Graduate Diploma of
PROJECT MANAGEMENT IN
ELECTRICAL ENGINEERING*

PATHWAY TO Master of Business and Project Management (Electrical Engineering)**

PART-TIME, INTENSIVE DISTANCE LEARNING OVER 12 MONTHS

WHAT YOU WILL GAIN:

- Skills and credibility in Project Management in Electrical Engineering
- Advanced skills and knowledge in the latest technologies in electrical engineering
- Practical know-how from practising experts with demonstrated ability
- Credibility as an advanced practitioner in electrical engineering
- Ability to make independent judgements and high level decisions in a variety of technical or managerial contexts
- Knowledge and skills to be actively involved in planning, implementation and evaluation stages of a range of functions in specialised electrical engineering projects
- A fully accredited Graduate Diploma of Project Management in Electrical Engineering

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 the EIT in all Australian states. The EIT delivers this program to students worldwide.

** Students who successfully complete the Graduate Diploma of Project Management in Electrical Engineering can proceed straight into the second part of an accredited Masters program and earn the Master of Business and Project Management. The Masters qualification is awarded by the Asia Pacific International College and legally accredited in Australia by the Higher Education Directorate. The prospectus for that program can be viewed here: http://www.eit.edu.au/downloads/E_MBPM.pdf

52587WA

START DATE:
For upcoming start dates, please view our program schedule at:
http://www.eit.edu.au/schedule

Gain cutting edge expertise with this prestigious, practical GRADUATE DIPLOMA

Endorsed by

ISA
Graduate Diploma of Project Management in Electrical Engineering

- Presented by distance learning (live web and video conferencing)
- Part time over 12 months
- Four semesters per year
- 12 weeks per semester

Benefits of Live E-Learning

We understand that many individuals face tough obstacles to furthering their education, including family commitments, full time careers, financial and geographical limitations. By using the latest technology and software, we provide flexible, affordable programs whilst retaining interaction, engagement and top quality tuition.

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

For more information on applications or enrolments, please contact us at:

Engineering Institute of Technology
T: +618 9321 1702
F: +618 9321 2891
E: enquiries@eit.edu.au

www.eit.edu.au
What Our Students Have to Say

QUOTES FROM PAST STUDENTS

What made you choose an EIT program(s)?

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

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

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

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

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

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

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

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

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

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

“I have done other programs with IDC [associated organisation] 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
Welcome to the Graduate Diploma of Project Management in Electrical Engineering

Dear Colleague,

It is our pleasure to welcome you to the Graduate Diploma of Project Management in Electrical Engineering. As its title suggests, this is an advanced program in Project Management in Electrical Engineering and it is ‘reasonably unique’ in the world. This program has been produced after considerable research into what an engineering professional working in the electrical engineering field really needs to help achieve the final steps up the career ladder. We believe the unique flavor of this program is the linking of project management, a key part of all engineers’ and technologists’ working careers, to that of electrical engineering. This program focuses on the practical issues of electrical engineering that will confront an advanced practitioner in the field. For example, you will be exposed to the design concepts and issues of best practice in power systems protection and switchgear. You will also be expected to undertake advanced project management, design and conceptualization work. Some of the work and study you will be undertaking will involve pioneering technology and exploring new approaches.

An added feature of this program is that in using web collaborative technologies you will not only study and work with your peers around the world on various electrical engineering design projects, but you will be able to do so conveniently and flexibly from your desktop. Using the latest techniques in live web and video conferencing, you will not have to leave your workplace to attend this highly interactive program.

You only need to look at the huge number of job openings in electrical engineering and project management to know that there is a definite ongoing need for highly qualified and skilled specialists in this field together with project management. Upon completing this program you will be able to show technical leadership in the field of electrical engineering and be recognized as an advanced practitioner. An innovation of this program is that it serves both as an up-skilling and cross-skilling mechanism. Students from a discipline such as Mechanical Engineering could complete the program to up-skill and cross-skill to electrical engineering project management.

In summary, this high level practical graduate diploma is based on:

- Outstanding lecturers with relevant, real-world, electrical engineering and project management experience
- Excellent materials with useful industry applicable theory
- Live, lecturer led e-learning presentations

Please take your time to study and compare our programs and contact us for further advice. We would be delighted to talk with you about furthering your career.

Regards,

Dr Steve Mackay

BSc(ElecEng), BSc(Hons), MBA, MMR, PhD, CP Eng, FIE (Aust)
Engineering Institute of Technology

Who Should Apply

Anyone who wants to gain solid knowledge of project management and the key elements of electrical engineering to improve their work skills and to further their job prospects:

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

EIT Program Delivery Methodology

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

Visit:
Program Structure*

This innovative graduate diploma comprises of 9 modules and is structured to be an intensive part-time program, running over a period of 4 semesters of 12 weeks each, with one-week of exams, and a one-week break between semesters. You will need to invest 15 to 20 hours per week [comprising of online lectures, assignments, lab and simulation work, collaborative team work and self-study in the program]. The structure of the graduate diploma does provide some flexibility; in that you can defer modules due to work commitments and continue when the timing is more appropriate for you.

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<th>PROGRAM STRUCTURE</th>
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*Delivery sequence subject to change.

Please note: this does not include the program induction week, or examination weeks. Total time to complete the program may take longer than 48 weeks.

For detailed information on the content and breakdown of modules, see pages 11 to 23

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 a lecture only. 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 internalise 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 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.

Master of Business and Project Management in Electrical Engineering

The Graduate Diploma of Project Management in Electrical Engineering is offered as a fully accredited stand-alone qualification with the opportunity for successful students to proceed straight into the second part of an accredited Masters program and earn the Master of Business and Project Management (Electrical Engineering). The masters qualification is awarded by the Asia Pacific International College and legally accredited in Australia by the Higher Education Directorate. The prospectus for that program can be viewed here: http://www.eit.edu.au/downloads/E_MBP.pdf. Note that most students will take an additional 15 months to complete the Masters section. It is possible to exit with the graduate diploma after the first year without proceeding to the Masters section.

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

Brett Lapham
Comprehensive eBooks and Associated Documentation

You will receive 20 of our up-to-date technical eBooks to add to your library. Together these texts contain thousands of pages of valuable know-how distilled from years of experience in presenting these programs throughout the world. Titles include:

- Safe Operation and Maintenance of Circuit Breakers and Switchgear
- Practical Energy Efficiency, Design, Engineering and Auditing
- Practical Electrical Safety Techniques for Industry
- Practical Earthing, Bonding, Lightning and Surge Protection
- Practical Electrical Substation Safety
- Practical Motor Protection, Control and Maintenance Technologies
- Practical Power Distribution
- Practical Power Quality: Problems and Solutions
- Practical Power System Protection for Engineers and Technicians
- Switchgear and Distribution Systems
- Practical Power Transformers: Operation, Maintenance and Testing
- Practical Variable Speed Drives for Instrumentation and Control Systems
- Practical Troubleshooting of Instrumentation, Electrical and Process Control
- The Practical Business Engineer
- Practical Financial Fundamentals and Project Investment Decision Making
- From Engineer to Leader
- Practical Project Management for Engineers and Technicians
- Practical Shutdown and Turnaround Management for Engineers and Managers
- Practical Specification and Technical Writing for Engineers and Other Technical People

Please Note: Students who choose to pay upfront will receive all 20 eBooks in advance. If you opt to pay by installments you will receive eBooks periodically throughout the program.

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

Admission Requirements

Applicants must have, as a minimum, a bachelors degree (or equivalent) in an applicable discipline or, otherwise, possess qualifications that can be considered equivalent in terms of subject matter and level. Potential students who do not meet this requirement would need evidence of academic and career experience that clearly demonstrates equivalent high level knowledge.

Applicants are considered on a case-by-case basis. However, suitable applicants should be seeking to achieve advanced knowledge and expertise in project management in electrical engineering.

English language competency is required. Students must understand spoken and written English and be able to communicate in English verbally and in writing.

Potential students include:

- Practising engineers or technologists with advanced knowledge, experience and education [such as a 3 or 4 year bachelor's degree]
- Practising electrical and instrumentation technologists or engineers with demonstrated competence and interest in electrical engineering
- Engineers or technologists from another discipline [such as mechanical and chemical engineering] wanting to up-skill in this area
- Individuals who have successfully completed the Advanced Diploma in Applied Electrical Engineering and cemented this with extensive practical experience in electrical engineering

For more information, applications or pre-requisites, please contact our program advisors at enquiries@eit.edu.au

Why Consider Postgraduate Education?

A postgraduate qualification such as a degree or diploma can have a huge impact on your career and employment prospects. Postgraduate surveys have often confirmed that individuals with postgraduate education not only have higher salaries, but also find employment much more quickly and spend more time overseas in desirable locations for employment. Successful students also graduate with access to a wider professional and industry network, with good quality employment contacts.

Employers recognise that students who have completed postgraduate education have much deeper knowledge, more independence and ambition as well as the ability to make higher level decisions. They also develop better time management skills and are more accountable and responsible in the workplace and hence they are more desirable candidates. There is no doubt that postgraduate education will help your employment prospects, and assist in your professional and personal development.

Exemptions and Recognized Prior Learning

Credit exemption is not guaranteed but will be assessed on the merits of the application. It is critical that anyone undertaking the program has an excellent grasp of fundamental electrical concepts and applications (as a minimum), such as those presented in the Advanced Diploma of Electrical Engineering program offered by EIT.

Weekly Commitment

The time required for the program depends greatly on your existing knowledge and experience. It is an intensive program and the material is at postgraduate level. We estimate that you would need 15 to 20 hours per week, on average, to successfully complete the program. This includes live webinars, scheduled activities, projects, assignments and readings. Obviously your time investment and dedication are directly linked to your results.

For more information or to enrol, please contact us at enquiries@eit.edu.au
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 and beyond. The finest engineering lecturers and lecturers, with extensive real engineering experience in industry, are drawn from around the world. The learning is gained through synchronous, online (e-learning) technologies. The EIT offers awards in a growing array of engineering fields. Many, perhaps most, engineering faculties at universities and colleges experience a significant challenge delivering the program-work affordably and with excellence. The 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.

The EIT is a sister company of the well known and reputable engineering training organisation, 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.

Endorsed by ISA

This Program is Endorsed by the International Society of Automation (ISA)

Founded in 1945, the International Society of Automation is a leading, global, non-profit organization that is setting the standard for automation by helping over 30,000 worldwide members and other professionals solve difficult technical problems, while enhancing their leadership and personal career capabilities.

ISA is one of the foremost professional organizations in the world for setting standards and educating industry professionals in automation. ISA Standards help automation professionals streamline processes and improve industry safety, efficiency, and profitability. Over 150 standards reflect the knowledge from more than 4,000 industry experts around the world. Since 1949, ISA has been recognized as the expert source for automation and control systems consensus industry standards.

ISA provides leadership and education in the professions that it serves, assisting engineers, technicians, and research scientists, as well as many others, in keeping pace with the rapidly changing industry. It also publishes books and technical articles, and hostsand exhibitions for automation professionals to gain access to the latest product developments and industry knowledge.

Furthermore, ISA certifies industry professionals. ISA certification provides an objective, third-party assessment and confirmation of a person's skills, and gives them the opportunity to stand out from the crowd and be recognized.

To enrol please contact enquiries@eit.edu.au
Frequently Asked Questions

Why study with EIT?
EIT has been actively engaged in running engineering programs throughout the world for over twenty years with outstanding feedback and results.

What is the difference between this online program and those from other universities or institutions?
We create a dynamic learning environment which is to be distinguished from some commonly found non-interactive (asynchronous) delivery methods where students are generally left to their own devices, resulting in feelings of isolation, lack of motivation and higher drop-out rates. In this program you would be assured of live, synchronous and frequent interaction with your lecturer and fellow students that will be inspiring and enriching. We use technology effectively to link you with your lecturers in real-time and enable you and your fellow students to communicate closely with them and with one another to acquire fresh thinking, new knowledge and heightened perspectives in this process.

What should I say to my employer to get support for this program?
In today’s fast moving world, our experience leads us to believe that employers are normally actively supportive of further study especially in project management and technically related disciplines which make an active contribution to their effectiveness. You may find that your employer will either partially refund your fees or request successful completion of each module before assisting financially. Employers are also delighted with the fact that their employees do not need to leave work to attend these online learning programs.

If the program is being presented by distance learning does this mean it is second rate?
There is no doubt, that there are an enormous amount of poorly presented online or distance learning programs. However, our research and proven results over the past five years, shows us that live, online learning can be considerably more powerful and effective than traditional face-to-face learning. And in fact, we believe that this is fast becoming obvious with the rapid take-up of online learning at even traditional residential universities. It is vital that the online experience is of the highest possible standard. Something we believe we excel in.

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 broadband connection and hardware are sufficient.

How much time will I need to complete the program?
You should recognise that you do need at least 10 to 15 hours per week over two years. The more time you put into the program the better your results will be.

Do you help with study skills training?
As part of this program, we provide an introductory program on study skills in the online environment. It is vital that you develop strong study skills habits that enable you to complete the program successfully and extract every possible benefit from the MBPM.

How often does the program start?
The program commences once per year.

I don’t have a high level academic qualification. Will I be able to apply?
A high level academic qualification is definitely not an essential prerequisite to entering the program. However it is useful as a reliable benchmark. We will examine your application, especially your industry and managerial experience, in making a decision.

Can I pay in instalments?
Yes, there are a range of payment options available. Contact us for more details.

Do I have to be online at specific times?
There are specific agreed times you have to be online to meet up and attend live presentations from your lecturer and colleagues. We do try and negotiate times to be as easy as possible for everyone in the class (who are generally located in different time zones). Recordings of sessions are also available if you have an urgent project to attend to and can’t make the lecture sessions. We believe a key part of the learning process is to attend the highly interactive lecture sessions and indeed, do your presentations. This is what distinguishes our program from other online programs where we believe there is a serious degradation in quality in the learning experience as a result.

Is there a requirement for residential or on-campus attendance at programs?
There are absolutely no requirements for on campus attendance at any of the programs.

Can you guarantee me a new job and a pay raise when I complete the Vocational Graduate Diploma?
The program commences once per year.

How often does the program start?
You are the only person who understands your unique requirements in terms of the ideal job, remuneration and life/work balance. Providing any sort of guarantees at the commencement of the program would be unrealistic and dishonest on our part. However, what we do know is that there is a serious shortage of qualified project managers especially in the engineering world (including that of Project Management). This is evidenced in the job shortages in this area. Our experience with recent graduates in the Master in Business and Project Management is that promotion and a salary increase is fairly normal.

I have more questions, can I talk to someone about the program?
Yes – you can contact us by email enquiries@eit.edu.au and one of our dedicated Program Advisors will respond to you within 1 business day. Alternatively, you can contact your nearest EIT office by phone. Visit www.eit.edu.au for office locations and contact details.
International Expert Faculty:

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

GUEST SPEAKER - EIT

Windsor Coles  OBE, C Eng, FIEE

Windsor Coles has over 50 years experience in the Electrical Engineering industry with a solid grounding in circuit breakers and switchgear. For over 25 years he acted as HM Senior Electrical Inspector in London and later in Wales, where he was responsible for the electrical and control systems safety matters in the region, and for the national oversight of electrical safety matters within the metals and quarrying sectors. During this time, he led investigations for the Health & Safety Executive, presenting evidence in both Civil and Criminal Courts.

Windsor currently focuses on consultancy, developing and presenting programs on Electrical Safety Standards and undertaking investigations into incidents involving electricity and machinery. He also develops and implements safety management systems for the electrical and process control sectors in both industrial and commercial sectors. Windsor is an enthusiastic and experienced lecturer, with a wealth of knowledge under his belt. He is passionate about transferring this knowledge in training programs and mentoring programmes.

PROGRAM DESIGNER

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

Steve has worked in engineering throughout Australia, Europe, Africa and North America for the past 30 years. 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 the Dean of Engineering at the Engineering Institute of Technology. He has also 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.

LECTURER

Behrouz Ghorbanian  BSc, M Sc, M IEAust

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. He then moved to the power industry and was involved in the design, installation, and commissioning of substations. 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, COMM S, SCADA). 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

John Lawrence  BSc (Hons] MSc BCom [Hons]

In today's hype 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. Over the past decade, 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 for the overall IT infrastructure. John is a dedicated professional who has trained engineers and technicians throughout the world.
LECTURER
Deon Reynders  BSc Eng (Hons)(Elec), MBA

Deon has had over 25 years experience in automation, data communications (with a focus on industrial applications) and Ethernet TCP/IP networks. He has specific experience in Systems Engineering, Project Management and software and hardware development. Currently he is retained as a consultant to industry in the TCP/IP, industrial Ethernet networking, OPC and the industrial data communications areas. Deon is a practical, hands-on person and a highly entertaining speaker. He has received excellent reviews from his thousands of program participants in regions ranging from Europe, North America, Africa and Australia. He takes great pride in demystifying difficult concepts and presents them in a simple-to-understand manner. He is a passionate, enthusiastic and knowledgeable professional engineer.

LECTURER
Geoff Bottrill  HNC, DMS, MIEE, Senior Hazardous Areas Engineer

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 industry.
Learning Outcomes

1. Demonstrate knowledge and basic competency in relation to scope and change management on projects, as per the PMBOK® Guide requirements

2. Demonstrate knowledge and basic competency in relation to scheduling and time management applying appropriate tools and techniques

3. Demonstrate knowledge and basic competency in relation to financial management including cost planning, budgeting and variation/change management

4. Apply knowledge and tools to projects in the work environment including setting up relevant systems and controls

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

Overview

This module deals with the basic principles of management in general and project management in particular. Project refers to an activity that has a specific start and end point and achieves a predetermined goal within the constraints of scope, time and cost. In order to manage a project effectively, the project manager has to understand these constraints and aim to operate within the bounds set by them. It is therefore necessary to understand the various ways of planning, monitoring and controlling the project scope, time and cost for the successful outcome of any project.

PMBOK is a registered mark of the Project Management Institute, Inc.
Module 2: Project Quality, Risk and Procurement Management

Learning Outcomes

1. Demonstrate knowledge and basic competency in relation to project/program quality management
2. Demonstrate knowledge and basic competency in project/program risk management
3. Demonstrate knowledge and basic competency in relation to project/program procurement management
4. Apply tools/techniques to projects/programs in the work environment, including setting up relevant systems and controls to manage quality, risk and procurement functions in each phase in an integrated manner

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

Overview

This module of study focuses on the three core project/program management knowledge and competency areas, namely: project quality management; project risk management; and project procurement management with a view to developing project management competency in these core areas.

THE PROGRAM

1: PROJECT QUALITY MANAGEMENT
- Definitions
- The imperatives of maintaining quality
- Cost of quality and cost of not maintaining quality
- Project/program quality management over project life cycle phases
- Project/program quality management
- Planning for quality
- Quality assurance measures
- Quality control measures

2: PROJECT RISK MANAGEMENT
- Definition of risk in the context of projects
- Positive and negative impacts
- Risk identification and risk analysis; the tools and techniques
- Risk management by appropriate risk control measures
- Qualitative and quantitative methods of risk analysis
- Risk response planning

3: PROJECT PROCUREMENT MANAGEMENT
- Definitions
- Procurement of equipment, materials and services in a project
- Introduction to project/program procurement management
- Planning of procurement
- Selection of contractors/vendors by proper analysis; tools for short listing and selection
- Contract administration including performance monitoring
- Contract closure and dispute resolution

4: INTEGRATED MANAGEMENT OF QUALITY, PROCUREMENT AND RISK
- Understanding the critical relationship between:
  - Quality and contracting
  - Contracting and risk
  - Quality and cost
- Need for an integrated view for effective project management and developing project controls in an integrated manner for successful outcome of a project

Overview

This module of study focuses on the three core project/program management knowledge and competency areas, namely: project quality management; project risk management; and project procurement management with a view to developing project management competency in these core areas.

Learning Outcomes

1. Demonstrate knowledge and basic competency in relation to project/program quality management
2. Demonstrate knowledge and basic competency in project/program risk management
3. Demonstrate knowledge and basic competency in relation to project/program procurement management
4. Apply tools/techniques to projects/programs in the work environment, including setting up relevant systems and controls to manage quality, risk and procurement functions in each phase in an integrated manner

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

Overview

This module of study focuses on the three core project/program management knowledge and competency areas, namely: project quality management; project risk management; and project procurement management with a view to developing project management competency in these core areas.

THE PROGRAM

1: PROJECT QUALITY MANAGEMENT
- Definitions
- The imperatives of maintaining quality
- Cost of quality and cost of not maintaining quality
- Project/program quality management over project life cycle phases
- Project/program quality management
- Planning for quality
- Quality assurance measures
- Quality control measures

2: PROJECT RISK MANAGEMENT
- Definition of risk in the context of projects
- Positive and negative impacts
- Risk identification and risk analysis; the tools and techniques
- Risk management by appropriate risk control measures
- Qualitative and quantitative methods of risk analysis
- Risk response planning

3: PROJECT PROCUREMENT MANAGEMENT
- Definitions
- Procurement of equipment, materials and services in a project
- Introduction to project/program procurement management
- Planning of procurement
- Selection of contractors/vendors by proper analysis; tools for short listing and selection
- Contract administration including performance monitoring
- Contract closure and dispute resolution

4: INTEGRATED MANAGEMENT OF QUALITY, PROCUREMENT AND RISK
- Understanding the critical relationship between:
  - Quality and contracting
  - Contracting and risk
  - Quality and cost
- Need for an integrated view for effective project management and developing project controls in an integrated manner for successful outcome of a project

Overview

This module of study focuses on the three core project/program management knowledge and competency areas, namely: project quality management; project risk management; and project procurement management with a view to developing project management competency in these core areas.

Learning Outcomes

1. Demonstrate knowledge and basic competency in relation to project/program quality management
2. Demonstrate knowledge and basic competency in project/program risk management
3. Demonstrate knowledge and basic competency in relation to project/program procurement management
4. Apply tools/techniques to projects/programs in the work environment, including setting up relevant systems and controls to manage quality, risk and procurement functions in each phase in an integrated manner

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

Overview

This module of study focuses on the three core project/program management knowledge and competency areas, namely: project quality management; project risk management; and project procurement management with a view to developing project management competency in these core areas.
Learning Outcomes
1. Identify the steps involved in identifying the need for, and economically justifying, a project
2. Discuss the different types of reports to be prepared during the life cycle of a project
3. Outline the role and management of project consultants
4. Explain the concept of ‘preliminary engineering’ and its associated activities
5. Examine and discuss the creation and management of project-related drawings
6. Analyze the issues related to procurement specifications, tendering and decision making
7. Explain the concept of ‘detailed engineering design’ and its associated activities
8. Evaluate the procedures for the receipt, inspection and storage of project equipment and materials on-site
9. Examine and discuss safety rules, regulations and procedures relating to power generation and distribution
10. Describe the procedures for project hand-over and closure

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

Overview
This module will focus on the work elements and processes involved in large electrical projects and explain each element in detail. It also covers the statutory safety requirements that electrical installations need to comply with as the project cannot be commissioned/become operational without establishing compliance.

THE PROGRAM
1: PROJECT IDENTIFICATION AND JUSTIFICATION
- Project personnel, responsibilities, and skills
- Defining a project [scope of work, project drivers, outcomes]
- Option analysis for meeting the project objectives
- Cost analysis and optimization between cost and technical requirements
- Project risks identification and risk analysis (pre-mitigation and post-mitigation)
- Impacts on the eco-system and sustainability criteria with a focus on the removal of asbestos, PCB’s, flammable substances, remediating the contaminated soil
- Stakeholder identification
- Critical success factors identification inclusive of site visits, system analysis, short-term and long-term planning, Hazop meetings, scope clarification, risk optimization
- Consultations with the public where required with a focus on controversial and conflicting issues such as noise mitigation, site physical appearance, wiping out vegetation and bush lands, fire hazards, fencing of potentially hazardous areas

2: PROJECT REPORTS
- Types and objectives of project reports
- Roles and responsibilities regarding preparation of reports
- Project time frame and deadline
- Project Gantt chart
- Feasibility studies
- Financial analysis for preferred options
- Sensitivity analysis
- Investment planning and approval with a focus on short-term and long-term plans, prioritization, projects short list, and funds allocation
- Involvement of statutory agencies to ensure compliance with technical rules, legal commitments, quality assurance
- Approvals
- Infrastructure requirements and investments with a focus on load growth, load centers identification, load transfer, asset aging and the associated replacement plans

3: CONSULTANTS AND THEIR ROLE
- Why consultants?
- The responsibilities of a consultant including helping with project scope clarification. System studies, concept design, detailed design, project coordination
- Searching for consultants and short listing with a focus on the company profile, past projects, national and international recognition for successfully implement major projects, customer support, competitive market-based prices for engineering services
- Choose appropriate consultants for the job who can show commitment towards project success, uninterruptible customer support during the life cycle of the project, representing the client for technical and financial negotiations where necessary
- Define consultant’s scope of work with clarification over the number hours/days that the consultant will work from their office or from the customer’s office, the level authority, and the role as the owner’s agent.
- Define the responsibilities of the consultant and the owner with a discussion on meeting on a regular basis to discuss the project hurdles and progress, authorizing the consultant to get access to non-confidential documents related to the project, conflict of interest, avoiding releasing the project documents to a non-related third party
- Monitoring the consultant’s progress of work through daily, weekly, and monthly progress reports, face-to-face meetings, teleconferencing, site visits, updating the database
- Contractual aspects [such as liabilities and indemnification]

4: PRELIMINARY ENGINEERING
- The objectives of preliminary engineering with a focus on load studies, fault studies, site information, technical surveys and investigations such as Geotech studies, earthing studies, access roads to the site, emergency engineering services
- Outcomes of preliminary engineering
- Preliminary engineering topics and contents
- Detailed project report with a description on the required curves, graphs, system modeling, optimization studies, cost analysis, risk analysis
- Analysis of the report vis-à-vis the project objectives
- Fine tuning the report including the executive summary, benchmarking, and updating the master database based on recent system augmentations and reticulations

Continued on next page
THE PROGRAM continued

5: PROJECT DRAWINGS
- Introduction to drawings with a focus on P&ID, Single Line Diagram (SLD), layout, schematic, wiring, terminations, foundations, supporting structures, protection, communications, system automation and control
- Drawing organization
- Drawing workflow
- Types of drawings [electrical, mechanical, civil, control, electronic]
- Drawing review and approval by concerned sections with a focus on squad checks, marking up the details, as-built drawings, commenting on vague areas, highlighting and summarizing the controversial issues
- Drawing issue for the project site group
- Revision control and the need for archiving different versions of documents and drawings in a software-based database
- Work completion and as-built drawings
- Exchange of drawings with different agencies [as long as the confidentiality of documents are not breached]
- Drawing standards with a description on IEC, IEEE, AS/NZ, and ANSI standards

6: PROCUREMENT SPECIFICATIONS, TENDERING AND DECISION MAKING
- Projects procurement procedure and process
- EPC implementation of projects as an alternative strategy
- Pros and cons of EPC and package based route [including engineering design, service delivery, project management]
- Decision-making process on packages such as power stations, power factor compensation solutions, power quality solutions
- Battery limits of packages such as the roles and responsibilities in terms of supplying different plants in a site by cable circuits, switch boxes, and LVDC/LVAC panels
- Tendering process including enterprise rules and norms
- Tenders and finalization of package parameters
- Vendor selection criteria
- Procurement contract finalization with a focus on cost compatibility with the market prices
- Dispute resolution mechanism including force major, third party liabilities
- Payment schedules and planning the funds flow with a focus on splitting the project into different stages/phase for better clarity

7: DETAILED ENGINEERING
- Defining detailed engineering
- The difference between EPC and non-EPC approach in detailed engineering
- Vendor drawing review and approval
- Approaches to data exchange between different vendors, and the deadline for the completion of detailed engineering services
- Common/offsite engineering services
- Drawings issued to site after detailed engineering phase including as-built drawings, construction drawings, and vendors’ technical diagrams
- Revisions during installation and commissioning, and as-built drawings
- Preparation of commissioning and operating instructions with a focus on power transformers, HV circuit breakers, protection systems, and control circuits

8: RECEIPT OF EQUIPMENT/MATERIALS, INSPECTION AND STORAGE
- Importance of material accounting in large projects
- Unpacking and inspection
- Claims for any damages and arranging timely replacement [including warranty period, after-sales services]
- Storage of materials and equipment with reference to standards regarding the minimum requirements
- Weather proofing requirements including protection and insulation against dust, humidity, corrosion, high temperatures
- Security issues such as CCTV cameras, their location, and the associated monitoring system
- Preservation steps for longer storage with reference to cooling and heating systems, ventilation systems, minimum distances to ensure proper air circulation
- Issue of materials and equipment for installation and construction, with reference to access roads, entry to the buildings [such as control room, switchgear building], foundations, cable ducts and trenches, panel arrangement
- Handling machinery requirements for loading and unloading purposes
- Hoists and cranes for placement on foundations and their readiness
- Safety aspects in handling and transportation with reference to potential hazards and the associated safety procedures

9: SAFETY RULES OVERVIEW
- Contents and applications of the standard IEC 60364
- Informative comparison between different applications applied in different countries [statutory regulations]
- Emphasis on safety including key issues important to the public, staff, and equipment
- Design guidelines on sizing and selection of equipment with a special focus sizing of HV power and control cables, sizing of power transformers, and insulation coordination
- Guidelines on installation of HV and LV cable circuits
- Recommended installation practices with sufficient reference to the installation practices for power transformers, power cables, circuit breakers, batteries and battery chargers, and protection and control panels
- Earthing practices with sufficient reference to earth fault currents, equipment fault capacity, earthing methods such earthing mesh, equipotential bonding
- Safe clearances for HV class and MV class equipment
- Inspection and testing of installations [including routine tests and preventative maintenance]
- Statutory inspection requirements and defect liquidation
- Provisions on special installations such as GIS substations, thermal power stations

10: PROJECT HANDING OVER AND CLOSURE
- Project completion
- Clearances from statutory agencies
- Handing over and take over procedures
- Projects involving additions
- Joint inspection, defect listing and defect resolution
- Handing over of documents [including test sheets and as-built drawings]
- Vendor training for operating and maintenance personnel including on-site and off-site trainings, orientation trainings, and license trainings [for allowing the authorized personnel to enter places such as substations and power stations]
- Closure of procurement contracts, installation contracts, and contract of consultants
- Equipment warranties and service contracts for initial period, with an explanation on how to extend the warranty period on special occasions
- Spares and consumables for initial operation
Module 4: Processes, Tools and Templates for Management of Electrical Projects

**Learning Outcomes**
1. Design and/or adopt organizational processes, tools and templates in order to manage electrical engineering projects from a managerial perspective

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

**THE PROGRAM**

1: PROJECT MANAGEMENT PROCESSES
- An overview of PM processes
- Tools to be used for the key processes
- Use of templates in reducing the time taken in formulating projects and improving the quality of management
- Developing typical examples of templates

2: CASE STUDY OUTLINE
- The lecturer will discuss a case study which will be used as an example for developing project management skills.

3: BIDDING FOR PROJECTS
- Prepare a bid for managing projects by estimating the scope of work and requirements of inputs.

4: PROJECT MANAGEMENT STEPS
- Plan for project management by preparing a project charter, preliminary project scope statements and project planning documents.

5: PROJECT MANAGEMENT TOOLS
- Identify the tools proposed to be deployed for key project management processes

6: PROJECT MANAGEMENT TEMPLATES
- Prepare templates for output reports of key project management processes

7: PROJECT CLOSURE REPORT
- Prepare a project closure report in the capacity of a project manager

**Overview**
This module will focus on organizational processes, tools and templates that are needed to manage industrial electrical projects from a managerial perspective. Students will learn the fundamentals of designing processes, tools and templates. The facilitator (typically an enterprise project management consultant) will guide students in terms of design or adoption of processes, tools and templates. There are various tools that will be tailored to the business under consideration that will essentially provide clear processes and procedures for gathering of data, storage and processing of data, generation of reports in accordance with recognized standards or best practice models or new innovations on management of industrial automation projects and given their unique characteristics, risks and requirements.
Module 5: Power Generation

Learning Outcomes

1. Discuss the basic concepts of power generation
2. Compare the details of key power generation processes and equipment
3. Determine the best size for different types of power plants
4. Examine and discuss the methods of generating electricity from renewable sources
5. Compare the different renewable options when planning large scale generation
6. Examine and discuss the adoption of renewable technologies by utilities
7. Examine and discuss the significance of embedded generation by industrial and domestic users
8. Examine and discuss the concepts of co-generation and its applicability in different types of industries
9. Evaluate the salient aspects of the design and construction of alternators used in large power stations
10. Explain the various technical and managerial issues in planning and executing a large power generation project

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

Overview

Power generation plays a key role in building up power systems and their associated infrastructure. In general, the output of the generator terminals are in the order of 11kV, 22kV, 33kV and the like, but before the generated power is delivered to the transmission system to be carried towards load centers, this voltage is increased [using step-up transformers] to as high as 132kV, 220kV, and 330kV to cope with voltage drop. Growth of the economy requires power in adequate quantities and of acceptable quality. Investments in a large power project runs into millions of dollars, the project has a high gestation period, has social and environmental effects, and poses numerous engineering challenges which need to be resolved to get the project on stream.

THE PROGRAM

1: POWER GENERATION BASIC CONCEPTS
- Heat transfer, heat loss, and mechanical loss
- Generation synchronization
- Power factor
- Power Factor Correction (PFC)
- Voltage stability
- Frequency stability
- System reliability (no outage, security of supply)
- Harmonics
- System behavior under steady-state vs. transient conditions

2: THERMAL POWER PLANTS
- Coal-fired thermal power plants including turbine technology and cooling system
- Gas-fired power plants including turbine technology and cooling system
- Liquid-fired power plants including turbine technology and cooling system
- Combustion [gas turbine] power plants [including turbine technology and cooling system]
- Nuclear power plants including turbine technology and cooling system
- Pros and cons

3: THERMAL PLANTS DESIGN AND IMPACTS
- Sizing of plant
- Sizing and number of units
- Combustion processes and effluents
- Environmental impact of large coal-fired power plants
- Environmental impact of liquid and gas fuel based engine power plants
- Environmental impact of gas turbine based power stations
- Environmental short and long term impact of nuclear power plants
- Ecological impact of large hydroelectric plants
- Minimizing emissions and environmental impacts of power

4: RENEWABLE ENERGY TECHNOLOGIES
- Solar power using PV cells
- Solar thermal power [direct and steam cycle based]
- Sizing and location of solar power plants
- Environmental issues of solar power
- Wind power
- Frequency and voltage stability in wind farms
- Sizing and location of wind farms
- Environmental issues of wind power
- Geothermal power
- Small thermal power plants using renewable fuels (biomass)

5: LARGE SCALE RENEWABLE GENERATION BY UTILITIES
- Large scale power generation plants using solar power
- Solar thermal power variants for large capacity plants
- Establishing wind farms by utilities with private funding
- Establishing ROI on wind power investments
- Optimum location of wind farms and establishing viability
- Wind turbines design, construction, and installation

6: EMBEDDED GENERATION
- The need for embedded generation
- Engine based power generation
- Fuel cells
- Wind power applications
- Solar cells for small capacity output
- Off-the-grid usage and need for storage
- Operation requirements for connecting embedded small capacity generation to the grid
- Islanding [constraints and solutions]
- Line overload
- Under Frequency Load Shedding (UFLS)
- Under Voltage Load Shedding (UVLS)

7: COGENERATION AND CAPTIVE GENERATION BY INDUSTRIES
- The need for cogeneration
- Cogeneration cycles [topping/bottoming]
- Common cogeneration solutions
- Typical scenarios of cogeneration and plant sizing
- The difference between cogeneration and captive generation
- Decision on captive generation
- Capacity planning and choice of generation method
- Integration of generation capacity within a plant power system
- Important considerations
- Typical scenarios and solutions
- Need for interconnecting to the national grid
- Interconnection constraints
- Abnormal system conditions and complications
- Isolation and load management

Continued on next page
Module 5: Power Generation Continued

THE PROGRAM continued

8: ALTERNATORS IN LARGE POWER STATIONS
- Design criteria
- Performance limits
- Construction of alternators
- Special features of large capacity alternators (hydrogen and direct water cooling)
- Monitoring of alternators in operation
- Steady-state and transient behaviour
- Machine safety and protection
- Testing of alternators

9: LARGE POWER PROJECTS (THERMAL AND HYDRO ELECTRIC): STEPS IN PLANNING AND EXECUTION
- Site identification
- Environmental clearances
- Stakeholder review and discussions
- Site acquisition and development (vegetations, natural reserves, underground assets)
- Fuel linkage and long term pricing (gas pipes, gasoil tanks)
- Infrastructure requirements and development for material and fuel transportation
- Land usage earmarking
- Effluent disposal planning for long term operation; land requirements for ash disposal and usage
- Minimizing adverse ecological impact of thermal and hydro electric plants
- Case studies
Module 6: Power Transmission and Distribution

Learning Outcomes

1. Design a transmission conductor system
2. Outline the major concepts involved in a distribution system
3. Examine and discuss the application of power transformers in transmission and distribution systems
4. Compare different substation types and busbar configurations
5. Compare different types of distribution arrangements

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

Overview

Power generation, transmission, and distribution equipment are essential components of any power system. The previous module mainly focused on power generation types, techniques, and specifications for power generation. This module, however, discusses the types, functions, and specifications of the equipment required for power transmission and sub-transmission systems, substations, and distribution networks. Transmission systems carry all the power generated from large central power stations towards load centers and large industries via overhead transmission lines which end in terminal stations, transmission substations, or zone substations. From there, sub-transmission lines carry the power to distribution networks in order to further distribute the power to distribution substations at different voltage levels. Distribution networks are comprised of overhead lines, or cables, or a combination of both, depending on the location and amount of power to be handled.

THE PROGRAM

1: POWER TRANSMISSION BASIC CONCEPTS

- Line span
- Line sag
- Cross arm
- Conductor codes and ratings
- Line insulation
- Transmission poles and towers types and applications
- Line thermal capacity
- Line mechanical stress and tension
- Line maximum loadability and power transfer
- Voltage drop constraints and maximum permissible levels
- Short circuit constraints
- Line transposition
- Geometrical Mean Distance [GMD]
- Geometrical Mean Radius [GMR]
- Bundled conductors
- Line routing and easement
- Lightning tests (impulse frequency)
- Overvoltage protection against lightning and switching impulses, plus insulation coordination

2: POWER DISTRIBUTION BASIC CONCEPTS

- Load profile (including base load and peak load)
- Voltage profile, dip, and distortion
- Demand (including peak demand, maximum demand, average demand)
- Demand factor
- Load factor
- Diversity factor
- Average interruption duration [SAIDI]
- Customer average interruption duration index [CAIDI]
- System average interruption frequency index [SAIFI]
- Compatibility between generation and demand
- Line and cable overload and contingency
- Voltage drop and short circuit withstand capability
- Load shedding
- Power quality [SVC, STATCOM, Cap Bank]

3: POWER TRANSFORMERS FOR TRANSMISSION SYSTEMS

- Transformer voltage ratio, rating, vector group, and tap changer settings
- Transformer magnetization curve, knee point, and saturation area
- Transformer behaviour when saturated
- Transformer energization, in-rush currents, and eddy currents
- Design, operation, and construction of large power transformers with a focus on transformer oil circulation, and fire walls
- Definitions for transformer modes of operation; i.e. ONAN, ONAF, and ODAF
- Transformer Losses and efficiency
- Transformer life cycle and its impact on transformer design and cost
- Power transformer transportation and installation
- Transformer foundation types [concrete vs. polymer bunds]
- Power transformer fire safety precautions and noise mitigation techniques
- Environmental issues mainly on cooling liquids and disposal of Polychlorinated Biphenyls (PCBs)
- Checks on large transformers during commissioning to prove health
- Monitoring transformer performance in operation using DGA/Furan analysis
- Advancements and techniques in partial discharge measurement and analysis (including tan δ test)
- Online condition monitoring of transformers
- Use of frequency response analysis in predicting transformer internal problems
- Power transformer power cables and control cables ducting and glazing
- Power transformers running in parallel with a focus on equal load distribution, and fault level increases
- Built-in protection devices [Buchholz relay, pressure relief, winding temperature, and oil temperature]

Continued on next page
THE PROGRAM continued

4: HV SWITCHYARDS, HV CIRCUIT BREAKERS AND GIS INSTALLATIONS
- Common switchyard configurations
- Comparison of alternative configurations
- Layout options
- Clearances to be maintained for work in energized switchyards [AS standards]
- Typical arrangement of a switchyard bay and marshalling arrangements
- Auxiliary AC and DC power supply alternatives
- HV outdoor type circuit breaker [particularly SF6 circuit breakers] with special attention on make and break currents and contacts, arc quenching, and trip and close coils and auxiliary contacts
- Operating mechanism and the comparison of mechanical, pneumatic and hydraulic variants
- Single-phase and three-phase operation with a focus on delivered power and phase balance
- Lightning protection of switchyard; design criteria
- Earthing of switchyards [earthing mesh, earth sticks, equipotential bonding]
- Benefits and applications of Gas Insulated Switchgear [GIS]
- GIS typical layout diagrams
- GIS design and construction complexities and constraints
- Testing of GIS switchgear
- Special problems in GIS installation
- GIS diagnostics
- Fast transients in GIS installations
- Condition monitoring and future trends

5: DISTRIBUTION LINES AND CABLES
- Cable/line conductor rated current and fault capacity (thermal capacity)
- Cable mechanical strength [armoured cables]
- Cable earthing [cable sheath]
- Cable insulation materials [impregnated paper, rubber, PVC, XLPE]
- Cable installation techniques (direct buried in ground, in duct, in air)
- Cable de-rating factors [air temperature, soil temperature, depth of burial, grouping, soil resistivity]
- Reliability indicators for distribution networks
- Overhead vs. underground distribution [pros and cons]
- Design principles for distribution OH lines [cost vs. reliability]
- Role of Aerial Bundled Conductors (ABC) in improving system reliability
- Routing of distribution lines and extensions
- Distribution and reticulation using cables
- Advances in HV XLPE cables for 220/110 kV ring mains for CBD distribution
- XLPE jointing for 220/110 kV installation practices
Module 7:  Power System Protection and Control

Learning Outcomes

1. Explain the concept and attributes of power quality
2. Describe power system protection principles
3. Describe the role of SCADA in modern power systems
4. Describe the basics of protective earthing principles with emphasis on HV substations
5. Assess the role of DC and AC emergency power supplies in electrical systems

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

Overview

Besides the equipment used in power transmission and distribution systems, there are other important components which are essential for keeping the systems operating without interruptions. These include power system protection, earthing systems, DC auxiliaries in substations and supervisory control equipment. This module will discuss power quality requirements and equipment necessary for power quality improvement.

THE PROGRAM

1: POWER QUALITY
- Defining power quality
- Main parameters of power quality and effects of poor quality on connected equipment
- Reliability indices used by utilities to measure performance and designing for reliability
- Voltage interruptions, sag and swell
- Shunt and series compensators, SVC for flicker compensation, STATCOM technology
- Transients and protection requirements
- Harmonics, harmonics filters, and harmonic analysis by DFT/FFT

2: POWER SYSTEM PROTECTION
- Basic roles of protection; mainly focusing on safety of personnel and the public, continuity of supply, maintaining synchronization, and minimizing damage to the plant
- Major concepts of over current and earth fault protection, plus applications
- Balanced current circulating protection method
- Opposed voltage protection method
- Major concepts of differential protection, plus applications
- Feeder protection schemes
- Overcurrent protection vs. differential protection
- Line protection schemes with digital distance/optical pilot protection
- Transformer protection schemes
- Bus bar protection in terminal substations using numerical protection schemes
- Wide area protection through intra substation wide area schemes and their role in preserving power system stability
- Frequency based islanding schemes in a power system and determining settings of frequency and rate of frequency fall for preventing system collapse and improving availability

3: THE ROLE OF SCADA AND COMMS IN THE OPERATION AND CONTROL OF POWER SYSTEMS
- SCADA: definition and major components (master station and RTUs)
- COMMS: definition, different methods [radio, PLC, fiber, pilot wire, copper]
- COMMS protocols [RS232, Modbus, Fieldbus, DNP3, IEC61850], pros and cons
- Area networks [PAN, LAN, WAN] with a focus on Ethernet and TCP/IP definitions
- Intertropping
- Remote signaling
- Role of SCADA in modern power systems
- Basic SCADA configurations
- Basics and benefits of IEC 61850
- HMI design principles and operations through SCADA
- Using SCADA for reporting and optimization approach through trending and summarizing

4: EARTHING OF CRITICAL POWER SYSTEM INSTALLATIONS
- Earthing principles review [prospective fault levels, equipment fault capacity, equipotential bunding, earthing mesh, touch and step voltages]
- Earthing design approach for switchyards
- Multi-layer soil applications in design [soil resistivity, soil mechanical strength]
- Practical considerations in establishing substation earthing system
- Bonding with grids for safety enhancement
- Earth grid in GIS installations

5: EMERGENCY POWER IN ELECTRICAL INSTALLATIONS
- The need for emergency supply in substations
- DC power supply systems through battery backup
- Battery sizing
- Basic factors to be considered while planning high capacity battery installations
- Increasing need for AC emergency power supply in substations and power stations and use of diesel engines for backup power in utility scale generation plants
- Principles and sizing of Uninterrupted Power Supply (UPS) System
Learning Outcomes

1. Examine and discuss feasibility, design and installation issues for fossil-fuelled power stations
2. Examine and discuss feasibility, design and installation issues for wind farms
3. Examine and discuss the installation requirements for overhead power lines
4. Examine and discuss the installation of power cables
5. Demonstrate a clear knowledge of the installation procedure for switchyards and switchgear equipment
6. Evaluate the basic concepts involved in the testing of electrical equipment.
7. Examine and discuss the testing procedures for the major system components in a power system
8. Assess the various pre-commissioning checks and commissioning tests on power system equipment
9. Examine and discuss the concepts of acceptance testing and performance guarantee testing
10. Demonstrate a thorough knowledge of the basic principles of electrical safety practices and standards

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

Overview

Trouble-free and reliable service of electrical equipment requires correct selection of the equipment plus appropriate installation and commissioning as per standards, industry-recommended practices and manufacturers’ guidelines.

THE PROGRAM

1: INSTALLATION OF FOSSIL-FUELED POWER STATIONS
- Feasibility studies (including site dimensions, proximity to the load centre and transmission system, minimum required clearances to the business and residential areas)
- Pollution control measures
- Noise mitigation considerations
- Installation of thermal power station equipment (including boiler, steam turbine, heat exchangers, compressors, condensers, pressure valves, cooling tower, cooling system)
- Installation of gas turbines and the associated equipment
- Installation of generators and their auxiliaries
- Precautions regarding installation of steam turbines
- Precautions regarding installation of gas turbines
- Off-site facilities and electrical installation
- Installation sequence

2: INSTALLATION OF WIND POWER STATIONS
- Feasibility studies (including site dimensions, proximity to the load centre and transmission system, minimum required clearances to the business and residential areas)
- Physical appearance
- Noise mitigation considerations
- Wind turbine speed and pitch control
- Installation of wind power station equipment with a focus on tilting angles towards wind flow, altitude, efficiency adjustments
- Installation sequence

3: INSTALLATION OF OVERHEAD LINES
- Overhead line easement and route finalizing
- Tower types [wood poles, steel poles, concrete poles], selection criteria, and the installation techniques (civil and electrical)
- Special spans such as river crossings and crossing over distribution transmission lines with a focus on interference, mutual coupling, and minimum clearance requirements
- Tower erection, insulator types and their installation, tower height, and cross arms
- Stringing and tensioning
- Conductor joints and fastening with supports
- Accessories for conductors (vibration dampers, aviation warning)
- Vegetation removal and control measures
- Tower earthing and measuring earth resistance
- Double-circuited lines and their installation considerations
- Impact of mechanical stress [wind, ice, snow] on the installation of OH lines

5: INSTALLATION OF SWITCHYARDS AND SWITCHGEAR
- Outdoor switchyard installation [preparation of foundations, supporting structures, access roads, cable trenches and ducts, soil compaction, fencing the site, earthing mesh and rods, installation of primary HV assets with sufficient clearance from live parts, plant insulation degree]
- Indoor switchgear installation [SF6 circuit breaker cubicles, withdrawable cubicles with earthing rods and safety earth latch, modular construction and installation design, switchgear room temperature control and air ventilation]
- Underground structures for foundations and cabling [depth of laying, installation formations, grouping, laying cables into different circuits]
Module 8: Installation, Testing and Commissioning of Electrical Equipment

**THE PROGRAM continued**

- Laying out the earth grid (including earthing mesh, pads, rods, welding points, earthing conductor and cable sizes, earthing system software-aided uniformity curves, step potential, touch potential)
- Structure installation (number of legs, bar reinforcement for mechanical strength against wind and electrical strength against faults, earth connection)
- Mounting of equipment on structures (installation height, clearance from live parts, electrical interference imposed on LV and control equipment, base plate boring and bolting)
- Importance of maintaining proper clearances and use of mobile equipment (standard LV, MV, and HV clearance distances per standards and engineering practices)
- Control, protection, and communication equipment (marshalling panels, relay panels and racks, control panels, SCADA RTU’s, LVAC and LVDC panels, CDMMS panels, batteries and battery chargers, installation/termination/grounding/grouping of control cables)
- Panel installation sequence and considerations (including panel arrangement layouts, ventilation, distance to the walls, fire walls, cable trenches)
- External control interconnections (alarms, annunciators, trip circuit supervision)
- Bonding and measurement of earthing systems (equipotential bonding to cancel the effects of connecting the local earthing system to remote earth)

**6: TESTING OF ELECTRICAL EQUIPMENT**

- Need for testing (with a focus on overheating, thermal capacity, flashover, partial discharge)
- Test classes and their objectives (primary injection, secondary injection, meggert testing, earth leakage current testing of panels)
- Insulation and its importance with a focus on creepage distance, partial discharge (PD), basic insulation level (BIL), insulation material and applications
- Various tests for proving solid, liquid, and gaseous insulation with a focus on key temperature and pressure thresholds such as boiling point, condensation point, freezing point, permeability, dielectric strength, conductivity
- Conductor continuity (ohm check, meggert test)
- Measurement of low resistances as a part of testing

**7: FACTORY TESTS BY MANUFACTURERS AND TYPE TESTS**

- Type tests conducted in third party test labs
- Acceptance of type tests for a given design series
- Need for factory inspection (validation of warranty period, quality assurance, witnessing factory tests by the owner’s representative)
- Type tests on different equipment with a focus on the tests carried out on HV circuit breakers, power transformers, current and voltage transformers, and HV cables
- Routine factory tests on different equipment with a focus on laboratory test conditions such as ambient temperature and air pressure (i.e. height from the sea level)
- Acceptance of equipment on the basis of witnessed tests (as per test sheets)
- Acceptance on the basis of reports (as per test sheets and laboratory results)
- Time and costs in factory tests-contractual aspects (after-sale services, pre-commissioning tests)

**8: PRE-COMMISSIONING CHECKS AND COMMISSIONING TESTS, DEFECT LISTING AND RECTIFICATION**

- Need for pre-commissioning checks
- Checking the major equipment for defects during transportation and storage
- Accuracy checks and installation close-out
- Defect lists (as per terms and conditions for the defects included in the warranty period)
- Commissioning checks for different types of electrical equipment (inclusive of power transformers, HV circuit breakers, current and voltage transformers, protection relays, HV and control cables, SCADA and CDMMS gears)
- Commissioning of individual systems and the entire project (inclusive of interlocking circuits, auxiliary contacts, circuit breaker trip and close circuits, circuit breaker oil and gas pressure levels, control switches and latches as per schematic and telemetry drawings and diagrams)

**9: ACCEPTANCE TESTING AND PERFORMANCE GUARANTEE TESTING**

- Acceptance testing and performance guarantee testing
- Test procedures
- Test location (supplier/site)
- Facilities
- Duration of test (impulse frequency tests, secondary injection tests, thermal capacity tests, soil resistivity)
- Cost of testing
- Conducting tests, observation and agreement of tests in accordance with contracts
- Equipment non-compliance with the guaranteed parameters (as per Australian standards and current engineering practices)

**10: ELECTRICAL SAFETY - BASIC PRINCIPLES**

- Common electrical hazards (open and short circuits, improper wiring, loose terminations)
- Electric shocks and arcing (ohmic resistance of human body, defibrillation, minimum clearance distances at different voltage levels as per Australian standards)
- Arc protection (including optical arc protection used inside panels, surge arresters)
- Special hazards in power generating stations and large substations (step and touch potentials, power transformer overload, equipment noise levels beyond permissible dB limits)
- Construction safety procedures (dial before you dig)
- Design safety factors with a special focus on allowing sufficient margins for power cables rated currents, transformers kVA and MVA ratings, measuring transformers accuracy class
- Project safety features
- Equipment selection criteria to ensure safe operation (cable sizing, transformer tap changer settings, protection relays types and TCC curves as well as fuse ratings and curves)
- Installation safety (hard hats, safety gloves and goggles, glowing vests, safety shoes and boots, lifting and moving heavy objects, open and short circuits, tripping hazards)
- Safety procedures (hazops, safety orientations, safety standards)
- Certification and competency for workers
Learning Outcomes

1. Evaluate safety management principles and intrinsic safety concepts
2. Identify hazards and perform hazard analysis
3. Examine how safety instrumented systems function, determine Safety Integrity Levels [SIL] and safety requirements
4. Select, configure and evaluate Safety Instrumented Systems (SIS); validate, test and maintain SIS installations
5. Initiate SIS project consultations, make SIS project preparations and presentations, perform assessments

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

Overview

Safety systems engineering embraces a range of well established techniques deployed to reduce the risk of hazardous events in industrial plants. The most significant topics are the provision of functional safety systems to reduce the likelihood of a serious hazardous event and the protection methods used to avoid ignition in areas where flammable atmospheres can arise. In this module the student will review the common safety philosophy of hazard identification, risk management and risk based design of protection methods.

THE PROGRAM

1: SAFETY SYSTEMS-PRINCIPLES
• Safety management: fundamental principles
• Principles and classification of flammable atmospheres
• Engineering standard IEC 60079 for hazardous atmosphere practices

2: PROTECTION METHODS
• Protection methods including intrinsically safe equipment
• Maintenance and competency requirements for Ex systems

3: IDENTIFICATION OF HAZARDOUS AREAS
• Hazard identification in automated plants
• Hazard and Operability Study (HAZOP) method and HAZOP leadership
• Worksheet reporting form using Excel

4: HAZARD ANALYSIS
• Hazard analysis methods and LOPA modelling
• Brief study process hazard situation with fault tree analysis
• Layer of protection analysis model development using Excel formatted software

5: SAFETY INSTRUMENTED SYSTEMS (SIS)
• Overview
• Management of functional safety
• Safety life cycle as per IEC 61511
• Safety Integrity level [SIL]
• Safety Integrity Level (SIL) determination
• Development of the safety requirements specification

6: SIS EQUIPMENT
• SIS configuration and equipment selection
• Principles of safety certified PLCs and high integrity application software

7: SIS EVALUATION
• SIS performance evaluation and reliability modeling
• Calculation practical and development of Excel spreadsheet tool

8: SIS VALIDATION
• Validation, testing and maintenance of SIS installations
• SIS project launch meeting

9: PROJECT SIS REQUIREMENTS
• SIS project consultations
• SIS project preparations
• SIS project presentations and assessments