of safety control systems.
- The scope and application of the IEC standards 61508 and 61511 and their principal requirements.
- Essential features of safety PLCs
- The safety life cycle

Topic 14.2
SAFETY REQUIREMENTS SPECIFICATION

- How hazard analysis and risk assessment leads to the safety requirements specification
- Demand mode and continuous mode methods for risk reduction
- LOPA and Risk graph methods for determination of SIL targets
- Fault tolerance and redundant architectures

Topic 14.3
SAFETY SYSTEM EQUIPMENT SELECTION AND APPLICATION SOFTWARE

- Essential features of field devices
- Instrument selection and issues of certification
- Safety PLCs and networks
- Application software activities and tools

Topic 14.4
PERFORMANCE EVALUATION, TESTING AND MAINTENANCE OF SAFETY SYSTEMS

- Basic reliability analysis and how it benefits the end user
- Diagnostics and proof testing for improved performance
- The benefits of safety certified and smart instruments
Module 15: Practical HAZOPS* for Engineers and Technicians

*Hazard and Operability Studies

Duration: 4 WEEKS

You Will Learn How To:
1. Outline the principles of HAZOP
2. Examine and discuss the HAZOP examination phase
3. Plan and lead HAZOP workshops
4. Perform hazard analysis and SILs

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

Overview

This module will concentrate on awareness level training for managers, engineers and technicians in the practical application of hazard and operability workshops (known as HAZOP). Training takes the form of an introductory presentation followed by interactive examples where you can obtain an understanding of the HAZOP technique and HAZOP team leaders can practice the required skills. HAZOP is widely used for identifying hazards in an industrial process and for assessing the potential consequences where there are risks of harm to persons, the environment or to assets.

The HAZOP technique is fully recognised and recommended throughout industry by professional engineering institutions, government regulators and insurance companies. It is one of the principle risk management tools required by most government regulators for industrial processes worldwide. HAZOP is applied at both the design stage and throughout the life of a process plant, where it supports the safety management and (where applicable) the validation of the plant safety case. HAZOP is also an essential technique when reviewing modifications and upgrades to existing plants.

This module will introduce you to the basics of the HAZOP technique and discuss its relationship with other safety (risk) management tools. HAZOP can be applied to any process industry, onshore or offshore, be it in the oil and gas industry, mining, chemical or other processing industries. Consequently it will be of interest to a variety of managers and to most engineering disciplines. Examples include the design of a new process plant and modifications to an existing process plant. The study of process flow-sheets and process and instrumentation diagrams (P&IDs) will also be covered.

SCOPE

These topics will provide training in the techniques of hazard and operability studies that are widely used in industry for the identification of potential hazards in process plant operations. HAZOP can be adapted to a wide range of applications to seek out operational failure modes and possible harm to persons, environment or assets. HAZOP methods have been extended to searching for hazards in operational procedures in many other fields including electronic controls and emergency planning procedures.

This module will describe the role of HAZOP within a framework of risk management techniques that support the field of Process Hazard Analysis. The training will cover the 4 phases of Hazop activities, which comprise: Planning, preparation, examination and reporting with particular emphasis on the details of the examination phase in which guidewords are systematically applied to parts of a process or stages of an operation to test for deviations from design intent. A number of practical exercises support the training information and allow you to test your understanding of the material provided in the training manual. The content extends to include risk assessment techniques such as FIA and determination of safety integrity levels (SILs) for safeguarding using safety instrumented systems.

Hazard studies interact closely with process design and safety engineering solutions in the critical stages of engineering projects. Understanding these interactions will assist to plan your work efficiently and to contribute effectively to the reduction of risks in the workplace. You will learn how information flow from HAZOP supports safety management throughout the life cycle of the plant. The HAZOP techniques and safety system practices described are based on the latest international practices including the guidelines in IEC 61822 for HAZOP studies.

THE PROGRAM

Topic 15.1
INTRODUCTION TO THE PRINCIPLES OF HAZOP
• The how, when and why outline of Hazard and Operability Studies (HAZOPS)
• Hazard studies and regulations
• The six level life cycle model
• Typical HAZOP workshop

Topic 15.2
THE HAZOP EXAMINATION PHASE
• Defining the parts for study
• Generating deviations with guidewords
• Worked examples of process HAZOP for continuous plant
• Procedural HAZOP for sequential operations and batch processes

Topic 15.3
PLANNING AND LEADERSHIP OF HAZOP WORKSHOPS
• Duties of the team leader
• Make up of the study team
• Leading the sessions
• Recording and reporting methods

Topic 15.4
FROM HAZOP TO HAZARD ANALYSIS AND SILS
• Fundamentals of risk assessment and the risk matrix
• Risk reduction and layers of protection
• The role of safety instrumented systems and determination of SIL targets
• Hazard analysis methods of FMEA, FTA and LOPA
Module 16: Practical Shielding, EMC/EMI, Noise Reduction, Earthing and Circuit Board Layout of Electronic Systems

You Will Learn How To:

1. Outline the basic principles of EMI
2. Examine the concepts of earthing and shielding
3. Examine noise issues with cables, connectors and circuits
4. Examine the application of protection and filtering components
5. Examine noise-related PCB design issues

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

Overview

The aim of this module is to help you identify, design, prevent and fix common EMI/EMC problems with a focus on earthing and shielding techniques. Learning how to fix earthing and shielding problems on the job can be very expensive and frustrating. Although it must be noted that most of the principles involved are simple, these topics will give you the tools to approach earthing and shielding issues in a logical and systematic way. The circuit board layout section concentrates on design and layout of circuits and components on a printed circuit board. The overall focus is on useful design and systems issues; not about regulations and standards. You will take this material back with you to your work and apply the key principles immediately to your design and troubleshooting challenges.

THE PROGRAM

Duration: 2 WEEKS

Topic 16.1

INTRODUCTION
- EMI vs EMC
- Interference sources
- Need for standards
- EMC - issues and testing categories
- The compatibility gap

EM PRINCIPLES
- Coupling: paths, mechanisms and the supply network
- Electromagnetic fields
- Rayleigh/Maxwell near/far fields
- Coupling modes: differential and common

EM PRINCIPLES - 2
- DM/CM conversion
- Common mode rejection ratio (CMRR)
- Units in EMC engineering
- Spectrum usage and created interference
- Fourier analysis
- Choice of logic family
- Lightning and ESD bandwidth

SHIELDING
- Murphy’s Law
- LF magnetic shielding
- Apertures and shielding effectiveness
- Waveguides
- Gasketting and sealing
- Panel displays and keyboards
- Ventilation and shielding
- PCB-level shielding

EARTHING
- Earthing: frequency, loops, impedance and topologies
- Guidelines

Topic 16.2

CABLES, CONNECTORS AND CIRCUITS
- Cable parameters and implication
- Cable types and frequency
- Cable routing and screening
- Types of screening
- Screened and unscreened connectors
- Transmission lines
- Cable coupling to radiated field

CIRCUITS
- Clocking
- Choice of logic family
- Design and component choice
- Analog immunity and demodulation

PROTECTION, FILTERING AND COMPONENTS
- Parasitic in passives
- Filter types and operation
- Soft ferrites
- Filter specifications
- Impedance matching
- Filtering precision and filter earthing
- Filters and shielding

SURGE PROTECTION
- Devices (SPDs) and integrity
- Ratings and fusing
- Positioning SPDs

POWER SUPPLIES
- PSUs as noise generators
- Switch-mode PSU as a noise generator
- Coupling paths, conducted emissions
- Parasitic components in SMPS

PCB DESIGN AND LAYOUT
- PCB design objectives
- Differential and common mode coupling
- Electrical and physical parameters
- Board, component and track layout
- The Image Plane effect
- Maintaining plane integrity and gridded ground
- Board layering and stacking
- Grounding on the board
- Decoupling capacitors
- Transmission lines on PCBs
- Multiple boards and backplanes
- Interfacing noisy and quite areas

ENGINEERING MEASUREMENTS
- Measuring in Noisy Environments
- E and H Field Probes
- RF Injection
Module 17: Practical Wireless Ethernet and TCP/IP Networking

Duration: 3 WEEKS

You Will Learn How To:
1. Design and troubleshoot Ethernet (IEEE 802.3) LANs
2. Perform configuration and troubleshooting for TCP/IP
3. Examine wireless and antenna fundamentals
4. Perform configuration and troubleshoot for Wi-Fi (IEEE 802.11) WLANs
5. Examine wireless industrial automation standards and their application

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

Overview

The use of Wireless and Ethernet in industrial and plant floor environments has grown dramatically in the last few years. Industrial users face a wide range of options when designing and implementing plant-level Wireless and Ethernet networks. Great success is being achieved using Wireless, provided certain ground rules are applied. These topics cover IEEE 802.3 Ethernet LANs and IEEE 802.11 WLANs, as well as all the supporting technologies. These issues will be addressed in a clear and practical manner, enabling you to apply the technology quickly and effectively in your next project. By the end of this module you will have a clear understanding of the choices available to you in designing and implementing your own Wireless and associated Ethernet LANs.

THE PROGRAM

**Topic 17.1**
ETHERNET
- Ethernet frame structure
- VLANs
- Half-duplex operation (CSMA/CD)
- Full-duplex operation
- Auto-negotiation
- Deterministic Ethernet

**THE TCP/IP PROTOCOL SUITE**
- IPv4 vs. IPv6
- IP Addressing
- Routing
- ICMP and ARP
- TCP and UDP
- TCP/IP utilities

**Topic 17.2**
WIRELESS FUNDAMENTALS
- Basics of electromagnetic transmission
- Frequency allocations
- Gain and loss (dB)
- WLAN modulation techniques
- Spread Spectrum techniques

**ANTENNAS**
- Antenna basics
- Dipole, Yagi and parabolic reflector antennas
- Diversity
- VSWR

**Topic 17.3**
IEEE802.11 WIRELESS LANs
- Architecture (Ad-hoc vs. infrastructure)
- Bridging and roaming
- Specifications (IEEE 802.11b, a, g, n)
- Medium Access Control
- Frame structure
- Site surveys
- AP configuration
- WLAN vulnerabilities
- WPA2/IEEE 802.11i
- AES encryption
- PSK and RADIUS authentication

INDUSTRIAL WIRELESS NETWORKS
- WirelessHART (IEEE802.15.4)
- ISA 100.11a
Module 18: Practical Radio Telemetry Systems for Industry

Overview
These topics have been designed in conjunction with radio telemetry experts from throughout the world (the SCADA list) and aim at providing you with all the critical information you will need. You will start with a review of radio and wireless fundamentals to ensure you are brought up to speed with the basics. The essentials of data communications (and Ethernet) are then reviewed as they apply to radio telemetry systems. A review of wireless LAN systems is undertaken with a comparison of radio modems, along with the fast growing topic of cellular radio data services. Protocols are a key part of all radio telemetry systems and we investigate the importance of them together with the challenges associated with radio. Satellite and microwave systems are given a brief overview, followed by performance analysis. A discussion on radio telemetry systems would not be complete without sketching out the key issues of SCADA systems and alarm management. The overall network architecture of radio telemetry systems is then detailed.

You will conclude with an examination of troubleshooting techniques and the vital topic of security and encryption. These topics reflect today’s emphasis on using open protocols and networking standards such as DNP3, TCP/IP and Ethernet off-the-shelf hardware and software to keep the costs down. You will gain real life skills with a selection of case studies, used to illustrate the key concepts with examples of real-world radio telemetry systems in water, electrical and processing industries. You will also have an excellent opportunity to network with your peers as well as to gain significant new information and techniques for your next radio telemetry project.

THE PROGRAM

You Will Learn How To:
1. Compare the wireless technologies available for communication with fixed installations
2. Examine the selection and application of wireless modems
3. Design a point-to-point microwave link
4. Examine infrastructural issues pertaining to the installation of fixed wireless links

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

Duration: 3 WEEKS

Topic 18.1
FIXED SYSTEMS
- Wireless modems
- Repeaters
- Modem selection
- IEEE802.16/WiMax
- 3G/4G cellular data services
- Remote telemetry via 3G

Topic 18.2
LINE-OF-SIGHT MICROWAVE
- Point-to-point vs. point-to-multipoint networks
- Power calculations
- Distance and Free Space Loss calculations
- ISM band point-to-point terrestrial microwave link design
  - Mast height calculations
  - Fresnel zone clearance
  - Antenna and feeder selection
  - Fade Margin calculations
  - EIRP limitations
- Backhaul design

Topic 18.3
NETWORK INFRASTRUCTURE
- Site selection
- Antenna support structures
- Equipment shelters
- Power supply
- Supervisory systems
- Cabling infrastructure
- Audits
- Redundancy

SECURITY
- Security issues
- Countermeasures
Module 19: Practical SCADA Systems for Industry

Duration: 3 WEEKS

You Will Learn How To:
1. Design a basic SCADA system infrastructure
2. Compare WAN communication technologies for SCADA systems
3. Apply OPC technology to SCADA system operation
4. Examine the security issues related to SCADA systems

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

Overview
SCADA has traditionally meant a window into the process of a plant or gathering of 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 the fundamentals of SCADA design, installation and troubleshooting. It presents an excellent opportunity to network with your peers as well as gain significant new information and techniques for your next SCADA project.

THE PROGRAM

Topic 19.1
BACKGROUND TO SCADA
- SCADA concepts and terminology
- Typical SCADA architectures

SCADA HARDWARE
- I/O Servers
- Historians
- RTUs
- Firewalls
- Component-level redundancy

SCADA SOFTWARE
- Commercially-available SCADA software
- Configuration

Topic 19.2
APPLICATION OF PROTOCOLS IN SCADA
- TCP/IP
- MODBUS
- DNP3

ETHERNET APPLICATIONS IN SCADA
- Components
- Network redundancy

WIRELESS APPLICATIONS IN SCADA
- Terrestrial microwave
- Cellular

WAN TECHNOLOGIES IN SCADA
- Digital hierarchies (T/E)
- Packet switching (X.25)
- Frame Relay
- ATM
- SONET/SDH

Topic 19.3
OPC
- Basic concepts
- OPC specifications (Legacy and Unified Architecture)
- Accessing SCADA parameters via OPC
- Tunnelling

SECURITY
- Cyber threats against SCADA installations
- Security philosophies for SCADA systems
- Requirements for SCADA firewalls
Module 20: Motor Protection, Control and Maintenance Technologies

Duration: 4 WEEKS

You Will Learn How To:

1. Examine the basics of electric motors
2. Perform motor and bearing failure analysis
3. Examine the basics of motor control and protection
4. Examine the basics of fault-finding on motors

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

Overview

It is estimated that electrical drives and other rotating equipment consume about 50% of the total electrical energy consumed in the world today (and this figure increases to 70% if you only consider industry.) 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’s 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 concluding topic of the program will give you the fundamental tools in troubleshooting motors confidently and effectively.

THE PROGRAM

Topic 20.1

BASICS OF ELECTRIC MOTORS
- Introduction
- Fundamentals of motor technology and construction
- Three phase AC induction motors
- Energy losses and efficiency of three phase AC induction motors

Topic 20.2

MOTOR FAILURE ANALYSIS
- Motor failure analysis
- Bearing failure analysis
- Testing

Topic 20.3

MOTOR CONTROL AND PROTECTION
- Protection of motors
- Motor control
- Control systems for AC variable speed drives

Topic 20.4

FAULT FINDING
- Installation of motors
- Fault finding on motors
- New technologies and developments
Module 21: Practical Power Distribution for Engineers and Technicians

You Will Learn How To:
1. Examine power distribution fundamentals
2. Perform short circuit current calculations
3. Select medium voltage switchgear
4. Select power cables
5. Examine and discuss the basics of power transformers
6. Examine compensation and power factor correction
7. Examine and explain correct earthing procedures
8. Perform distribution-related simulations

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

Overview
These topics will focus on medium voltage [1 kV - 36 kV] power considerations, switchgear, power cables, transformers, power factor correction, earthing/grounding, lightning protection and network studies. You will gain technical know-how in these areas not covered by university or college programs. Throughout the module you will perform practical design calculations to reinforce your understanding of each section. These will include how to use computer simulation software to design and/or troubleshoot your electrical power network - important practical issues in doing fault level calculations, load flow forecasts, motor starting studies and equipment sizing.

THE PROGRAM

Topic 21.1
INTRODUCTION
- Definition of power distribution
- Elements of a power distribution network
- Focus of workshop

FUNDAMENTALS OF POWER DISTRIBUTION
- Overview of basic electrical theory
- Basic design considerations
- Voltage considerations and improvement of voltage conditions
- Equipment generally used in power networks today

SHORT-CIRCUIT CURRENT CALCULATIONS
- Sources of fault current
- Fundamentals of short-circuit current calculations
- Assumptions and simplified calculations
- Restraints of simplified calculations
- Worked examples

Topic 21.2
MEDIUM VOLTAGE SWITCHGEAR
- Load currents and fault currents
- Switchgear capabilities and ratings
- Types of switchgear manufactured today and their applications
- Comparison of different types of insulation methods (air, oil, vacuum, SF6)
- Advantages and disadvantages of different types of medium voltage switchgear
- Internal arc proofing
- Modern protection relays used with switchgear
- Preventative maintenance
- Future trends

POWER CABLES
- Insulation types and their applications
- Cable losses and voltage drop
- Cable ratings and short-circuits
- Single core vs three core cables
- Cable installation
- Cable splicing and termination techniques

Topic 21.3
TRANSFORMERS
- Classifications
- Specifications
- Power transformers
- Connections and voltage taps
- Transformer impedance
- Insulation methods
- Cooling techniques
- Star-point earthing
- Accessories and protection

COMPENSATION AND POWER FACTOR CORRECTION
- Various capacitive and reactive compensation methods
- Overview of power factor theory
- Causes and effects of low power factor
- Methods to improve power factor and benefits
- Caution: capacitors with induction motors
- Transients and capacitor switching
- Resonance and harmonics
- Protection of capacitor banks
- Economic justification for power factor correction

Topic 21.4
EARTHING
- System earthing
- Equipment earthing and earthing of structures
- Electrical safety earthing
- Static earthing
- Lightning protection
- Ground resistance measurement
- Factors influencing ground resistance

OVERVIEW OF COMPUTER SIMULATION SOFTWARE
- Load flow studies
- Fault level studies
- Equipment sizing
- Motor starting studies

LATEST DEVELOPMENTS IN TECHNOLOGY
- Automation of power distribution networks
- Digital instrument transformers