

**Electrical & Mechanical
Services Industry**

Electrical Engineering Branch

**Specification of
Competency Standards**

1st Edition

April 2011

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Chapter 1

Preface

Background of the Industry

Electrical engineering has been playing an important role in Hong Kong industry and commerce since the 1950s. The Hong Kong economy has been changing proactively and electrical engineering has also shifted its emphasis from manufacturing-oriented in early stage to service-oriented later on and developed into a high value-added industry, hoping to keep pace with some of the economic powers (developed countries). While many industries did not survive the economic changes as they could not follow the development, the electrical industry always keeps abreast of the time and has diversified its development as Hong Kong did. Nowadays, electrical engineering has become an indispensable part of different sectors. In the past, it was more a project engineering than a service engineering industry. But now, with its deep and profound scope of service, the electrical engineering branch is as much a service engineering industry as it is a project engineering industry. The industry, therefore, is still important to the future development of Hong Kong. The electrical engineering branch has a history of more than a hundred years in Hong Kong. In the past, during the economic surge of Hong Kong and the bloom of the manufacturing industry, electrical engineering courses were offered by the universities. The industry has laid extremely great emphasis on on-the-job training for long, and many organizations have their own comprehensive, versatile and systematic training mechanism. Nevertheless, if there is integrated and systematic staff competency training for all related organizations, it will certainly give greater benefits to the enhancement of the staff competency and the standard of the Industry.

Current Situation of the Industry

2. Hong Kong has become a financial centre in Asia, with an undeniable international status. However, Hong Kong's success today is definitely built on the long-term silent endeavours of a group of enthusiastic and enterprising professionals in various sectors. The electrical engineering team has created for Hong Kong an efficient, stable and competitive electricity network system. In the era of information explosion in future, a stable electricity system will play an important part in the operation management of the commercial world in Hong Kong, implying that the electrical engineering branch will bear a greater responsibility.

3. The development of the electrical engineering branch has been relatively stable and adaptable to the economic impact. Notwithstanding the economic downturn in the past, qualified persons are always required by government's infrastructures and constructions as well as the private sector to perform periodic maintenance, repairs and inspection on all kinds of electricity systems in compliance with the statutory requirements. Electrical engineering talents, therefore, are always in demand no matter what economic cycle we are in. The industry also enjoyed the prosperity of the economic development. The demand for electrical and mechanical engineering personnel becomes greater as the economy of Hong Kong recovers in recent years. It is expected that relevant projects will create a large number of electrical engineering job opportunities, making the industry an ever growing one.

4. The surge of Mainland's economy has opened up new opportunities for local electrical engineering personnel. As people's living standard rises, business opportunities in Mainland are found everywhere. The good picture of heavy industry, light industry and manufacturing industry, etc. has attracted many manufacturers to invest in the Mainland, thus invisibly consolidating China's status as being the world's factory. It can be seen that the demand for related technical manpower will become stronger in order to cope with the development of the industries. Backed by China and facing the world, the elite of the electrical engineering branch in Hong Kong will be an ideal choice for many Mainland manufacturers that intend to enter the international market.

5. The world trend of environmental protection helps in absorbing new blood of the electrical engineering branch. Awareness in different industries becomes higher for effective use of energy. So improvements in electricity system and R & D for new technologies are necessary, which directly stimulates the manpower demand in this field.

6. Nowadays, although individual universities, training institutes or some large enterprises have provided pre-employment technical or on-the-job training courses related to electrical engineering branch, these courses cannot fully cater for the development of the electrical engineering branch in different domains. As a result, for the frontline practitioners in some domains like technical staff, designers and maintenance technicians, etc., they in general can only learn from their experienced colleagues or masters to deal with common routine work upon employment. Along with the downfall of traditional "apprenticeship" system, quite many practitioners become unable to fully master formal professional knowledge and the application of new technology related to the Industry.

Specification of Competency Standards

7. In view of the industry's current status and future development trend, it is imminent that the Specification of Competency Standards (SCS) be formulated to provide a solid framework for training with unified course contents to enhance the industry's technical capability, competitiveness and quality of service.

8. The SCS consists of competency standards of different levels. Competency standards are benchmarks for the industry-specific knowledge, professional skills and soft skills required for performing different job functions of the industry. The functional areas and competency standards under SCS will be practical and competence-based. The SCS not only sets out the professional knowledge and skills required for today, but also takes into account factors such as the developmental trend of both the industry and the society.

9. In the long run, the industry-recognized SCS will become the blueprint for training. It will not only ensure that training providers can meet the industry's present and future needs by offering training courses covering all the knowledge and skills required by the industry, but also provide employees with a clear set of learning pathways, so that they can draw up their own learning and career roadmaps. As such, the SCS will complement the full-scale implementation of the Qualifications Framework by the Government.

10. The E&M Industry Training Advisory Committee (ITAC), comprising representatives of employers, employees and professional bodies of the industry, has prepared a preliminary version of SCS for the industry with reference to its current status and development trend, as well as the standard and format adopted in the Mainland and overseas, with a view to providing employees with clear guidelines for devising their own learning and career roadmaps.

Chapter 2

Qualifications Framework

Hong Kong Qualifications Framework

11. The E&M Industry Training Advisory Committee (ITAC) was set up to facilitate the implementation of the Hong Kong Qualifications Framework (QF) in the industry. The proposed QF is a voluntary system. It is a seven-level hierarchy that provides benchmarks for determining the level of complexity and difficulty of individual competencies. It is also used to order and support qualifications of different natures and titles. The QF has in place an independent quality assurance (QA) system that would enhance recognition and acceptance of the qualifications in the industry, irrespective of the mode and source of learning.

12. The E&M ITAC is responsible for the development of its industry-specific, task-based Specification of Competency Standards (SCS) for the identified core functional areas. The SCS, in the form of Units of Competencies (UoCs), provides not only quantitative and qualitative specifications on the competencies required for specific tasks, but also the integrated outcome standards required as well as information on the QF level and credit.

13. The SCS may be used to aid vocational curriculum design by vocational education and training providers, or in-service employee development by HR personnel, or best practice recognition and qualifications by awarding bodies within the industry. SCS is the cornerstone to enhance workforce competitiveness and industry sustainability in the long run.

14. The QF aims to provide clear learning pathways for individuals to draw up their own roadmaps to obtain quality assured qualifications. Learners can either pursue a specific learning pathway to upgrade their skills in a particular area of specialization in a gradual and orderly manner (vertical development), or progress through traversing learning pathways to become multi-skilled (horizontal development). Through the full-scale implementation of the QF, we will foster a vocational environment and culture conducive to lifelong learning and continuing education in the industry. With the active participation of employers and employees as well as the wide acceptance of the industry, the QF will also encourage the development of quality training programmes by providers to meet the needs of the community and the industry.

Qualifications Framework levels

15. The QF has seven levels, from level 1 to level 7, where level 1 is the lowest and level 7 the highest. The outcome characteristic of each level is depicted by a set of generic level descriptors (GLD) (Appendix 1). The GLD specifies for each QF level its generic complexity, demand and challenges in the four dimensions below:

- a. Knowledge and intellectual skills;
- b. Process;
- c. Application, autonomy and accountability; and
- d. Communications, IT skills and numeracy.

The UoCs (See Chapter 4) are benchmarked to the QF levels in accordance with the GLD. It is worth noting that competency elements in a UoC may fall in some or all of the GLD dimensions as what it naturally should be. The QF level assignment is essentially a holistic judgement on the unit's integrated outcome requirement.

16. QF levels are discrete. That is, there cannot be assignment of UoC in-between QF levels. Also, UoCs that may not fully match the characteristic requirement of one or more dimensions of a level would be "rounded" to the level below.

Chapter 3

Competency Standards

Major Functional Areas of the Electrical Engineering Branch in the Electrical and Mechanical Services Industry

17. As proposed by the Electrical and Mechanical ITAC, functional areas of the Electrical Engineering Branch should focus on: (i) design, (ii) installation, (iii) inspection, testing and commissioning, (iv) operation, maintenance and repair, (v) project management, (vi) operation management, (vii) safety, health and environmental protection, (viii) quality management, and (ix) marketing and sales. The Specification of Competency Standards (SCS), therefore, may consist of the following major functional areas:

(1) Design

Electricity facility design covers the following: (i) thoroughly analyze and understand client requirements including: all the clauses in tender specifications or quotations, contract terms, drawings, project schedule, etc.; (ii) be familiar with all local legislations relevant to the design of electricity facilities; (iii) know about the techniques and technical requirements for assembling, operation, testing and maintenance of electricity facilities and devices on work site; (iv) investigate and know about the characteristics and constraints of every work place; (v) know about the functions and properties of all kinds of materials in application; (vi) know about and use computer aided design software to enhance the efficiency and quality of design work; (vii) formulate and submit design proposal and design drawings (viii) liaise and communicate with clients and parties concerned to solve design problems, and, through coordination among the parties concerned, come up with a design solution for the electricity facility approved by all and accepted by the client.

(2) Installation

This area covers the following: (i) thoroughly understand the requirements, drawings and project schedules of tender specifications or quotations; (ii) investigate on site and thoroughly understand the actual situation and constraints of the work site; (iii) be familiar with the steps of the installation procedure in detail for each kind of equipment in the project; (iv) know about the techniques and technical requirements for assembling, operation, testing and maintenance of electricity facilities and devices on work site; (v) know about the functions and properties of all kinds of materials in application; (vi) has in-depth understanding on the installation sequence for each kind of equipment in the project; (vii) thoroughly understand and effectively coordinate the status and procedures of allocation of engineering personnel, materials, tools, instruments and other resources of the project; (viii) master the use of tools and electrical materials and the methods of assembling equipment in different situations; and (ix) monitor, record, control and report on the progress of work, so as to make flexible arrangements for the procedures of assembling equipment and to complete the project on time.

(3) Inspection, Testing and Commissioning

This area covers the following: (i) thoroughly know about the inspection and testing requirements of tender specifications or quotations; (ii) know about the methods and criteria of relevant international technical standards for the inspection, testing and commissioning of electrical installations; (iii) know about the operating methods and working principles of inspection and testing tools and instruments; (iv) safely perform inspection and testing on electrical installations and equipment; (v) write testing or commissioning reports and related documents; and (vi) use all means of communications, including fax, e-mail, correspondence, meeting, telephone, etc. to liaise and communicate effectively

(4) Operation, Repair and Maintenance

This area covers the following: (i) know about the requirements, procedures and techniques for after-sales service, contract maintenance and all types of operation, maintenance and repair; (ii) be familiar with different fault finding methods; (iii) know about different operations and failures of different installations and equipment; (iv) be familiar with the repair methods for all kinds of failures; (v) master the safety code of practice for installations, equipment and instruments; and (vi) know about and perform follow-up logistic support services.

(5) Project Management

This area mainly engages in project quotation, planning, material procurement, liaison and communication. It covers the following: (i) thoroughly analyze and understand all the clauses in clients' tender specifications or quotations, contract terms, drawings, project schedule, etc.; (ii) actually master and follow corporate strategy in bidding tender when making project quotations; (iii) have certain degree of knowledge of the financial and engineering insurance arrangements of the company; (iv) understand all the functions and characteristics of the electrical equipment or services to be sold; (v) thoroughly master the techniques of calculating the prices of project items; (vi) understand the information relevant to market prices for different levels, time of delivery and the competitors of the electrical equipment or services to be sold; (vii) be familiar with local legislations relevant to the electrical equipment or services to be sold; (viii) understand the information relevant to market prices for different levels and different sources of supply and to time of delivery, and the trends of interest rate and foreign exchange rate; (ix) formulate material procurement specification documents, contract terms and delivery timetable; (x) know about and perform relevant logistic support services; (xi) be familiar with the relevant manpower supply market situation; (xii) understand the tendering strategy, management, risk and cash flow analysis of the company, and commercial law; (xiii) use all means of communications, including fax, e-mail, correspondence, meeting, telephone, etc. to liaise and communicate effectively; (xiv) master the time, place and way of communication to communicate and liaise effectively, and finish the work satisfactorily; and (xv) make good preparations before liaising with different parties; understand the purpose of communication in order to provide or obtain the information needed and establish a strong liaison network.

(6) Operation Management

This area covers the following: (i) understand all the clauses in tender specifications or quotations, contract terms, drawings, project schedule, etc. from partners of all sides (e.g. client, contractor and supplier) ; (ii) have good knowledge of the content and implementation of every procedure of the project and the inter-relationship among procedures, and make risk and cash flow analysis; (iii) thoroughly understand and master the status and procedures of allocation of engineering personnel, materials, tools, instruments and other resources of the project; (iv) use different project planning tools such as computer software and flow chart to properly analyze and flexibly arrange engineering procedures; (v) know about the inspection of materials and implement logistic management; (vi) monitor, record, control and report on the progress of work, so as to complete the project on time; (vii) improve the situations of work that are not up to standard or not complying with regulations to facilitate quality management; (viii) ensure a smooth operation and balance of revenue and expenditure for the project; (ix) understand relevant commercial laws and litigation matters; (x) prepare and arrange for documents and records for additional project charges; (xi) be familiar with the prices of different levels of electrical equipment or services to be sold, actually master and follow the tendering strategy of the company, and charge clients with additional engineering fees; (xii) understand after-sales service management; (xiii) use all means of communications, including fax, e-mail, correspondence, meeting, telephone, etc. to liaise and communicate effectively; (xiv) master the time, place and way of communication to communicate and liaise effectively, and finish the work satisfactorily; and (xv) make good preparations before liaising with different parties; understand the purpose of communication in order to provide or obtain the information needed and establish a strong liaison network.

(7) Safety, Health and Environmental Protection

This area covers the following: (i) be familiar with local legislations on occupational safety, health and environmental protection relevant to electrical equipment or services to be sold; (ii) apply safety management knowledge to plan, organize and effectively control high-risk procedures before and during the implementation of work, so as to achieve zero accident rate; (iii) make accurate risk assessment on every procedure of project; (iv) formulate, implement and supervise safety plans; (v) understand the functions, strengths, weaknesses and characteristics of all safety measures and protective devices; (vi) investigate and make reviews on industrial accidents, and formulate effective improvement plans; and (vii) assist in, promote and implement courses and training items on occupational safety, health and environmental protection for the company, and encourage and enhance staff's awareness of safety, health and environmental protection.

(8) Quality Management

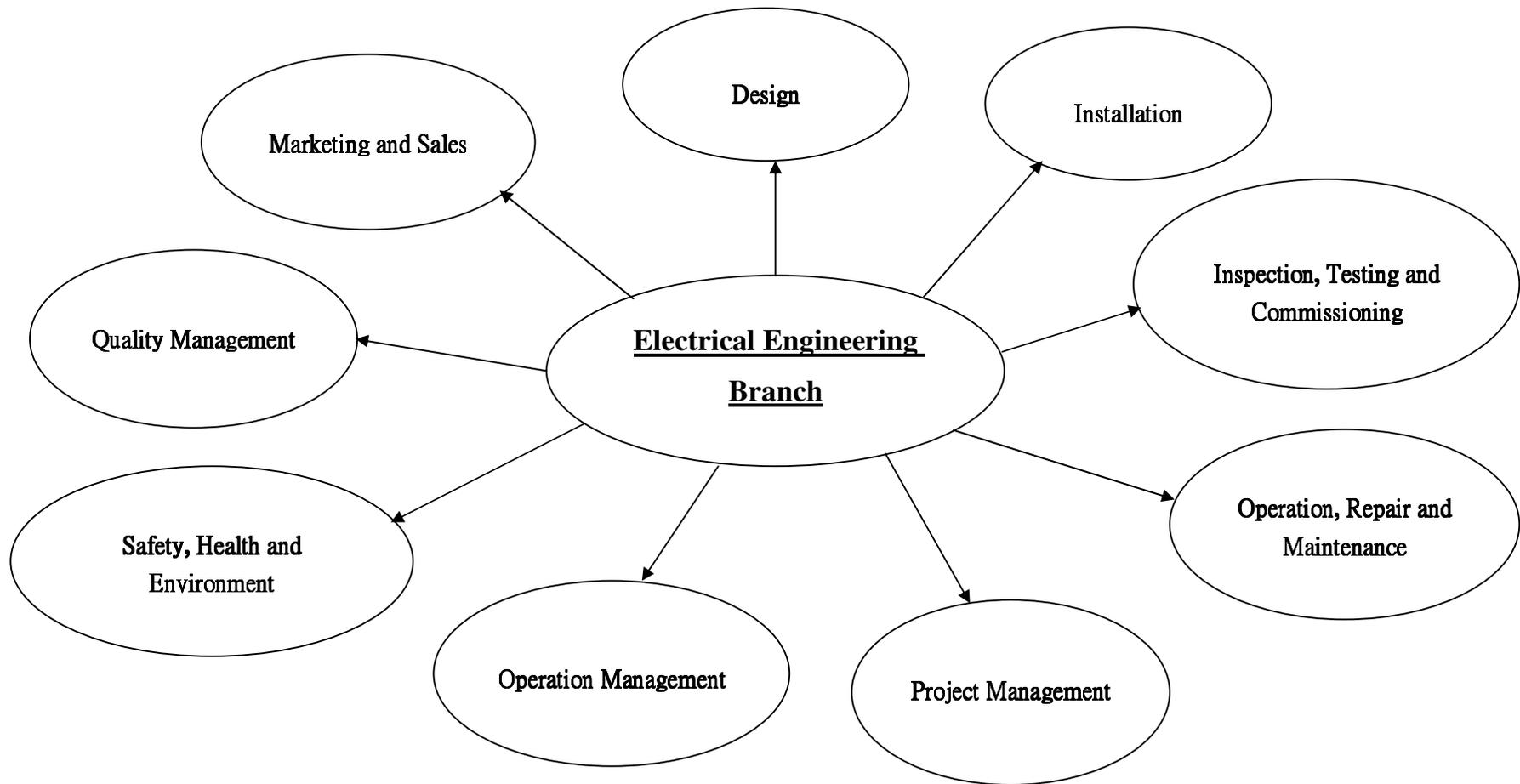
This area covers the following: (i) know about 'Plan-Do-Check-Act' Quality Management Cycle; (ii) have good knowledge of the content and implementation of every procedure of the project; (iii) apply the knowledge of quality management to plan, organize and effectively control work procedures before and during the implementation of work, so as to achieve the effect of low cost and high quality; (iv) set check points for every process of work of the project; (v) formulate, implement and supervise quality management plans (vi) analyze, handle and review client complaints on quality; and (vii) assist in, promote and implement courses and training items on quality management for the company.

(9) Sales and Marketing

This area covers the following: (i) understand the information relevant to the functions, characteristics, strengths, weaknesses, prices, time of delivery and the competitors of the electrical equipment or services to be sold; (ii) be familiar with local legislations, trends and development direction relevant to the electrical equipment or services to be sold; (iii) thoroughly understand corporate marketing strategy, management and analysis; and (iv) actually master the concept and steps of implementing marketing tasks, and have different levels of knowledge in work supervision.

18. Based on the generic level descriptors and the major functional areas, the E&M ITAC has formulated a "List of Competencies" (Chapter 4) for the industry. The list provides details of the training requirements of the industry in regard to the different competency levels and functional areas. It is designed to provide clear and unified guidelines to the public for drawing up individual learning roadmaps. Learners may either pursue a specific learning pathway to upgrade their skills in a particular area of specialization in a gradual and orderly manner (vertical development), or progress along a number of learning pathways to become multi-skilled (horizontal development) in a specialized area.

Functional Map Showing the Major Functional Areas of the Electrical Engineering Branch
in the Electrical and Mechanical Services Industry



Competency Standards

19. Competency standards refer to the skills and knowledge required for a particular job function. They represent the industry benchmarks for the skills, knowledge and attributes required to perform competently in a particular job. Thus they are the most important part of the SCS.

Units of Competencies

20. The E&M ITAC has set out the competency standards for various job functions in the form of units of competencies, which describe the performance and standard required for each competency. Please refer to Chapter 4 for details.

Every “unit of competency” comprises eight basic items:

1. Title
2. Code
3. Range
4. Level
5. Credit
6. Competency
7. Assessment Criteria
8. Remarks

Recognition of Prior Learning

21. A major concept of QF is that individuals may acquire knowledge and skills from their work experience, apart from attending formal training courses. People may, through the Recognition of Prior Learning (RPL) mechanism, obtain relevant qualifications if their experience, skills and knowledge gained in the workplace meet the competency standards set by the ITAC.

22. Since in-house training has long been the major training opportunity for employees of the Electrical industry, it is extremely difficult to determine whether such training has met the competency standards. Therefore, the ITAC will consult members of the industry to develop an appropriate RPL mechanism.

Chapter 4

Units of Competencies of the Electrical Engineering Branch in the Electrical & Mechanical Services Industry

List of Competencies for Practitioners of the Electrical Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
1	Use typical electrical meters (3 Credits) <u>EMCUDE101A</u> (P.43)	Use typical electrical meters (3 Credits) <u>EMCUDE101A</u> (P.43)	Use typical electrical meters (3 Credits) <u>EMCUDE101A</u> (P.43)	Use typical electrical meters (3 Credits) <u>EMCUDE101A</u> (P.43)		Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.75)	Use general personal protective equipment (3 Credits) <u>EMCUSH108A</u> (P.76)	Perform quality assurance (3 Credits) <u>EMCUQM101A</u> (P.82)	
	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.45)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.45)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.45)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.45)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.45)		Perform manual handling operation (3 Credits) <u>EMCUSH109A</u> (P.77)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.45)	
	Understand common terms and units of basic electrical principles and neon gas (3 Credits) <u>EMELDE101A</u> (P.46)	Understand common terms and units of basic electrical principles and neon gas (3 Credits) <u>EMELDE101A</u> (P.46)	Understand the construction and working principles of general household appliance products, and perform inspection, testing and commissioning (3 Credits) <u>EMELIT101A</u> (P.68)	Operate and maintain general household electrical appliances (9 Credits) <u>EMELOR101A</u> (P.72)			Safety operation in confined spaces (3 Credits) <u>EMCUSH110A</u> (P.78)	Understand general quality management courses and training programmes (3 Credits) <u>EMELQM101A</u> (P.83)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
1	Understand basic intallation concept, popular neon materials and details of simple shop drawings of neon installations (6 Credits) <i>EMELDE102A</i> (P.47)	Understand basic intallation concept, popular neon materials and details of simple shop drawings of neon installations (6 Credits) <i>EMELDE102A</i> (P.47)	Understand the basic concepts of inspecting, testing and commissioning general neon installations (3 Credits) <i>EMELIT102A</i> (P.69)	Understand the basic concepts of operating, repairing and maintaining general neon installations (4 Credits) <i>EMELOR103A</i> (P.73)			Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <i>EMCUSH111A</i> (P.79)	Understand the basic methods of dealing with customers' complaints (3 Credits) <i>EMELQM102A</i> (P.84)	
	Understand the basic design concept of general extra-low voltage installations of buildings (6 Credits) <i>EMELDE103A</i> (P.49)	Understand the basic design concept of general extra-low voltage installations of buildings (6 Credits) <i>EMELDE103A</i> (P.49)	Understand the basic design concept of general extra-low voltage installations of buildings (6 Credits) <i>EMELDE103A</i> (P.49)	Understand the basic design concept of general extra-low voltage installations of buildings (6 Credits) <i>EMELDE103A</i> (P.49)			Comply with the legal requirements on environmental protection (3 Credits) <i>EMCUSH112A</i> (P.80)		
	Draw shop drawings of simple installations of power supply system (6 Credits) <i>EMELDE104A</i> (P.50)	Draw shop drawings of simple installations of power supply system (6 Credits) <i>EMELDE104A</i> (P.50)	Draw shop drawings of simple installations of power supply system (6 Credits) <i>EMELDE104A</i> (P.50)	Draw shop drawings of simple installations of power supply system (6 Credits) <i>EMELDE104A</i> (P.50)			Handle general chemicals safely (3 Credits) <i>EMCUSH113A</i> (P.81)		
	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)	Understand simple documents of electrical installation works (3 Credits) <i>EMELDE105A</i> (P.51)

Functional Areas	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
QF Levels	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
1	Understand commonly used electricity regulations, international standards and design documents (3 Credits) EMELDE106A (P.52)	Use general machining equipments (9 Credits) <u>EMCUIN101A</u> (P.56)	Understand commonly used electricity regulations and international standards, and basic techniques of inspection, testing and commissioning (3 Credits) EMELIT103A (P.70)						
	Understand basic methods and techniques of winding and repairing simple transformers (3 Credits) EMELDE107A (P.53)	Use general loading and lifting equipment (9 Credits) <u>EMCUIN102A</u> (P.57)							
	Understand commonly used basic electrical materials, electrical equipment and tools (3 Credits) EMELDE108A (P.54) Master simple numerical and graphical data (3 Credits) EMELDE109A (P.55)	Apply basic bench fitting techniques and use small typical hand tools (9 Credits) <u>EMCUIN106A</u> (P.59) Identify different types of pipe materials and their range of application (3 Credits) <u>EMCUIN109A</u> (P.61)	Apply basic bench fitting techniques and use small typical hand tools (9 Credits) <u>EMCUIN106A</u> (P.59)	Apply basic bench fitting techniques and use small typical hand tools (9 Credits) <u>EMCUIN106A</u> (P.59)					

<u>Functional Areas</u>	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
<u>QF Levels</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
1		Install simple neon installations (4 Credits) EMELIN101A (P.62)							
		Install simple extra-low voltage installations of buildings (3 Credits) EMELIN102A (P.63)							
		Assemble simple electrical equipment, water pumps and generating units (non-live) (6 Credits) EMELIN103A (P.64)							
		Understand commonly used electricity regulations, international standards and basic installation techniques (3 Credits) EMELIN104A (P.65)							
		Wind and repair simple transformers (6 Credits) EMELIN105A (P.66)							

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
2	Select general electrical materials and electrical equipment (6 Credits) <u>EMCUDE204A</u> (P.86)	Select general electrical materials and electrical equipment (6 Credits) <u>EMCUDE204A</u> (P.86)	Select general electrical materials and electrical equipment (6 Credits) <u>EMCUDE204A</u> (P.86)	Select general electrical materials and electrical equipment (6 Credits) <u>EMCUDE204A</u> (P.86)	Make simple plans for general low voltage electrical installation projects (3 Credits) EMELPM201A (P.130)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.131)	Apply basic risk assessment methods (3 Credits) <u>EMCUSH205A</u> (P.135)		Launch basic marketing and sales courses and training programmes (3 Credits) EMELMS202A (P.141)
	Use computer to draw electrical drawings (8 Credits) <u>EMCUDE213A</u> (P.88)	Perform general electrical assembly and fitting (6 Credits) <u>EMCUIN201A</u> (P.96)	Apply commonly used regulations and international standards relevant to electrical installations (6 Credits) <u>EMCUIT203A</u> (P.109)	Service generators and accessories (4 Credits) <u>EMCUMA205A</u> (P.117)		Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.132)	Implement work site occupational health and safety management (3 Credits) <u>EMCUSH206A</u> (P.136)		Describe the merits of electrical appliances (3 Credits) EMELMS204A (P.142)
	Master the basic design concept and the details of the shop drawings of various kinds of extra-low voltage installations of buildings (6 Credits) <u>EMELDE201A</u> (P.89)	Master the basic design concept and the details of the shop drawings of various kinds of extra-low voltage installations of buildings (6 Credits) <u>EMELDE201A</u> (P.89)	Inspect general electrical installation and fitting (3 Credits) EMELIT201A (P.110)	Service control, protection and indicator of generators (4 Credits) <u>EMCUMA206A</u> (P.119)		Perform basic tasks of operation for low voltage electrical installation projects (6 Credits) EMELOM201A (P.133)	Handle general industrial accidents (3 Credits) <u>EMCUSH208A</u> (P.137)		Conduct market research to assist in marketing and sales (3 Credits) EMELMS205A (P.143)

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
2	Implement simple site investigations for the purpose of designing electrical installations (3 Credits) EMELDE205A (P.90)	Assemble power unit according to installation drawing (4 Credits) EMCUIN205A (P.97)	Inspect busbars and switchboard enclosures (3 Credits) EMELIT203A (P.111)	Master the construction, working principles, operation, repair and maintenance of various kinds of electrical products (6 Credits) EMELOR202A (P.121)		Implement basic operational arrangements of low voltage electrical installations (3 Credits) EMELOM203A (P.134)	Obtain data and information of occupational safety and health and environmental protection to compile relevant statistics (3 Credits) EMCUSH211A (P.138)		
		Perform routine wiring tasks (9 Credits) EMCUIN208A (P.98)	Inspect, test and commission simple extra-low voltage installations of buildings (3 Credits) EMELIT204A (P.112)				Implement preventive measures on general occupational safety and health (3 Credits) EMCUSH212A (P.139)		
		Replace mechanical parts and devices of electric motors (3 Credits) EMCUIN221A (P.100)					Gas test in confined spaces (3 Credits) EMCUSH213A (P.140)		
	Assess the performance of simple AC/DC circuits (9 Credits) EMELDE206A (P.91)	Assess the performance of simple AC/DC circuits (9 Credits) EMELDE206A (P.91)	Assess the performance of simple AC/DC circuits (9 Credits) EMELDE206A (P.91)	Assess the performance of simple AC/DC circuits (9 Credits) EMELDE206A (P.91)					

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
2	Select appropriate AC/DC motors for electrical and mechanical installations (6 Credits) EMELDE207A (P.92)	Select appropriate AC/DC motors for electrical and mechanical installations (6 Credits) EMELDE207A (P.92)	Carry out site investigations for the purpose of inspecting, testing and commissioning of electrical installations (3 Credits) EMELIT209A (P.113)	Perform the operation, repair and maintenance for simple extra-low voltage installations of buildings (4 Credits) EMELOR204A (P.122)	Carry out site investigations for the purpose of inspecting, testing and commissioning of electrical installations (3 Credits) EMELIT209A (P.113)				
	Draw schematic single-line diagrams for simple low voltage power supply systems (3 Credits) EMELDE208A (P.93)	Draw schematic single-line diagrams for simple low voltage power supply systems (3 Credits) EMELDE208A (P.93)	Detect underground power cables (6 Credits) EMELIT210A (P.114)	Perform the operation, repair and maintenance for neon installations (3 Credits) EMELOR205A (P.123)					
	Master the basic design concept of neon installations (3 Credits) EMELDE211A (P.94)	Repair and rewind single-phase motors (6 Credits) EMELIN201A (P.101)	Use basic tools and instruments to inspect, test and commission neon installations (6 Credits) EMELIT211A (P.116)	Perform the operation, repair and maintenance for simple low voltage power systems and associated installations (6 Credits) EMELOR207A (P.124)					
	Select distribution transformers for power supply to buildings or work sites (3 Credits) EMELDE212A (P.95)	Fabricate busbars and switchboard enclosures (6 Credits) EMELIN202A (P.103)		Find out general faults in various types of low voltage electrical installations (4 Credits) EMELOR209A (P.126)					

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
2		Implement simple site investigations for the purpose of installing electrical installations (3 Credits) EMELIN209A (P.105)		Repair control and starter circuits of general low voltage motors (6 Credits) EMELOR210A (P.127)		Implement simple site investigations for the purpose of installing electrical installations (3 Credits) EMELIN209A (P.105)			
		Install neon installations and various kinds of basic wiring systems (6 Credits) EMELIN205A (P.104)		Repair and maintain electrical products (9 Credits) EMELOR211A (P.128)					
		Install simple extra-low voltage installations of buildings (6 Credits) EMELIN211A (P.106)							
		Install simple neon installations (4 Credits) EMELIN212A (P.107)							
		Install control and starter circuits for general low voltage motors (6 Credits) EMELIN213A (P.108)							

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
3	Use programmable logic controller (PLC) to write circuit control programme (6 Credits) <u>EMCUDE306A</u> (P.145)	Use programmable logic controller (PLC) to write circuit control programme (6 Credits) <u>EMCUDE306A</u> (P.145)	Use programmable logic controller (PLC) to write circuit control programme (6 Credits) <u>EMCUDE306A</u> (P.145)	Use programmable logic controller (PLC) to write circuit control programme (6 Credits) <u>EMCUDE306A</u> (P.145)	Use programmable logic controller (PLC) to write circuit control programme (6 Credits) <u>EMCUDE306A</u> (P.145)	Procure simple electrical and mechanical engineering equipment and materials (3 Credits) <u>EMCUOM301A</u> (P.215)	Investigate general industrial accidents (3 Credits) <u>EMCUSH305A</u> (P.219)	Handle and review customers' complaints about electrical and mechanical product or service quality (3 Credits) <u>EMCUQM302A</u> (P.222)	Apply sales and marketing techniques (3 Credits) <u>EMCUMS301A</u> (P.226)
	Apply diodes and transistors in electronic control circuits (8 Credits) <u>EMCUDE311A</u> (P.146)		Apply diodes and transistors in electronic control circuits (8 Credits) <u>EMCUDE311A</u> (P.146)	Apply diodes and transistors in electronic control circuits (8 Credits) <u>EMCUDE311A</u> (P.146)	Implement project management plan for low voltage electrical installations (6 Credits) <u>EMELPM302A</u> (P.213)	Implement project management plan for low voltage electrical installations (6 Credits) <u>EMELPM302A</u> (P.213)	Perform occupational safety and health supervision (3 Credits) <u>EMCUSH308A</u> (P.221)	Implement quality control and quality assurance (4 Credits) <u>EMCUQM303A</u> (P.223)	Master the market trend of general electrical products and relevant marketing development skills (3 Credits) <u>EMELMS301A</u> (P.227)
	Use computer to draw for complicated electrical engineering drawings (5 Credits) <u>EMCUDE316A</u> (P.148)	Use computer to draw for complicated electrical engineering drawings (5 Credits) <u>EMCUDE316A</u> (P.148)	Inspect, test and commission high voltage power distribution or generation facilities and devices (6 Credits) <u>EMELIT303A</u> (P.189)	Repair electrical devices for electric traction control system (6 Credits) <u>EMCUMA302A</u> (P.195)	Perform basic project management for low voltage electrical installation projects at work site (6 Credits) <u>EMELPM303A</u> (P.214)	Perform basic project management for low voltage electrical installation projects at work site (6 Credits) <u>EMELPM303A</u> (P.214)		Formulate simple quality assurance plan and quality assurance reports (6 Credits) <u>EMCUQM304A</u> (P.224)	Master electrical product design to promote electrical product sales (3 Credits) <u>EMELMS303A</u> (P.228)
	Use computer to draw combined services drawings of building services (5 Credits) <u>EMCUDE317A</u> (P.149)	Use computer to draw combined services drawings of building services (5 Credits) <u>EMCUDE317A</u> (P.149)	Detect underground facilities (9 Credits) <u>EMELIT304A</u> (P.191)	Repair electronic control equipment for traction control system and main current transformer (9 Credits) <u>EMCUMA303A</u> (P.197)		Implement operation management plans for low voltage electrical installation projects (6 Credits) <u>EMELOM302A</u> (P.216)		Record quality issues on electrical and mechanical services (3 Credits) <u>EMCUQM306A</u> (P.225)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency				
3	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.150)	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.150)	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.150)	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.150)		Implement general acceptance of materials, logistic management and after-sales service (6 Credits) EMELOM303A (P.218)			
	Apply basic AC and DC circuit theories to assess general design performance of electrical machines (6 Credits) <u>EMELDE301A</u> (P.151)	Apply basic AC and DC circuit theories to assess general design performance of electrical machines (6 Credits) <u>EMELDE301A</u> (P.151)	Apply basic AC and DC circuit theories to assess general design performance of electrical machines (6 Credits) <u>EMELDE301A</u> (P.151)	Apply basic AC and DC circuit theories to assess general design performance of electrical machines (6 Credits) <u>EMELDE301A</u> (P.151)	Apply basic AC and DC circuit theories to assess general design performance of electrical machines (6 Credits) <u>EMELDE301A</u> (P.151)			Apply basic AC and DC circuit theories to assess general design performance of electrical machines (6 Credits) <u>EMELDE301A</u> (P.151)	
	Apply basic AC and DC circuit theories to design simple extra-low voltage installations (6 Credits) <u>EMELDE302A</u> (P.152)	Apply basic AC and DC circuit theories to design simple extra-low voltage installations (6 Credits) <u>EMELDE302A</u> (P.152)	Apply basic AC and DC circuit theories to design simple extra-low voltage installations (6 Credits) <u>EMELDE302A</u> (P.152)	Apply basic AC and DC circuit theories to design simple extra-low voltage installations (6 Credits) <u>EMELDE302A</u> (P.152)	Apply basic AC and DC circuit theories to design simple extra-low voltage installations (6 Credits) <u>EMELDE302A</u> (P.152)				
	Draw schematic diagrams of various kinds of extra-low voltage installations of buildings (3 Credits) <u>EMELDE303A</u> (P.153)	Repair and rewind three-phase motors (9 Credits) <u>EMCUIN304A</u> (P.172)	Inspect, test and commission low voltage power systems fed by a single transformer (6 Credits) <u>EMELIT305A</u> (P.193)	Repair and rewind three-phase motors (9 Credits) <u>EMCUIN304A</u> (P.172)					

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
3	Master the design of various kinds of extra-low voltage installations of buildings (6 Credits) <i>EMELDE304A</i> (P.154)	Master the design of various kinds of extra-low voltage installations of buildings (6 Credits) <i>EMELDE304A</i> (P.154)	Master the design of various kinds of extra-low voltage installations of buildings (6 Credits) <i>EMELDE304A</i> (P.154)	Master the design of various kinds of extra-low voltage installations of buildings (6 Credits) <i>EMELDE304A</i> (P.154)	Master the design of various kinds of extra-low voltage installations of buildings (6 Credits) <i>EMELDE304A</i> (P.154)			Master the design of various kinds of extra-low voltage installations of buildings (6 Credits) <i>EMELDE304A</i> (P.154)	
	Draw schematic diagrams of power supply from power system to neon installations (6 Credits) <i>EMELDE306A</i> (P.155)	Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring (4 Credits) <i>EMCUIN306A</i> (P.173)	Inspect, test and commission low voltage power systems (6 Credits) <i>EMELIT306A</i> (P.194)	Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring (4 Credits) <i>EMCUIN306A</i> (P.173)					
	Master the installation and technical requirements for extra-low voltage installations of buildings (4 Credits) <i>EMELDE309A</i> (P.156)	Master the installation and technical requirements for extra-low voltage installations of buildings (4 Credits) <i>EMELDE309A</i> (P.156)	Master the installation and technical requirements for extra-low voltage installations of buildings (4 Credits) <i>EMELDE309A</i> (P.156)	Repair overhead line equipment (feeder, insulation, suspension and earthed systems) (6 Credits) <i>EMCUMA305A</i> (P.199)	Master the installation and technical requirements for extra-low voltage installations of buildings (4 Credits) <i>EMELDE309A</i> (P.156)				
	Master the design concept of high voltage distribution or generation installations (6 Credits) <i>EMELDE310A</i> (P.157)	Master the design concept of high voltage distribution or generation installations (6 Credits) <i>EMELDE310A</i> (P.157)	Master the design concept of high voltage distribution or generation installations (6 Credits) <i>EMELDE310A</i> (P.157)	Master the design concept of high voltage distribution or generation installations (6 Credits) <i>EMELDE310A</i> (P.157)	Master the design concept of high voltage distribution or generation installations (6 Credits) <i>EMELDE310A</i> (P.157)			Master the design concept of high voltage distribution or generation installations (6 Credits) <i>EMELDE310A</i> (P.157)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
3	Draw schematic single-line diagrams for the power supply of simple high voltage distribution or generation systems (4 Credits) EMELDE311A (P.158)	Use measuring tools and instruments to install, connect or measure overhead line installations (5 Credits) EMCUIN309A (P.175)		Use measuring tools and instruments to install, connect or measure overhead line installations (5 Credits) EMCUIN309A (P.175)					
	Conform to regulations and international standards for designing high voltage distribution or generation installations (6 Credits) EMELDE312A (P.159)	Install overhead line isolator control circuit (6 Credits) EMCUIN310A (P.176)		Install overhead line isolator control circuit (6 Credits) EMCUIN310A (P.176)					
	Master data and information to conduct analyses on electrical engineering projects (6 Credits) EMELDE313A (P.160)	Perform general lifting machinery and lifting equipment inspection (3 Credits) EMCUIN313A (P.177)		Perform general lifting machinery and lifting equipment inspection (3 Credits) EMCUIN313A (P.177)					
	Assess the performance of DC and single-phase AC circuits (9 Credits) EMELDE314A (P.162)	Operate and maintain abrasive wheels safely (3 Credits) EMCUIN315A (P.178)		Operate and maintain abrasive wheels safely (3 Credits) EMCUIN315A (P.178)					

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
3	Assess the performance of three-phase AC circuits (6 Credits) EMELDE315A (P.163)	Implement assembly, fitting and dismantling of large-scale transformers, electric motors and switchboards (6 Credits) <u>EMELIN301A</u> (P.179)		Implement assembly, fitting and dismantling of large-scale transformers, electric motors and switchboards (6 Credits) <u>EMELIN301A</u> (P.179)					
	Assess the performance of AC/DC motors (6 Credits) EMELDE316A (P.164)	Carry out basic installation of extra-low voltage installations (6 Credits) <u>EMELIN302A</u> (P.180)		Carry out basic installation of extra-low voltage installations (6 Credits) <u>EMELIN302A</u> (P.180)					
	Assess the performance of transformers (6 Credits) EMELDE317A (P.165)	Draw shop drawings of extra-low voltage installations of buildings (6 Credits) <u>EMELIN303A</u> (P.181)	Draw shop drawings of extra-low voltage installations of buildings (6 Credits) <u>EMELIN303A</u> (P.181)	Service overhead power system equipment (isolator, power supply system switchboard and control circuit) (6 Credits) <u>EMCUMA306A</u> (P.200)					
	Assess the performance of power electronic control circuits (6 Credits) EMELDE318A (P.166)	Install high voltage power distribution or generation facilities (6 Credits) <u>EMELIN304A</u> (P.182)		Apply fault finding techniques to find the root causes of fault (3 Credits) <u>EMCUOR301A</u> (P.201)					

<u>Functional Areas</u>	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
<u>QF Levels</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
3	Design neon installation systems (6 Credits) EMELDE319A (P.167)	Draw shop drawings of high voltage power distribution or generation facilities (6 Credits) EMELIN305A (P.183)	Draw shop drawings of high voltage power distribution or generation facilities (6 Credits) EMELIN305A (P.183)	Repair overhead line and related equipment (6 Credits) EMCUOR302A (P.202)					
	Design specific motor control and starter circuits (9 Credits) EMELDE320A (P.168)	Draw shop drawings for assembling electrical machine unit (4 Credits) EMELIN306A (P.184)	Draw shop drawings for assembling electrical machine unit (4 Credits) EMELIN306A (P.184)	Repair faults in current transformers and control equipment (6 Credits) EMCUOR304A (P.203)					
	Design basic low voltage power supply systems (6 Credits) EMELDE321A (P.169)	Install motor control and starter circuits of particular design (9 Credits) EMELIN308A (P.185)		Repair faults in generator and its accessories (9 Credits) EMCUOR307A (P.205)					
	Analyze electrical engineering data and information (3 Credits) EMELDE322A (P.170)	Install low voltage power systems fed by a single transformer (6 Credits) EMELIN309A (P.187)		Repair faults in control and protection device of diesel engines and generators (9 Credits) EMCUOR309A (P.206)					

Functional Areas	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
QF Levels	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
3		Carry out installation of low voltage power systems and associated facilities according to the details of shop drawings (3 Credits) EMELIN310A (P.188)		Apply various fault finding methods for high voltage distribution or generation facilities and devices (6 Credits) EMELOR302A (P.208)					
				Operate, repair and maintain high voltage power distribution or generation facilities and devices (6 Credits) EMELOR305A (P.209)					
				Repair control and starter circuits of electrical machine systems (9 Credits) EMELOR306A (P.211)					
				Repair low voltage power systems fed by a single transformer (6 Credits) EMELOR307A (P.212)					

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
4	Formulate effective storage and updating system for drawings (3 Credits) <u>EMCUDE405A</u> (P.230)	Master the details of drawings and lead the team to perform the assembly and bench fitting of major electrical and mechanical facilities (6 Credits) <u>EMELIN402A</u> (P.245)	Inspect, test and commission overhead line equipment and related suspension and earthed installations (6 Credits) <u>EMCUIT401A</u> (P.253)	Supervise equipment maintenance work to ensure its quality, standard and efficiency (9 Credits) <u>EMCUMA401A</u> (P.261)	Plan the finance, accounts and insurance of engineering projects (6 Credits) <u>EMCUPM401A</u> (P.273)	Plan the finance, accounts and insurance of engineering projects (6 Credits) <u>EMCUPM401A</u> (P.273)	Apply advanced technologies to occupational safety, health and environmental protection of electrical installations (3 Credits) <u>EMELSH401A</u> (P.281)	Implement quality management in electrical and mechanical engineering services (6 Credits) <u>EMCUQM402A</u> (P.282)	Launch the products according to the marketing direction preset by the company (3 Credits) <u>EMELMS401A</u> (P.287)
	Apply the electrical principles to assess power network design performance (6 Credits) <u>EMELDE401A</u> (P.231)	Apply the electrical principles to assess power network design performance (6 Credits) <u>EMELDE401A</u> (P.231)	Apply the electrical principles to assess power network design performance (6 Credits) <u>EMELDE401A</u> (P.231)	Apply the electrical principles to assess power network design performance (6 Credits) <u>EMELDE401A</u> (P.231)	Implement logistics support service for various kinds of electrical installations (3 Credits) <u>EMELPM402A</u> (P.274)	Implement logistics support service for various kinds of electrical installations (3 Credits) <u>EMELPM402A</u> (P.274)		Promote quality management culture at working level (3 Credits) <u>EMCUQM403A</u> (P.283)	Implement marketing and sales promotion for low voltage electrical installations (4 Credits) <u>EMELMS402A</u> (P.288)
	Design extra-low voltage installations (6 Credits) <u>EMELDE403A</u> (P.232)	Design extra-low voltage installations (6 Credits) <u>EMELDE403A</u> (P.232)	Design extra-low voltage installations (6 Credits) <u>EMELDE403A</u> (P.232)	Design extra-low voltage installations (6 Credits) <u>EMELDE403A</u> (P.232)	Use advanced technologies in the implementation of electrical installation project management (3 Credits) <u>EMELPM406A</u> (P.275)	Implement advanced technologies for the operation management of electrical installations (3 Credits) <u>EMELOM404A</u> (P.278)		Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.284)	
	Formulate schematic diagrams of extra-low voltage installations of buildings (6 Credits) <u>EMELDE404A</u> (P.233)	Master technical requirements and to install extra-low voltage installations (6 Credits) <u>EMELIN403A</u> (P.247)	Inspect, test and commission extra-low voltage installations (4 Credits) <u>EMELIT402A</u> (P.254)	Inspect, test and commission extra-low voltage installations (4 Credits) <u>EMELIT402A</u> (P.254)	Implement project management for high voltage transmission installation projects (6 Credits) <u>EMELPM408A</u> (P.276)	Implement engineering operation, supervisory management and human resources management (6 Credits) <u>EMELOM405A</u> (P.279)		Apply specialized electrical principles for quality management (6 Credits) <u>EMELQM401A</u> (P.285)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
4	Master the techniques of assembling, operating, testing and repairing power supply facilities (3 Credits) EMELDE406A (P.234)	Master the techniques of assembling, operating, testing and repairing power supply facilities (3 Credits) EMELDE406A (P.234)	Master the techniques of assembling, operating, testing and repairing power supply facilities (3 Credits) EMELDE406A (P.234)	Master the techniques of assembling, operating, testing and repairing power supply facilities (3 Credits) EMELDE406A (P.234)		Perform operation management for high voltage transmission engineering projects (3 Credits) EMELOM406A (P.280)		Implement advanced technologies for the quality management of electrical installations (6 Credits) EMELQM402A (P.286)	
	Formulate high voltage transmission schematic diagrams and protection control circuits (6 Credits) EMELDE407A (P.235)	Monitor work progress for high voltage transmission installations (6 Credits) EMELIN405A (P.248)	Draw schematic diagram of high voltage transmissions and improve protection control circuits (6 Credits) EMELIT404A (P.255)	Operate, repair and maintain extra-low voltage installations (3 Credits) EMELOR402A (P.263)					
	Conform to relevant regulations and international standards for implementing power supply network projects (6 Credits) EMELDE408A (P.236)	Apply advanced technologies to the installation of electrical supply facilities (3 Credits) EMELIN407A (P.249)	Implement advanced technologies on the inspection, testing and commissioning of electrical installations (3 Credits) EMELIT407A (P.256)	Find faults in high voltage transmission equipment (6 Credits) EMELOR404A (P.264)					
	Use computer application software to enhance engineering efficiency and quality (3 Credits) EMELDE409A (P.238)	Install high voltage transmission network facilities (6 Credits) EMELIN409A (P.250)	Inspect, test and commission high voltage transmission installations (9 Credits) EMELIT409A (P.257)	Provide logistic services of operation, maintenance and repair (6 Credits) EMELOR406A (P.265)					

<u>Functional Areas</u>	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
<u>QF Levels</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
4	Formulate engineering design solutions (3 Credits) EMELDE410A (P.239)	Install low voltage distribution network systems (6 Credits) EMELIN410A (P.252)	Inspect, test and commission low voltage distribution network system installations (9 Credits) EMELIT410A (P.259)	Supervise the repair of high voltage transmission equipment (6 Credits) EMELOR407A (P.266)					
	Assess the performance of three-phase transformers (6 Credits) EMELDE411A (P.240)			Use advanced technologies in the operation, maintenance and repair of electrical installations (3 Credits) EMELOR408A (P.267)					
	Assess AC-DC traction control system performance (6 Credits) EMELDE412A (P.241)			Operate, repair and maintain high voltage transmission installations (6 Credits) EMELOR410A (P.268)					
	Master the details of the electrical engineering project and communicate with the client (3 Credits) EMELDE414A (P.242)			Repair low voltage distribution network system installations (6 Credits) EMELOR411A (P.270)					

Functional Areas	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
QF Levels	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
4	Design low voltage power systems fed by a single transformer (9 Credits) EMELDE416A (P.243)			find and evaluate faults in distribution transformers (6 Credits) EMELOR412A (P.272)					

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)	
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	
5	Analyze and assess performance of electrical system and equipment (9 Credits) <u>EMCUDE501A</u> (P.290)	Analyze and assess performance of electrical system and equipment (9 Credits) <u>EMCUDE501A</u> (P.290)	Analyze and assess performance of electrical system and equipment (9 Credits) <u>EMCUDE501A</u> (P.290)	Analyze and assess performance of electrical system and equipment (9 Credits) <u>EMCUDE501A</u> (P.290)	Analyze and assess performance of electrical system and equipment (9 Credits) <u>EMCUDE501A</u> (P.290)	Analyze and assess performance of electrical system and equipment (9 Credits) <u>EMCUDE501A</u> (P.290)	Implement risk management for electrical and mechanical services (9 Credits) <u>EMCUSH502A</u> (P.351)	Analyze and assess performance of electrical system and equipment (9 Credits) <u>EMCUDE501A</u> (P.290)	Master market situation of power generation, transmission and distribution network and formulate marketing plans (6 Credits) EMELMS501A (P.365)	
	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Formulate occupational safety and health management system (3 Credits) <u>EMCUSH504A</u> (P.353)	Use programmable logic controller (PLC) to upgrade control equipment (9 Credits) <u>EMCUDE502A</u> (P.292)	Implement marketing and sales courses and training programmes (3 Credits) EMELMS502A (P.367)
	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Formulate occupational safety and health and environmental protection schemes (6 Credits) <u>EMCUSH505A</u> (P.354)	Design safe and efficient control, interlocking and protection systems for power supply system (6 Credits) <u>EMCUDE503A</u> (P.294)	Formulate human resources strategy to enhance the quality of marketing staff (9 Credits) EMELMS503A (P.368)
	Analyze quality of electricity data and design suitable device to improve electricity quality (6 Credits) <u>EMCUDE504A</u> (P.295)	Formulate installation instructions for overhead line system (6 Credits) <u>EMCUIN501A</u> (P.314)	Formulate instructions on overhead line system inspection, testing and commissioning (6 Credits) <u>EMCUIT501A</u> (P.320)		Analyze quality of electricity data and design suitable device to improve electricity quality (6 Credits) <u>EMCUDE504A</u> (P.295)	Analyze quality of electricity data and design suitable device to improve electricity quality (6 Credits) <u>EMCUDE504A</u> (P.295)	Perform risk assessment for electrical and mechanical work (3 Credits) <u>EMCUSH506A</u> (P.356)	Analyze quality of electricity data and design suitable device to improve electricity quality (6 Credits) <u>EMCUDE504A</u> (P.295)	Use advanced and specialized techniques to support the marketing and sales management of integrated electrical works (6 Credits) EMELMS504A (P.369)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
5	Apply SCADA system to remote control design (6 Credits) <u>EMCUDE505A</u> (P.296)		Apply SCADA system to remote control design (6 Credits) <u>EMCUDE505A</u> (P.296)	Apply SCADA system to remote control design (6 Credits) <u>EMCUDE505A</u> (P.296)	Apply SCADA system to remote control design (6 Credits) <u>EMCUDE505A</u> (P.296)	Apply SCADA system to remote control design (6 Credits) <u>EMCUDE505A</u> (P.296)	Formulate environmental protection management system (3 Credits) <u>EMCUSH507A</u> (P.357)	Apply SCADA system to remote control design (6 Credits) <u>EMCUDE505A</u> (P.296)	
	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.297)
	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.298)
	Implement the design of high voltage generation or transmission and distribution network (6 Credits) <u>EMELDE502A</u> (P.299)	Master the performance requirements for power generation or transmission and distribution network to perform installation work (9 Credits) <u>EMELIN502A</u> (P.315)	Formulate instructions on inspection, testing and commissioning of switchboard, control circuit, protector and electricity quality improvement device (6 Credits) <u>EMCUIT502A</u> (P.321)	Master the performance requirements for power generation or transmission and distribution network to perform operation, repair and maintenance (9 Credits) <u>EMELOR502A</u> (P.328)	Formulate project procedures and schedule (9 Credits) <u>EMCUPM501A</u> (P.336)	Formulate operation management plans for power generation, transmission and distribution network projects (6 Credits) <u>EMELOM501A</u> (P.346)	Implement occupational safety and health and environmental protection courses and training programmes (3 Credits) <u>EMCUSH508A</u> (P.358)	Formulate and implement quality management courses and training programmes (4 Credits) <u>EMCUQM503A</u> (P.360)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
5	Master the performance requirements for power generation or transmission and distribution network to perform design work (9 Credits) EMELDE503A (P.301)	Coordinate the installation project of power generation or transmission and distribution network (6 Credits) EMELIN503A (P.317)	Master the performance requirements for power generation or transmission and distribution network to perform inspection, testing and commissioning (9 Credits) EMELIT502A (P.322)	Formulate after-sales service logistics system (6 Credits) EMELOR503A (P.331)	Implement project management for projects of power generation, transmission and distribution network (6 Credits) EMELPM501A (P.337)	Formulate operation management plans and correct substandard works (4 Credits) EMELOM502A (P.348)		Formulate and analyze quality assurance reports (3 Credits) <u>EMCUQM504A</u> (P.361)	
	Formulate the schematic diagrams of power generation or transmission and distribution network and the protection control circuit diagrams (9 Credits) EMELDE504A (P.303)	Formulate the schematic diagrams of power generation or transmission and distribution network and the protection control circuit diagrams (9 Credits) EMELDE504A (P.303)	Coordinate the inspection, testing and commissioning project of power generation or transmission and distribution network (6 Credits) EMELIT503A (P.324)	Use various fault finding methods for electrical installations (6 Credits) EMELOR504A (P.332)	Follow the tender bidding strategy of the organization to make engineering project quotations (6 Credits) EMELPM502A (P.339)	Formulate financial management for individual engineering projects (6 Credits) EMELOM504A (P.349)		Formulate schemes to enhance staff's awareness of quality management (5 Credits) <u>EMCUQM505A</u> (P.362)	
	Coordinate the design project of power generation or transmission and distribution network (3 Credits) EMELDE505A (P.304)	Select and use advanced and specialized skills to support engineering management for electrical installation projects (6 Credits) EMELIN504A (P.318)		Coordinate the operation, repair and maintenance project of power generation or transmission and distribution network (6 Credits) EMELOR505A (P.333)	Justify the costing of engineering project according to procurement specifications (6 Credits) EMELPM503A (P.340)	Use advanced and specialized techniques to support the operation management of integrated electrical works (6 Credits) EMELOM509A (P.350)		Implement quality management training courses (9 Credits) <u>EMCUQM506A</u> (P.363)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
5	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)	Master local regulations and relevant international standards to coordinate engineering works for power supply network (6 Credits) <i>EMELDE506A</i> (P.305)
	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)	Act in emergency to make decisions for and lead the engineering project (6 Credits) <i>EMELDE508A</i> (P.306)
	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)	Formulate large-scale project contract specifications (9 Credits) <i>EMELDE510A</i> (P.307)
	Select and use advanced and specialized skills to support electrical engineering design (6 Credits) <i>EMELDE511A</i> (P.308)		Select and use advanced and specialized skills to support engineering management for inspection, test and commissioning of electrical installations (6 Credits) <i>EMELIT504A</i> (P.326)	Select and use advanced and specialized skills to support engineering management for operation, repair and maintenance of electrical installations (6 Credits) <i>EMELOR506A</i> (P.335)	Analyze professional skills needed by the project and implement human resources management for the project (6 Credits) <i>EMELPM506A</i> (P.341)			Implement quality management standards of International Organization for Standardization (ISO) (3 Credits) <i>EMCUQM507A</i> (P.364)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency								
5	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)	Use information technology application software to support power generation or transmission and distribution network engineering work (6 Credits) <i>EMELDE512A</i> (P.309)
	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)	Make use of power generation or transmission and distribution network data for system performance design purpose (4 Credits) <i>EMELDE513A</i> (P.311)
	Design low voltage distribution network systems (9 Credits) <i>EMELDE514A</i> (P.312)				Master the design performance requirements of power generation, transmission and distribution network and perform project management (6 Credits) <i>EMELPM507A</i> (P.342)				
					Plan the allocation of project resources (6 Credits) <i>EMELPM508A</i> (P.343)	Plan the allocation of project resources (6 Credits) <i>EMELPM508A</i> (P.343)			

<u>Functional Areas</u>	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
<u>QF Levels</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
5					Coordinate the project management of electricity generation, transmission and distribution network (6 Credits) EMELPM509A (P.344)				
					Use advanced and specialized techniques to support electrical engineering project management (6 Credits) EMELPM510A (P.345)				

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency	Unit of Competency
6	Use highly specialized technical skills to explore the conditions of existing power supply system for economic despatch and further improvement (9 Credits) <i>EMELDE601A</i> (P.371)	Use highly specialized technical skills to explore the conditions of existing power supply system for economic despatch and further improvement (9 Credits) <i>EMELDE601A</i> (P.371)	Use highly specialized technical skills to explore the conditions of existing power supply system for economic despatch and further improvement (9 Credits) <i>EMELDE601A</i> (P.371)	Use highly specialized technical skills to explore the conditions of existing power supply system for economic despatch and further improvement (9 Credits) <i>EMELDE601A</i> (P.371)	Apply project management skills and professional knowledge to handle unfulfilled or unperformed contracts effectively (20 Credits) <i>EMCUPM601A</i> (P.384)	Master tender specifications and market competition information and formulate operation management strategy (9 Credits) <i>EMELOM601A</i> (P.391)	Formulate overall safety, health and environmental protection policy (20 Credits) <i>EMCUSH601A</i> (P.399)	Use highly specialized technical skills to explore the conditions of existing power supply system for economic despatch and further improvement (9 Credits) <i>EMELDE601A</i> (P.371)	Formulate corporate marketing strategy for electrical installations (6 Credits) <i>EMELMS601A</i> (P.408)
	Implement design project of large-scale power network (9 Credits) <i>EMELDE602A</i> (P.372)	Implement engineering project management for large-scale power network (6 Credits) <i>EMELIN601A</i> (P.378)	Inspect, test and commission large-scale power network (6 Credits) <i>EMELIT601A</i> (P.380)	Formulate strategy of operation, repair and maintenance management for large-scale power network (6 Credits) <i>EMELOR601A</i> (P.382)	Formulate marketing and bidding strategies for electrical installations (9 Credits) <i>EMELPM601A</i> (P.385)	Master the operation of the organization and allocate resources to match the workflow (6 Credits) <i>EMELOM602A</i> (P.392)	Formulate improvement plans for occupational safety and health (20 Credits) <i>EMCUSH602A</i> (P.401)	Formulate quality management strategy (20 Credits) <i>EMCUQM601A</i> (P.405)	Formulate effective marketing and sales courses and training programmes (6 Credits) <i>EMELMS602A</i> (P.409)
	Lead and supervise the design project (9 Credits) <i>EMELDE603A</i> (P.373)	Lead and supervise the installation project (6 Credits) <i>EMELIN602A</i> (P.379)	Lead and supervise the inspection, testing and commissioning project (6 Credits) <i>EMELIT602A</i> (P.381)	Lead and supervise the operation, repair and maintenance project (6 Credits) <i>EMELOR602A</i> (P.383)	Implement project management for large-scale power networks (6 Credits) <i>EMELPM602A</i> (P.386)	Master the holistic business environment and formulate corporate business development strategy of the organization (6 Credits) <i>EMELOM603A</i> (P.393)	Formulate environmental protection improvement plans (20 Credits) <i>EMCUSH603A</i> (P.403)	Implement total quality management plan (20 Credits) <i>EMCUQM602A</i> (P.406)	

Functional Areas	Design (DE)	Installation (IN)	Inspection, Testing and Commissioning (IT)	Operation, Repair and Maintenance (OR)	Project Management (PM)	Operation Management (OM)	Safety, Health and Environment (SH)	Quality Management (QM)	Marketing and Sales (MS)
QF Levels	Unit of Competency	Unit of Competency	Unit of Competency						
6	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works (9 Credits) <i>EMELDE604A</i> (P.374)	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works (9 Credits) <i>EMELDE604A</i> (P.374)	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works (9 Credits) <i>EMELDE604A</i> (P.374)	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works (9 Credits) <i>EMELDE604A</i> (P.374)	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works (9 Credits) <i>EMELDE604A</i> (P.374)	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works (9 Credits) <i>EMELDE604A</i> (P.374)	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works (9 Credits) <i>EMELDE604A</i> (P.374)		
	Lead the design renovation of large-scale power supply system installations (9 Credits) <i>EMELDE606A</i> (P.375)				Formulate material procurement specifications and strategy (6 Credits) <i>EMELPM603A</i> (P.387)	Master the requirements of different tender specifications and formulate an integrated material procurement strategy (6 Credits) <i>EMELOM604A</i> (P.394)			
	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)	Use engineering software to identify areas that need to be improved in the power supply network (6 Credits) <i>EMELDE607A</i> (P.376)
	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	Consolidate and calculate power supply network data (6 Credits) <i>EMELDE608A</i> (P.377)	

<u>Functional Areas</u>	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
<u>QF Levels</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
6					Formulate tender bidding strategy and risk management plan (6 Credits) EMELPM604A (P.388)	Decide on and implement different tender bidding strategies (6 Credits) EMELOM605A (P.395)			
					Lead and supervise project management of large-scale electrical works (6 Credits) EMELPM605A (P.389)	Lead and supervise operation management of concurrent large-scale electricity supply system projects (6 Credits) EMELOM607A (P.396)			
					Master tender specifications and follow tender bidding strategy to charge additional engineering fees (6 Credits) EMELPM606A (P.390)	Formulate operation strategies and make arrangements for charging additional engineering fees (6 Credits) EMELOM608A (P.397)			
						Handle engineering contract problems and implement business regulations and litigation matters (6 Credits) EMELOM609A (P.398)			

Functional Areas	<u>Design (DE)</u>	<u>Installation (IN)</u>	<u>Inspection, Testing and Commissioning (IT)</u>	<u>Operation, Repair and Maintenance (OR)</u>	<u>Project Management (PM)</u>	<u>Operation Management (OM)</u>	<u>Safety, Health and Environment (SH)</u>	<u>Quality Management (QM)</u>	<u>Marketing and Sales (MS)</u>
QF Levels	<u>Unit of Competency</u>								
7	Constantly advance the renovation of power system design (6 Credits) EMELDE704A (P.411)					Formulate overall operation development direction and strategy (20 Credits) EMCUOM701A (P.414)			
	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)	Establish standards in the engineering research report and lead the research direction (9 Credits) EMELDE705A (P.412)
	Consolidate power supply network design data for extensive use (6 Credits) EMELDE707A (P.413)					Decide on, facilitate, coordinate and monitor the entire electrical works project (9 Credits) EMELOM701A (P.416)			

Competencies for Practitioners of the Electrical Engineering Branch in the Electrical & Mechanical Services Industry

Competency Level 1

1. Title	Use typical electrical meters
2. Code	EMCUDE101A
3. Range	With regard to electrical and mechanical engineering services, have basic understanding in electrical terms, units and calculations, and electrical components; and use typical electrical meters for general measurement.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic electrical concepts</p> <ul style="list-style-type: none"> ◆ Understand basic electrical concepts, including: <ul style="list-style-type: none"> • Stating briefly the names and uses of common electrical components from distribution board to all final circuits • Distinguish and apply basic electrical terms such as electric current, electric voltage, electric resistance, electric energy and electric power, etc., and their basic units and calculations ◆ Understand the working principles of common meters, including: <ul style="list-style-type: none"> • Structure and working principles of moving coil, moving iron and electric meter • Uses and the pros and cons of the above three types of meters • Structure, working principles and uses of traditional multimeter ◆ Understand the code of safety and operation for using common meters <p>6.2 Use of meters</p> <ul style="list-style-type: none"> ◆ Use typical meters <ul style="list-style-type: none"> • Capable to use multimeters safely and correctly to measure electric current, electric voltage and electric resistance of simple circuits • Capable to use appropriate common meters safely and correctly to measure electric energy (kWh) and electric power (kW) • Know how to maintain typical meters

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to use multimeters to measure electric current, electric voltage and electric resistance of simple circuits according to the code of safety and operation, and make simple calculations of electricity; and (ii) Capable to use appropriate typical meters to measure electric energy and electric power of simple circuits according to the code of safety and operation.
8. Remarks	<p>This unit of competency is applicable to new entrants of electrical and mechanical engineering services.</p>

1. Title	Identify general properties of different types of typical electrical and mechanical engineering materials
2. Code	EMCUDE109A
3. Range	Capable to identify the general properties and range of application of different types of typical electrical and mechanical engineering materials for electrical and mechanical design, installation, repair and maintenance.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 General properties of typical electrical and mechanical engineering materials</p> <ul style="list-style-type: none"> ◆ Understand the general properties of typical electrical and mechanical engineering materials including metals and non-metals: <ul style="list-style-type: none"> • Mechanical properties such as strength, hardness, resilience, etc. • Density • Electric conductivity • Thermal conductivity • Melt ability <p>6.2 Identify properties and range of application of typical electrical and mechanical engineering materials</p> <ul style="list-style-type: none"> ◆ Capable to identify different types of typical electrical and mechanical engineering materials, including metal type: steel, copper, aluminium, iron, etc., and non-metal type: wood, plastic, resin, etc. ◆ Capable to identify basic range of application of different types of typical electrical and mechanical engineering materials ◆ Capable to perform simple design, installation, repair and maintenance engineering works according to the general properties and range of application of different types of typical electrical and mechanical engineering materials
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to identify the general properties and range of application of different types of typical electrical and mechanical engineering materials.</p>
8. Remarks	This unit of competency is applicable to new entrants of electrical and mechanical engineering services.

1. Title	Understand common terms and units of basic electrical principles and neon gas
2. Code	EMELDE101A
3. Range	Use common terms and units of basic electrical principles and neon gas that are applicable to neon installation work from low voltage power supply to final circuit.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Common terms and units of basic electrical principles and neon gas</p> <ul style="list-style-type: none"> ◆ Understand basic electrical terms and units commonly used in general international standards, including prefixes and symbols ◆ Understand neon gas types, technical terms and units used in common international standards, including common terms, units and symbols for temperature, brightness and mechanics <p>6.2 Understand types of electrical and neon gas applications and major terms and units according to design documents</p> <ul style="list-style-type: none"> ◆ Understand basic electrical terms and units commonly used, including prefixes and symbols, according to design documents ◆ Understand neon gas types, technical terms and units used in common international standards, including common terms, units and symbols for temperature, brightness and mechanics according to design documents ◆ Apply common terms and units of basic electrical principles and neon gas to neon installation work from low voltage power supply to final circuit
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand basic electrical terms and units used in common international standards;</p> <p>(ii) Capable to understand neon gas types, technical terms and units for temperature, brightness and mechanics used in common international standards; and</p> <p>(iii) Capable to apply common terms and units of basic electrical principles and neon gas to neon installation work from low voltage power supply to final circuit.</p>
8. Remarks	

1. Title	Understand basic intallation concept, popular neon materials and details of simple shop drawings of neon installations
2. Code	EMELDE102A
3. Range	With regard to electrical engineering design and installation of neon installations, understand the installation concept of neon installations; the arrangement and protection of electrical installations; the functions and application of various kinds of neon materials, electrical equipment, tools and meters; and the details of shop drawings of electrical installations.
4. Level	1
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic intallation concept of neon installations; functions and application of various kinds of neon materials, installation tools and meters; power supply arrangement and protection of neon systems; and the details of simple shop drawings</p> <ul style="list-style-type: none"> ◆ Understand the basic installation concept of neon installations such as site requirements, fire switches and their installation height, positions to install high voltage cables and high voltage circuits, supporting structures for neon installations, etc. ◆ Understand the functions and application of various kinds of neon installation materials, including neon tube materials, step-up transformers, various accessories and metal conduits for surface wiring, various kinds of cables, cable ducts and accessories, and fireman’s switches commonly used for fixed electrical installations ◆ Understand the craftsmanship of wiring using metal conduits, etc. ◆ Understand the fabrication and installation of cable ducts <ul style="list-style-type: none"> • Fabricate different shapes of cable ducts as required • Install the trunking and duct the lines according to drawings ◆ Understand the functions and application of neon tube power circuits: <ul style="list-style-type: none"> • Control and protection circuits of neon tube • Power circuit of step-up transformer • Power circuits of distribution board ◆ Understand how to use instrument to perform the following tests: <ul style="list-style-type: none"> • Insulation resistance test for electrical installations • Continuity and tripping tests for power circuit and circuit protective conductors • Polarity test

	<ul style="list-style-type: none"> ◆ Understand applications of the installation tools for various kinds of neon systems: <ul style="list-style-type: none"> • Neon gas injector, heating facilities • Measuring tools: steel ruler, tape measure, calliper • Cutting tools: iron saw, cutter, plier • Conduit bending tools: conduit benders, conduit bending machine • Power tools: power drill, power saw, threading machine • Tap and tap wrench <p>6.2 Understand simple shop drawings of the electrical installations of neon systems</p> <ul style="list-style-type: none"> ◆ Understand simple drawings related to installation work, such as: <ul style="list-style-type: none"> • Neon tube control and protection circuits • Electrical installation wiring diagrams • Electrical installation layouts • Shop drawings of electrical installations • Layout plans
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to understand the arrangement, protection systems, and design and assembling methods of electrical installations as specified; and (ii) Capable to understand simple shop drawings of electrical installations of neon systems, to receive and convey instructions on basic electrical installation procedures, and perform simple tasks for installing electrical installations of neon systems under instruction.
8. Remarks	

1. Title	Understand the basic design concept of general extra-low voltage installations of buildings
2. Code	EMELDE103A
3. Range	Understand the basic design concept of various kinds of extra-low voltage installations of buildings, the installation requirements, application of materials, tools and details of simple shop drawings of general installations.
4. Level	1
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Design and installation concepts and the application of installation materials and tools for various kinds of extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Understand the basic design and installation concepts of various kinds of installation systems such as common antenna TV and satellite TV systems, security system, public address (PA) system, and PABX system ◆ Understand the application of general installation materials and tools for various kinds of installations such as cable connection and wiring <p>6.2 Master the details of simple shop drawings of various kinds of extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Master the details of simple shop drawings of various kinds of installations such as general system schematic, installation layout plan and wiring diagram
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the basic design and installation concepts of various kinds of extra-low voltage installations of buildings;</p> <p>(ii) Capable to master the details of simple shop drawings of various kinds of extra-low voltage installations of buildings; and</p> <p>(iii) Capable to understand the application of general installation materials and tools, to receive and convey instructions on installation procedures for extra-low voltage installations of buildings, and apply installation materials and tools under instruction.</p>
8. Remarks	

1. Title	Draw shop drawings of simple installations of power supply system
2. Code	EMELDE104A
3. Range	Understand common electrical symbols and basic electrical installation arrangements, and draw simple single-line circuit diagrams and basic electrical installation drawings for low voltage electrical installations in general buildings using three-phase or single-phase power supply from the distribution board to final circuits.
4. Level	1
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of drawing simple single-line diagrams of low voltage power supply systems</p> <ul style="list-style-type: none"> ◆ Know about the components of low voltage electrical installations in general buildings using three-phase or single-phase power supply from the distribution board to final circuits, and the names and symbols of the components ◆ Know about the arrangement, protection system and design requirements for low voltage electrical installations in general buildings using three-phase or single-phase power supply from the distribution board to final circuits ◆ Understand the functions, correlation and importance of various kinds of drawings such as single-line plans, circuit diagrams, shop drawings, electrical installation layout plans and 3D assembly drawings ◆ Understand the drawing basics to draw simple low voltage power supply systems single-line diagrams showing the three-phase or single-phase power supply from the distribution board to final circuits <p>6.2 Draw simple low voltage electrical installation shop drawings</p> <ul style="list-style-type: none"> ◆ List the working requirements and explanatory notes on the drawings such as using electrical installation layout plans, 3D assembly drawings and sectional drawings
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use simple electrical symbols to draw a simple diagram showing the three-phase or single-phase power supply from the distribution board to final circuits, and master the details of the work.</p>
8. Remarks	

1. Title	Understand simple documents of electrical installation works
2. Code	EMELDE105A
3. Range	Understand simple documents of electrical installation works for electrical installation works in general buildings using three-phase or single-phase power supply from the distribution board to final circuits.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand common electrical symbols, general single-line diagrams and circuit diagrams, and simple documents of work</p> <ul style="list-style-type: none"> ◆ Know about the components of low voltage electrical installations in general buildings using three-phase or single-phase power supply from the distribution board to final circuits, and the names and symbols of the components, such as: <ul style="list-style-type: none"> • Various kinds of electrical equipment such as distribution board, switchgear, cables, socket, lighting appliances, electric appliances • Various kinds of protection devices such as various kinds of miniature circuit breakers, molded case circuit breakers and fuses <p>6.2 Understand documents of work relevant to electrical installations</p> <ul style="list-style-type: none"> ◆ Understand documents of work relevant to electrical installations, such as work schedule, work flow, material list for the installation, installation manual, terminal diagram, installation diagram, equipment layout plan and conduit layout diagram ◆ Identify basic requirements for general circuits on protection, control, identification, circuit segregation, etc. ◆ Understand major requirements and rules of the documents of work for electrical installations, such as the moving of equipment, and safety and health codes of practice
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand common electrical symbols, general single-line diagrams, circuit diagrams; and</p> <p>(ii) Capable to understand major requirements and rules of the simple documents of work.</p>
8. Remarks	

1. Title	Understand commonly used electricity regulations, international standards and design documents
2. Code	EMELDE106A
3. Range	Understand the details of commonly used electricity regulations, international standards and design documents applicable to general electrical work.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Electricity regulations in Hong Kong and international standards relevant to electrical installations</p> <ul style="list-style-type: none"> ◆ Understand the spirit and details of electricity regulations and codes of practice such as: <ul style="list-style-type: none"> • Electricity Ordinance of Hong Kong • Electricity (Registration) Regulations • Electricity (Wiring) Regulations and their code of practice • Electricity Supply Lines (Protection) Regulation • Performance Monitoring Point System (PMPS) for Registered Electrical Workers • Basic legal requirements for additions, modifications, maintenance and repair of electrical installations such as WR1 and WR2 ◆ Understand other regulations related to electrical installations commonly used in Hong Kong such as: <ul style="list-style-type: none"> • IEE Wiring Regulations (BS7671) • The Supply Rules of electricity companies • Factories and Industrial Undertakings (Electricity) Regulations of the Labour Department ◆ Understand the names and access of common global standards related to electrical installations such as: <ul style="list-style-type: none"> • International Electric Community (IEC) • Chinese National Standard • British Standards (BS) <p>6.2 Understand work details of design documents commonly used</p> <ul style="list-style-type: none"> ◆ Understand the details of design documents commonly used such as design drawings, customer requirements, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand, under instruction, the details of electricity regulations, international standards and design documents commonly used.</p>
8. Remarks	

1. Title	Understand basic methods and techniques of winding and repairing simple transformers
2. Code	EMELDE107A
3. Range	Applicable to the works of design, material selection, winding preparations, winding, assembly, baking and impregnation, inspection and testing for winding and repairing transformers. Understand the construction of simple transformers and the functions of their components, general materials used for winding and their uses, and basic methods and techniques of winding and repairing simple transformers.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic construction of transformers and functions and applications of their components</p> <ul style="list-style-type: none"> ◆ Understand popular types of transformers such as auto-coupled, isolated and choke winding; iron core-type and shell-type; single-phase, three-phase, high-frequency power supplies ◆ Understand common terms and units relevant to transformers, such as: primary side, secondary side, power (VA) , turns ratio, copper loss and iron loss ◆ Understand the basic functions and simple applications of transformers such as stepping up or down the voltage during power supply or distribution <p>6.2 Understand general materials used for winding, general winding and handling process for transformers, and instruments used for basic testing of transformers</p> <ul style="list-style-type: none"> ◆ Understand popular winding materials such as winding wire, insulating materials, iron core and assembling materials ◆ Understand the names, specifications and uses of the following materials: enamelled wire number, thickness of insulated paper, core size, terminal current value ◆ Understand the whole process of transformer winding including the basic assembly of transformer ◆ Understand the reasons and process of baking and impregnation such as : damp proof and noise proof; baking temperature and time ◆ Understand instruments generally used to test transformers, such as multi-meter, insulation resistance tester, power meter, voltage withstand tester and thermometer
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the construction and applications of general transformers;</p> <p>(ii) Capable to understand the types, specifications and applications of basic materials of transformers; and</p> <p>(iii) Capable of understand the process of winding a simple transformer.</p>
8. Remarks	

1. Title	Understand commonly used basic electrical materials, electrical equipment and tools
2. Code	EMELDE108A
3. Range	Understand various kinds of basic electrical materials, the types and construction of cables, the characteristics of electrical equipment and tools, and their applications in various kinds of related electrical installations for general electrical work.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand general electrical materials, electrical equipment, cable structure and characteristics of electrical tools</p> <ul style="list-style-type: none"> ◆ Understand the characteristics of general electrical materials including conduit, wire frame, trunking, various kinds of conductor, earthing rod, various kinds of protective devices, various kinds of connecting devices ◆ Understand the characteristics of general electrical equipment including rising mains, low voltage switchboards, transformers, current transformer, diesel generators, low voltage distribution boards, energy meters, pre-meter switches, etc. ◆ Understand the structure and materials for general PVC, XLPE, armoured and mineral-insulated cables including conductor, insulation, sheath, amour, etc. ◆ Understand the characteristics of general electrical tools including wire stripper, wire cutter, hose wrench, multi-meter, various kinds of screwdriver, clipping pliers, power drill, electric iron <p>6.2 Understand various kinds of general electrical materials and equipment, the construction of cables, and the applications of electrical tools</p> <ul style="list-style-type: none"> ◆ Understand various kinds of general electrical materials and equipment, the construction of cables, and the applications of electrical tools
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand various kinds of general electrical materials and equipment, the construction of cables, and the applications of electrical tools.</p>
8. Remarks	

1. Title	Master simple numerical and graphical data
2. Code	EMELDE109A
3. Range	Use integers and simple decimals for calculations and master simple numerical and graphical data for general calculations and analysis relevant to electrical and mechanical work.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Simple calculations in electrical and mechanical engineering ♦ Understand simple calculations in electrical and mechanical engineering such as:</p> <ul style="list-style-type: none"> • Use of function keys of calculators • Calculations of decimals, fractions and proportions • Area, diameter and volume calculations for various kinds of geometric figures • Basic algebra • Basic trigonometry <p>6.2 Master data or charts ♦ Use data to draw simple charts and do the calculations. The charts include:</p> <ul style="list-style-type: none"> • Line chart • Bar chart • Horizontal bar chart • Pie chart
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use simple calculations in electrical and mechanical engineering to create charts.</p>
8. Remarks	This unit of competency is applicable to new entrants of electrical engineering services.

1. Title	Use general machining equipments
2. Code	EMCUIN101A
3. Range	Use general-purpose machining equipments for servicing, manufacturing and grinding at industrial plants. This unit of competency does not include the ability in making parts according to drawings.
4. Level	1
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principles of machining equipments and code of safety</p> <ul style="list-style-type: none"> ◆ Understand the code of safety and operation of machining equipments ◆ Understand major components of general machining equipments: the transmission part, the part to hold and rotate the work piece, and the part to hold and move the cutting tool ◆ Understand the operation and limitations of general machining equipments ◆ Understand how to choose and install general machine tools <p>6.2 Use general machine tools correctly</p> <ul style="list-style-type: none"> ◆ Follow the codes of safety and operation to use common machining equipments correctly, including general lathes, milling machine, drilling machine, slotting machine, grinding machine, etc. ◆ Capable to operate and adjust general machine tools, including: <ul style="list-style-type: none"> • Cutting speed • Feeding method • Rotational speed adjustment • Feeding speed • Cutting depth ◆ Capable to maintain general machining equipments correctly, including routine cleaning ◆ Capable to use general machining equipments for servicing, manufacturing and grinding simple electrical and mechanical parts
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to follow the codes of safety and operation procedures to correctly operate general lathe, milling machine, drilling machine, slotting machine, grinding machine, etc. for servicing, manufacturing and grinding simple electrical and mechanical parts.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic workshop mechanical knowledge.

1. Title	Use general loading and lifting equipment	
2. Code	EMCUIN102A	
3. Range	Use general loading and light duty lifting equipment, not including heavy duty lifting equipment, in industrial plants or workplaces where lifting is involved.	
4. Level	1	
5. Credit	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the principles of common lifting machines and devices operation</p> <ul style="list-style-type: none"> ◆ Understand the types, use, functions, operation and maintenance of general loading and lifting machines and devices; and noting points when using them <ul style="list-style-type: none"> • Lifting machines include: crane, gin block, winch, rolling wheel, lift purchase and gin wheel • Lifting devices include: hook, chain, rope and overhead conveyor <p>6.2 Understand the code of safety and legal requirements for goods handling</p> <ul style="list-style-type: none"> ◆ Understand the code of safety and legal requirements for goods handling <ul style="list-style-type: none"> • Understand the danger of moving and using lifting machines and devices • Understand the safety inspection requirements for handling goods • Understand the safety operation of lifting device and sling, and the requirements for pre-use inspection • Understand the code of safety for using lifting machines and the requirements for pre-use inspection ◆ Inspect the safety of the working environment, and clear all obstacles and potential dangers to goods handling work before starting the lifting and loading operations <p>6.3 Apply general loading methods and lifting equipment correctly</p> <ul style="list-style-type: none"> ◆ Use general loading and lifting machines and devices correctly <ul style="list-style-type: none"> • Use general loading and lifting machines and devices correctly under clear instruction, including: <ul style="list-style-type: none"> ▸ Using chains and ropes to tie the goods ▸ Using lifting devices such as ropes, chain, hook and overhead conveyor to lift up and convey the goods ▸ Using hydraulic lifting machines to handle heavy goods ▸ Using electric lifting machines to handle goods ▸ operating truck lifting platform 	

	<ul style="list-style-type: none"> ◆ Use general loading methods correctly <ul style="list-style-type: none"> • Carry out basic manual handling operation correctly • Simple ways of using ropes, such as tying knots and rings
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use general loading and lifting machines and devices correctly and safely for handling general electrical and mechanical equipment.</p>
8. Remarks	<p>(i) This unit of competency is applicable to electrical and mechanical practitioners in general.</p> <p>(ii) The credit value of this unit of competencies is set on the presumption that the person already possesses the competency of the following unit of competency:</p> <p>(iii) The competencies of EMCUSH109A “Implement safety procedures for manual handling operation”.</p>

1. Title	Apply basic bench fitting techniques and use small typical hand tools
2. Code	EMCUIN106A
3. Range	Apply basic bench fitting techniques, including marking, sawing, filing, grinding, drilling and chiseling, in tasks of production, installation and maintenance and repairs for electrical and mechanical works.
4. Level	1
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about basic bench fitting techniques and small typical hand tools</p> <ul style="list-style-type: none"> ◆ Understand basic bench fitting techniques, including marking, sawing, filing, grinding, drilling and chiselling ◆ Understand the operation of small typical hand tools, including cutting tools, measuring instruments, files, assembling and dismantling tools, marking-out tools, portable power drills, drilling machines, and relevant concerns <p>6.2 Apply basic bench fitting techniques and small typical hand tools in tasks of production, installation and maintenance and repairs</p> <ul style="list-style-type: none"> ◆ Understand the correct use of small typical hand tools <ul style="list-style-type: none"> • Capable to use various types of cutting tools correctly, such as bow saws and shears • Capable to use metric and imperial measuring instruments correctly, such as steel rules, venires, inside callipers and outside callipers • Capable to use steel rules and beam squares to measure the length and to check horizontal, vertical and curved surfaces correctly • Capable to select and use files correctly, such as single cut files, flat files, round files, half-round files, triangular files, double cut files, rough-cut and smooth files of different degree of fineness • Capable to select and use scrapers correctly • Capable to use assembling and dismantling tools correctly, such as open-ended spanners, adjustable spanners, box spanners, hexagon ring spanners, screw drivers, jaw vices, hand vices and hammers, to assemble or dismantle simple mechanical devices • Capable to use various types of marking-out tools correctly, such as line needle, hook needle, centre punches, pin punches and dividers • Capable to use portable power drills and drilling machines correctly

	<ul style="list-style-type: none"> ◆ Apply basic bench fitting techniques and use small typical hand tools <ul style="list-style-type: none"> • Identify and select common metals <ul style="list-style-type: none"> ▸ Capable to identify various types of common metals ▸ Capable to select suitable common metals according to uses • Capable to apply basic bench fitting techniques, including marking, sawing, filing, grinding, drilling and chiselling, to trim materials, to measure work pieces and to make metal work pieces to required dimensions, according to templates or simple drawings <p>6.3 Code of practice for bench fitting</p> <ul style="list-style-type: none"> ◆ Capable to use small typical hand tools and bench fitting techniques in completing tasks of production, installation, maintenance and repairs according to the code of safety
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to make metal pieces to required dimensions according to templates or simple drawings; apply the techniques of marking, sawing, filing, grinding, drilling and chiseling in tasks of production, installation, maintenance and repairs; capable to observe the code of safety.</p>
8. Remarks	<p>This unit of competency is applicable to new entrants of the electrical and mechanical trade.</p>

1. Title	Identify different types of pipe materials and their range of application
2. Code	EMCUIN109A
3. Range	Capable to identify different types of pipe materials and their range of application in general industrial plants, power plants, and workplaces where ship engineering, fire engineering, plumbing or gas engineering is involved.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Pipe materials and their range of application</p> <ul style="list-style-type: none"> ◆ Understand different types of pipe materials, such as: <ul style="list-style-type: none"> • Cast iron • Low-carbon steel • Stainless steel • Copper • Aluminium • Plastic ◆ Understand the properties of different types of pipe materials, such as: <ul style="list-style-type: none"> • Bend ability • Pressure resistance • Heat resistance • Resilience • Weldability • Corrosion resistance ◆ Understand the characteristics of pipeline manufacturing <ul style="list-style-type: none"> • Casting • Plastic moulding • Lining • Electric welding • Seamless • Continuous welding, etc. ◆ Understand the range of application of different types of pipes <p>6.2 Identify the application of different types of pipes</p> <ul style="list-style-type: none"> ◆ Identify the properties and range of application of different types of pipe materials for general pipe installation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Identify the properties and range of application of different types of pipe materials for general pipe installation.</p>
8. Remarks	This unit of competency is applicable to new entrants of electrical and mechanical engineering services.

1. Title	Install simple neon installations
2. Code	EMELIN101A
3. Range	Understand the basic requirements of electricity regulations and the details of shop drawings, and use various kinds of basic neon materials, electrical equipment, tools and meters to install simple neon installations in general.
4. Level	1
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the requirements of electricity regulations on installing neon installations</p> <ul style="list-style-type: none"> ◆ Understand the relevant electricity regulations and basic requirements of the Guide on Advertisement Signs <p>6.2 Install general simple neon installations</p> <ul style="list-style-type: none"> ◆ Collectly understand the basic principles and details of shop drawings of general neon installations ◆ Use meters, tools and heating equipment to carry out simple neon installation procedures
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the requirements of electricity regulations for basic installation;</p> <p>(ii) Capable to understand the basic principles of simple neon installation circuit; and</p> <p>(iii) Capable to use general meters and tools to carry out simple neon installation work according to the details of shop drawings.</p>
8. Remarks	

1. Title	Install simple extra-low voltage installations of buildings
2. Code	EMELIN102A
3. Range	Understand the details of installation drawings of simple extra-low voltage installations of buildings, and carry out the installation work of simple extra-low voltage installations of buildings.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the details and requirement of installation diagrams of simple extra-low voltage installations of buildings ♦ Understand the details and requirement of the installation diagrams of simple extra-low voltage installations of buildings, and list out the installation items and schedule</p> <p>6.2 Carry out the installation work of simple extra-low voltage installations of buildings according to the actual situation and constraints of worksite ♦ Carry out the installation work of simple extra-low voltage installations of buildings according to the actual situation and constraints of worksite</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to list out the installation items and schedule; and</p> <p>(ii) Capable to carry out the installation work according to the actual situation and constraints of worksite as well as the details and requirements of the installation diagrams of simple extra-low voltage installations of buildings.</p>
8. Remarks	

1. Title	Assemble simple electrical equipment, water pumps and generating units (non-live)
2. Code	EMELIN103A
3. Range	Assemble simple electrical equipment, water pumps and generating units in non live conditions at general machine rooms or service rooms of buildings.
4. Level	1
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles and basic assembly of simple electrical equipment, water pumps and generating units</p> <ul style="list-style-type: none"> ◆ Understand the working principles and basic assembly of simple electrical equipment, water pumps and generating units such as: <ul style="list-style-type: none"> • Basic electrical equipment like lighting appliances, switches, power plugs and socket • Mechanical parts like mechanical energy transmission devices such as bearing and coupling • Power water pumps • Emergency generating units of buildings <p>6.2 Assemble simple electrical equipment, water pumps and generating units in non live conditions</p> <ul style="list-style-type: none"> ◆ Use various kinds of electrical materials, equipment, tools and instruments to assemble simple electrical equipment, water pumps and generating units such as: <ul style="list-style-type: none"> • Lighting appliances, switches, power plugs and socket • Motor starter and relevant circuit protection equipment • Single-phase and three-phase fed water pumps • Emergency generating units of buildings <p>6.3 Professionalism in assembling simple electrical equipment, water pumps and generating units</p> <ul style="list-style-type: none"> ◆ Follow the industry Safety Rules and practice to carry out the assembly of simple electrical equipment, water pumps and generating units
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to complete the assembly of simple electrical equipment, water pumps and generating units in non live condition.</p>
8. Remarks	This unit of competency is applicable to new entrants of electrical engineering services.

1. Title	Understand commonly used electricity regulations, international standards and basic installation techniques
2. Code	EMELIN104A
3. Range	Understand the basic technical requirements for installing general circuit or electrical installations from low voltage distribution board to final circuits.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Application of electricity regulations and common international standards</p> <ul style="list-style-type: none"> ◆ Understand the chapters and sections of electricity regulations commonly used for the technical requirements for installing general circuit or electrical installations from low voltage distribution board to final circuits, including the Electricity (Registration) Regulations and the Electricity (Wiring) Regulations ◆ Understand the application of relevant international standards commonly used including: <ul style="list-style-type: none"> • International Electric Community Standards (IEC) • British Standards (BS) • Chinese National Standard (GB) <p>6.2 Understand basic requirements on general circuits</p> <ul style="list-style-type: none"> ◆ Understand the basic requirements on general circuits including the protection, control, identification and isolation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand the basic requirements on general circuits according to scope of application of relevant chapters and sections of electricity regulations and common international standards.</p>
8. Remarks	

1. Title	Wind and repair simple transformers
2. Code	EMELIN105A
3. Range	Correctly use the structural components of transformers, qualified winding copper types, silicon steel sheet, insulation materials, impregnating varnish, general winding equipment, baking stoves, soldering iron and various types of basic testing instruments to wind and repair small power transformers at transformer repair workshops or field locations.
4. Level	1
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Construction and basic working principles of transformers</p> <ul style="list-style-type: none"> ◆ Understand the construction and basic working principles of transformers including: <ul style="list-style-type: none"> • Structural components of transformers • Working principles of transformers <p>6.2 Winding and repair of transformers</p> <ul style="list-style-type: none"> ◆ Make preparations for winding transformers under instruction: <ul style="list-style-type: none"> • Arrange materials for winding transformers including structural components of transformers, copper wire for winding with right current-carrying capacity, silicon steel sheet and assembly materials with right magnetic flux, appropriate insulation materials and impregnating varnish • Arrange hand tools and equipment for winding transformers including general winding machines, baking stoves and soldering iron • Arrange testing instruments for winding transformers including multi-meter, insulation resistance tester, power meter, high voltage withstand tester and thermometer ◆ Carry out general winding, impregnation and insulating varnish baking processes as follows under instruction: <ul style="list-style-type: none"> • Assemble structural components of transformers • Wind copper wire windings of transformers • Impregnate insulating varnish • Control the insulating varnish baking process ◆ Use basic testing instruments to conduct the following tests for the winded transformers under instruction such as copper winding resistance test, insulation resistance test, power test, winding pressure test and temperature measurement ◆ Use basic testing instruments to inspect, locate and repair faults of small transformers under instruction

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to carry out preparation procedures for winding transformers; (ii) Capable to carry out general winding, impregnation and insulating varnish baking processes; (iii) Capable to use basic testing instruments to conduct tests for transformers; and (iv) Capable to inspect and repair defective small transformers.
8. Remarks	

1. Title	Understand the construction and working principles of general household appliance products, and perform inspection, testing and commissioning
2. Code	EMELIT101A
3. Range	Applicable to routine inspection, commissioning, testing, measurement and repair of general household appliance products. Understand the construction and working principles of general household appliance products, and use common instruments to perform inspection, testing and commissioning.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Construction and working principles of general household appliance products</p> <ul style="list-style-type: none"> ◆ Understand the construction of general household appliance products and the uses and properties of their components such as components that give out light, heat, and sound and rotating parts ◆ Understand the working principles and operation of general household appliance products such as components that give out light, heat, and sound and rotating parts ◆ Understand the basic working principles of general multi-meters ◆ Understand the basic working principles of insulation resistance tester <p>6.2 Use general instruments to perform routine inspection, testing and measurement on general household appliance products</p> <ul style="list-style-type: none"> ◆ Correctly use the multi-meter to perform routine inspection, testing and measurement on general household appliance products including their current, voltage and resistance ◆ Correctly use the megohmmeter to measure the insulation resistance of general household appliance products
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the construction, working principles, and the methods of inspecting, testing and commissioning general household appliance products; and</p> <p>(ii) Capable to use the multi-meter and insulation resistance tester to measure, inspect, test and commission general household appliance products.</p>
8. Remarks	

1. Title	Understand the basic concepts of inspecting, testing and commissioning general neon installations
2. Code	EMELIT102A
3. Range	Understand the basic requirements for inspecting, testing and commissioning general neon installations.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic requirements, procedures and concepts of inspecting, testing and commissioning general neon installations</p> <ul style="list-style-type: none"> ◆ Understand the basic inspection, testing and commissioning requirements for general neon installations stipulated in the Code of Practice of the Electricity (Wiring) Regulations and the Guide on Advertisement Signs issued by the Buildings Department ◆ Understand basic procedures of inspecting, testing and commissioning general neon installations ◆ Understand the usage of general instruments and tools ◆ Understand the importance of the inspection, testing and commissioning requirements for general neon installations and relevant concepts <p>6.2 Understand basic procedures and concepts of inspecting, testing and commissioning general neon installations according to relevant requirements</p> <ul style="list-style-type: none"> ◆ Understand the following according to the basic inspection, testing and commissioning requirements for general neon installations <ul style="list-style-type: none"> • Basic procedures of inspecting, testing and commissioning general neon installations • Usage of general instruments and tools • The importance of the inspection, testing and commissioning requirements for general neon installations and relevant concepts
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the basic inspection, testing and commissioning requirements for general neon installations; and</p> <p>(ii) Capable to understand the basic procedures of inspecting, testing and commissioning general neon installations and relevant concepts.</p>
8. Remarks	

1. Title	Understand commonly used electricity regulations and international standards, and basic techniques of inspection, testing and commissioning
2. Code	EMELIT103A
3. Range	Apply commonly used electricity regulations, international standards, basic requirements for general electrical wiring and understand basic techniques of inspection, testing and commissioning applicable to mechanical and electrical work in general.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand electricity regulations in Hong Kong and international standards commonly used</p> <ul style="list-style-type: none"> ◆ Understand the spirit and details of electricity regulations and codes of practice such as: <ul style="list-style-type: none"> • Electricity Ordinance of Hong Kong • Electricity (Registration) Regulations • Electricity (Wiring) Regulations and their code of practice • Electrical Products (Safety) Regulations • Electricity Supply Lines (Protection) Regulation • Basic legal requirements for additions, modifications, maintenance and repair of electrical installations such as WR1 and WR2 ◆ Understand other regulations related to electrical installations commonly used in Hong Kong such as: <ul style="list-style-type: none"> • The Supply Rules of electricity companies • Factories and Industrial Undertakings (Electricity) Regulations of the Labour Department ◆ Understand the names and access of common global standards related to electrical installations such as: <ul style="list-style-type: none"> • International Electric Community (IEC) • Chinese National Standard • British Standards (BS) <p>6.2 Understand basic techniques of inspection, testing and commissioning for electrical installations</p> <ul style="list-style-type: none"> ◆ Understand basic techniques of inspection, testing and commissioning for electrical installations such as: <ul style="list-style-type: none"> • Visual inspection • Phase conductor continuity test • Circuit protective conductor continuity test • Insulation resistance test • Polarity test ◆ Apply the electricity ordinance, commonly used international standards and the basic requirements for general electrical wiring to perform inspection, testing and commissioning routines related to electrical and mechanical works under instruction

<p>7. Assessment Criteria</p>	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to understand basic techniques of inspection, testing and commissioning for electrical installations according to relevant requirements of electricity regulations of Hong Kong and common regulations; and (ii) Capable to apply the electricity ordinance, commonly used international standards and the basic requirements for general electrical wiring to perform inspection, testing and commissioning routines related to electrical and mechanical works under instruction.
<p>8. Remarks</p>	

1. Title	Operate and maintain general household electrical appliances
2. Code	EMELOR101A
3. Range	Apply basic electrical knowledge, in clearly-defined situations, to the operation, repair and maintenance of general household electrical appliances.
4. Level	1
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Construction and working principles of general household electrical appliances</p> <ul style="list-style-type: none"> ◆ Understand the basic construction and working principles of small general household electrical appliances such as electric cooker, electric iron, oven, toaster, water heater, electric blanket, electric fan, exhaust fan, range hood, blender, hair dryer, vacuum cleaner, light fixtures and lighting ◆ Understand the basic construction and working principles of large general household electrical appliances such as washing machine, clothes dryer, dishwasher, refrigerator, dehumidifier and air cleaners ◆ Understand the work details of regular repair and maintenance of general household electrical appliances such as regular inspection, cleaning, dusting, etc. <p>6.2 Carry out the operation and maintenance of household electrical appliances</p> <ul style="list-style-type: none"> ◆ Follow the instructions to carry out the operation and maintenance of general household electrical appliances
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the construction and working principles of general household electrical appliances; and</p> <p>(ii) Capable to carry out the operation and maintenance of household electrical appliances.</p>
8. Remarks	

1. Title	Understand the basic concepts of operating, repairing and maintaining general neon installations
2. Code	EMELOR103A
3. Range	Understand the concepts of operating, repairing and maintaining neon installations, including the arrangement and protection of electrical installations, the functions and application of various kinds of neon materials, electrical equipment, tools and instruments.
4. Level	1
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Concepts of the operation, repair and maintenance of general neon installations, and the arrangement and protection of power supply systems; functions and application of various kinds of neon materials, tools and instruments</p> <ul style="list-style-type: none"> ◆ Understand the operation of general neon installations, routine inspection, safety procedures for replacing components, inspection of high voltage and low voltage installations, inspection of the bearing capacity and rust corrosion of signboards ◆ Understand the arrangement and protection of power supply systems for the repair and maintenance of general neon installations including: <ul style="list-style-type: none"> • High voltage wiring and low voltage wiring arrangements • Arrangements of safety devices and power supply circuits • Basic requirements on protection and control circuits ◆ Understand the application of various kinds of neon materials for repairing and maintaining general neon installations, including neon tube materials, step-up transformers, accessories for surface wiring, metal conduits, various kinds of cables, cable ducts and accessories commonly used in fixed electrical installations, fire switches, etc. ◆ Understand the functions and application of various kinds of tools and instruments including ammeter/clamp meter, multi-meter, insulation/continuity tester, neon gas injector, heating facilities, etc.

	<p>6.2 Understand the concepts of the arrangement and protection of power supply systems of general neon installations, the functions and application of various kinds of neon materials, tools and instruments, tools and instruments according to the manuals of operation, repair and maintenance of neon installations</p> <p>◆ Understand the following according to the manuals of operation, repair and maintenance of neon installations:</p> <ul style="list-style-type: none"> • Operation of general neon installations, routine inspection, safety procedures for replacing components, inspection of high voltage and low voltage installations, inspection of the bearing capacity and rust corrosion of signboards • Arrangement and protection of power supply system of general neon installations • Application of materials of general neon installations • Functions and application of general tools and instruments
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the concept of operating, repairing and maintaining general neon installations;</p> <p>(ii) Capable to understand the arrangement and protection of power supply systems for general neon installations and</p> <p>(iii) Capable to understand the functions and application of various kinds of neon materials, tools and instruments for general neon installations.</p>
8. Remarks	<p>This unit of competency is applicable to new entrants of the neon installation services.</p>

1. Title	Basic knowledge of electrical and mechanical services management	
2. Code	EMCUOM102A	
3. Range	Capable to understand the basic concepts of electrical and mechanical services management, to build up team spirit and to assist the company to perform routine duties.	
4. Level	1	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about basic management theory</p> <ul style="list-style-type: none"> ◆ Understand team building and maintain team spirit, including: <ul style="list-style-type: none"> • Building of working team • Definition of working team • Classification of working team • Formulating clear and tangible goals • Trusting each other • Taking the initiative to listen carefully • Formulating practical and challenging goals ◆ Understand organization's basic way of operation, including: <ul style="list-style-type: none"> • Engineering workforce organizational chart • Engineering project schedules • Working procedure flow chart • Basic concept of logistics management for materials, tools, instruments, etc <p>6.2 Apply basic management theory in daily electrical and mechanical engineering works</p> <ul style="list-style-type: none"> ◆ Know how to apply basic management theory in daily electrical and mechanical engineering works, including: <ul style="list-style-type: none"> • Enhancing the efficiency of company's daily work • Fostering the spirit of cooperation among staff members • Minimizing misunderstanding of work • Strengthening self-confidence 	
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to know about basic theory of electrical and mechanical services management, to build up team spirit and to enhance the efficiency of organizational routines.</p>	
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.	

1. Title	Use general personal protective equipment
2. Code	EMCUSH108A
3. Range	Use general personal protection device correctly at electrical and mechanical work sites to protect personal safety and health.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Various types of personal protective equipment</p> <ul style="list-style-type: none"> ◆ Understand the types, utilization, maintenance and limitations of personal protection device such as safety belt, eye protector, safety shoes, insulating gloves, protective guard, helmet and ear plug, etc. ◆ Understand the basic maintenance of personal protective equipment <p>6.2 Use of personal protective equipment</p> <ul style="list-style-type: none"> ◆ Capable to use general personal protection device such as safety belt, eye protector, safety shoes, insulating gloves, protective guard, helmet and ear plug, etc. ◆ Capable to choose and use general personal protection device correctly by following systematic safety procedures for the best protection ◆ Capable to use and maintain personal protection device correctly according to safety guidelines and procedures so as to comply with the law
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand various types of personal protection device and their limitations;</p> <p>(ii) Capable to choose and use general personal protection device correctly; and</p> <p>(iii) Capable to use and maintain personal protection device correctly in daily working environment according to safety guidelines and procedures so as to comply with the law.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Perform manual handling operation
2. Code	EMCUSH109A
3. Range	Apply the correct way of manual lifting and handling at electrical and mechanical work sites to avoid bodily injuries.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Correct way of manual lifting and handling</p> <ul style="list-style-type: none"> ◆ Understand the effects of incorrect lifting and handling, including: <ul style="list-style-type: none"> • The impact on the waist and the back • Causes of manual lifting injuries • Basic knowledge of waist and back care <p>6.2 Application of the correct way of manual lifting and handling</p> <ul style="list-style-type: none"> ◆ Capable to apply the way of manual lifting and handling correctly and properly to avoid bodily injuries ◆ Capable to implement the recommendations of the risk assessment for the manual handling operation
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to illustrate the importance of applying the correct way of manual lifting and handling so as to avoid bodily injuries; and</p> <p>(ii) Capable to apply the correct way of manual lifting and handling for materials that need to be handled manually in routine operation.</p>
8. Remarks	This unit of competency is applicable to frontline electrical and mechanical practitioners in general.

1. Title	Safety operation in confined spaces
2. Code	EMCUSH110A
3. Range	Apply the basic knowledge of safety operation in confined spaces and understand the hazards when working in confined spaces so as to prevent accidents.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of safety operation in confined spaces</p> <ul style="list-style-type: none"> ◆ Understand potential hazards and causes for working in confined spaces, including explosion, fire, anoxia, poisonous gas, etc. ◆ Understand the types of confined spaces and relevant legal requirements ◆ Understand the safety procedures, including the use of general protective equipment, for working in confined spaces <p>6.2 Basic safety for working in confined spaces</p> <ul style="list-style-type: none"> ◆ Possess basic safety knowledge of carrying out electrical and mechanical engineering works in confined spaces ◆ Capable to work in confined spaces according to safety procedures, preventive measures of working in confined spaces and relevant legal requirements
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to work in confined spaces according to safety procedures, preventive measures of working in confined spaces and relevant legal requirements.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic safety knowledge.

1. Title	Comply with the legal requirements on electrical and mechanical occupational safety and health
2. Code	EMCUSH111A
3. Range	Comply with the codes of practice and legal requirements on occupational safety and health when working at electrical and mechanical work sites.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Codes of practice and ordinances for occupational safety and health</p> <ul style="list-style-type: none"> ◆ Understand the requirements for site workers imposed by the codes of practice and ordinances for occupational safety and health, and how to ensure personal occupational safety with correct working procedures. These codes and ordinances include: <ul style="list-style-type: none"> • Occupational Safety and Health ordinance and Regulations • Factories and Industrial Undertakings Ordinance and Regulations • Factories and Industrial Undertakings (Electricity) Regulations • Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations <p>6.2 Comply with codes of practice and ordinances for occupational safety and health</p> <ul style="list-style-type: none"> ◆ Capable to comply with the legal requirements on occupational safety and health to carry out routine, repetitive or clearly defined electrical and mechanical engineering work safely
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand the requirements for site workers imposed by the codes of practice and ordinances for occupational safety and health; and to carry out routine, repetitive or clearly defined electrical and mechanical engineering work with proper working procedures.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic safety knowledge.

1. Title	Comply with the legal requirements on environmental protection
2. Code	EMCUSH112A
3. Range	Comply with the legal requirements on environmental protection when working at electrical and mechanical work sites.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 environmental protection legislations</p> <ul style="list-style-type: none"> ◆ Understand the legal requirements for electrical and mechanical engineering work on environmental protection, such as: <ul style="list-style-type: none"> • Noise Control Ordinance • Waste Disposal Ordinance • Water Pollution Control Ordinance • Ozone Layer Protection Ordinance • Dumping at Sea Ordinance • Air Pollution Control Ordinance <p>6.2 Application of environmental protection legislations</p> <ul style="list-style-type: none"> ◆ Capable to comply with the legal requirements on environmental protection to carry out routine, repetitive or clearly defined electrical and mechanical engineering work
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to comply with the legal requirements on environmental protection to carry out routine, repetitive or clearly defined electrical and mechanical engineering work with correct working procedures.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses general awareness of environmental protection.

1. Title	Handle general chemicals safely
2. Code	EMCUSH113A
3. Range	Capable to handle general chemicals safely in workshops or work sites, and understand the hazards and preventive measures for these chemicals so as to protect oneself and other people during daily operation or accident happened.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of handling general chemicals safely in workshops or work sites</p> <ul style="list-style-type: none"> ◆ Possess basic knowledge of handling chemicals safely, including: <ul style="list-style-type: none"> • Hazards of chemicals • Labelling of chemicals • Ways of chemicals entering human bodies • Safety measures for handling chemicals • Personal protective equipment • Compliance of contingency measures ◆ Understand the classification of general chemical substances, including: <ul style="list-style-type: none"> • Explosive substance • Flammable substance • Strong supporter of combustion • Gas • Harmful or poisonous substance • Organic solvent • Corrosive fluid <p>6.2 Way of handling general chemicals</p> <ul style="list-style-type: none"> ◆ Handle chemicals correctly and prevent chemical hazards, including making use of personal protection device ◆ Capable to prevent occupational health hazards caused by chemicals
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to handle general chemicals safely and prevent chemical hazards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of occupational safety and health.

1. Title	Perform quality assurance
2. Code	EMCUQM101A
3. Range	With regard to electrical and mechanical engineering quality assurance, assist to control and monitor the engineering quality under supervision.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about quality assurance standards and rules</p> <ul style="list-style-type: none"> ◆ Understand the organizational quality management scheme, including: <ul style="list-style-type: none"> • Mode of quality management such as the implementation of ISO 9000, quality circle, etc. • Duties of quality management committee • Quality management training ◆ Understand the organizational and international quality assurance standards and rules <p>6.2 Perform quality assurance and monitoring procedures</p> <ul style="list-style-type: none"> ◆ Assist to perform quality assurance and monitoring for the electrical and mechanical engineering works under supervision according to organizational instructions and international standards ◆ Capable to record quality test results
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to master and apply the organizational and international quality management standards and rules, and assist in quality assurance and monitoring of the electrical and mechanical engineering works under supervision.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Understand general quality management courses and training programmes
2. Code	EMELQM101A
3. Range	Applicable to the quality management of electrical works. Understand the functions of general quality management courses and training programmes.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 International standards for general quality management, basic objectives and function of quality management courses and training programmes.</p> <ul style="list-style-type: none"> ◆ Understand the international standards for general quality management such as ISO 9000 quality management and quality assurance series of standards. ◆ Understand the objectives and functions of general quality management courses and training programmes such as training the ability of quality testing and quality control programmes. <p>6.2 Understand basic objectives and functions of general quality management courses and training programmes</p> <ul style="list-style-type: none"> ◆ Understand the key points of ISO 9000 quality management and quality assurance series standards ◆ Understand the objectives, functions and details of general quality management courses and training programmes ◆ Perform quality management for electrical works under instruction
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the international standards for general quality management; and</p> <p>(ii) Capable to understand the objectives, functions and details of general quality management courses and training programmes to perform quality management for electrical works under instruction.</p>
8. Remarks	

1. Title	Understand the basic methods of dealing with customers' complaints
2. Code	EMELQM102A
3. Range	Applicable to the communication relevant to electrical work and the response to customers' complaints about the quality of electrical installation work. Understand the importance of customers' complaints about product quality and assist in handling customers' complaints.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the basic methods of dealing with customers' complaints</p> <ul style="list-style-type: none"> ◆ Understand the importance of customers' complaints about product quality and the basic methods of dealing with customers' complaints including: <ul style="list-style-type: none"> • Listening to the complaint details • Write down accurately and briefly the details of the complaints • Method of investigation • Skills of responding to the complaints • Sentence structure, tone and format of the letters • Reporting mechanism <p>6.2 Assist in handling customers' complaint letters</p> <ul style="list-style-type: none"> ◆ Assist in responding to customers' complaint letters about the quality of electrical installations
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to understand the basic methods and the importance of dealing with customers' complaints.
8. Remarks	

**Competencies for Practitioners of
the Electrical Engineering Branch
in the Electrical & Mechanical Services
Industry**

Competency Level 2

1. Title	Select general electrical materials and electrical equipment
2. Code	EMCUDE204A
3. Range	Select general electrical materials and electrical equipment to perform electrical installation work.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Functions, properties and application conditions of general electrical materials and electrical equipment and devices</p> <ul style="list-style-type: none"> ◆ Understand the functions, properties and application conditions of general electrical materials and electrical equipment and devices, including: <ul style="list-style-type: none"> • General electrical materials <ul style="list-style-type: none"> ▸ Basic configuration, colour code, types, nominal, current-carrying capacity and skin effect of different cables ▸ Electrical materials generally used in wiring systems, such as switch, switch box, distribution board, metallic and non- metallic conduits, conduit accessories, trunking and trunking accessories, etc. ▸ Electrical materials generally used for motor control, such as electromagnetic switch, relay, timer, push-button switch, travel switch, overload protector, limit switch and water level controller, etc. ▸ Limitations of materials in voltage, current and temperature • General electrical equipment and devices <ul style="list-style-type: none"> ▸ General power supply and distribution equipment such as transformer, distribution board, busbar system and rising main ▸ General electrical equipment for buildings, such as electric pump and lighting, etc. <p>6.2 Select general electrical materials and electrical equipment and devices</p> <ul style="list-style-type: none"> ◆ Capable to select general electrical materials and electrical equipment correctly for electrical installation work according to the application requirements as well as the functions, properties and limitations of the materials and equipment ◆ Capable to select and check the materials and equipment in order to ensure that they comply with the safety standards and specifications

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to select general electrical materials and electrical equipment and devices correctly for general power distribution systems for buildings and building services installations according to the application requirements and ensure that they comply with the safety specifications.</p>
8. Remarks	<p>This unit of competency is applicable to electrical and mechanical practitioners in general.</p>

1. Title	Use computer to draw electrical drawings
2. Code	EMCUDE213A
3. Range	Use typical computer software to draw electrical drawings for electrical and mechanical work according to design.
4. Level	2
5. Credit	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Computer drawing techniques and methods ♦ Understand the computer drawing techniques and methods, including the knowledge of drawing specifications, electrical wiring symbols and layout</p> <p>6.2 Application of computer drawing ♦ Use the computer to lay down the drawing specifications</p> <ul style="list-style-type: none"> • Set the drawing specifications • Use all types of lines, layers and typeface • Open and save file <p>♦ Use the computer to draw geometric figures and electrical symbols</p> <p>♦ Use the computer to draw electrical drawings according to design</p> <ul style="list-style-type: none"> • Draw the main circuit layout according to the circuit design • Draw the wiring layout according to design • Draw the control circuit layout according to design
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use computer to draw the main circuit, wiring and control circuit layouts for a whole power system unit of a multi-storey building with general requirements and specifications according to design.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic computer knowledge.

1. Title	Master the basic design concept and the details of the shop drawings of various kinds of extra-low voltage installations of buildings
2. Code	EMELDE201A
3. Range	Applicable to the design and installation work of extra-low voltage installations of buildings. Understand the basic design concept and the key points of the shop drawings of various kinds of extra-low voltage installations of buildings.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the basic design concept and the details of the shop drawings of various kinds of extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Understand the basic organization of various kinds of extra-low voltage installations of buildings such as: <ul style="list-style-type: none"> • Security system • Intercom system • CCTV • Public antenna • Satellite TV ◆ Understand the wiring system and connection of various kinds of extra-low voltage installations of buildings ◆ Understand the wiring arrangement of extra-low voltage installations ◆ Understand the power supply of extra-low voltage installations ◆ Understand the details of the shop drawings various kinds of extra-low voltage installations of buildings such as: <ul style="list-style-type: none"> • Circuit diagram • Wiring diagram • Assembly diagram • Layout plan <p>6.2 Master the basic design concept and key points of various kinds of extra-low voltage installations of buildings according to the details of shop drawings</p> <ul style="list-style-type: none"> ◆ Master the basic structure, wiring arrangement and wiring system of various kinds of extra-low voltage installations of buildings ◆ Master the power supply of extra-low voltage installations ◆ Master the content and key points of the shop drawings various kinds of extra-low voltage installations of buildings
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to understand the basic design concept of various kinds of extra-low voltage installations of buildings; and (ii) Capable to master the details of the shop drawings of various kinds of extra-low voltage installations of buildings, to receive and convey instructions on, and perform installation tasks for various kinds of extra-low voltage installations of buildings under instruction.
8. Remarks	

1. Title	Implement simple site investigations for the purpose of designing electrical installations
2. Code	EMELDE205A
3. Range	Understand the characteristics and constraints of the general electrical installation site locations and implement simple site investigations for the purpose of designing electrical installations.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Read and understand architectural floor plans of buildings</p> <ul style="list-style-type: none"> ◆ Read and understand simple construction drawings such as floor plans of buildings, framing diagrams, and opening layout diagrams ◆ Understand what to note for simple building plan drawings <p>6.2 Carry out simple site investigations</p> <ul style="list-style-type: none"> ◆ Use measuring instruments properly to measure soil resistivity, path for transporting electrical equipment, etc. ◆ Investigate initially the characteristics and constraints of the site location according to the design of electrical equipment or systems ◆ Investigate initially the characteristics and constraints of the site location, and compile a simple report to be used for the design of electrical installations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the scope of application of relevant building plan drawings;</p> <p>(ii) Capable to master the design of electrical equipment or systems and investigate initially the characteristics and constraints of the site location; and</p> <p>(iii) Capable to write simple site investigation reports for record.</p>
8. Remarks	

1. Title	Assess the performance of simple AC/DC circuits
2. Code	EMELDE206A
3. Range	Applicable to electrical and mechanical design. Apply commonly used electrical theories to assess the performance of simple AC/DC circuits.
4. Level	2
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand commonly used electrical theories</p> <ul style="list-style-type: none"> ◆ Understand commonly used electrical theories such as: Ohm's law, Kirchhoff's law, superposition principle, Thevenin's theorem and Norton's theorem <p>6.2 Apply commonly used electrical theories to assess the performance of simple AC/DC circuits</p> <ul style="list-style-type: none"> ◆ Apply knowledge relevant to inductive impedance, capacitive impedance and circuit impedance ◆ Apply knowledge relevant to current source and voltage source ◆ Draw simple phaser diagrams ◆ Apply commonly used electrical theories to assess the performance of simple AC/DC circuits
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to apply commonly used electrical theories to calculate the voltage, current, power and power factor of AC/ DC circuits of series-connected resistors and/or parallel-connected resistors, and assess the performance of simple AC/DC circuits; and</p> <p>(ii) Capable to draw simple voltage and current phaser diagrams.</p>
8. Remarks	

1. Title	Select appropriate AC/DC motors for electrical and mechanical installations
2. Code	EMELDE207A
3. Range	Applicable to AC/DC motors design. Apply basic operating principles of simple AC/DC motors to assess general operation performance of the motors for general electrical and mechanical work, such as water pumps of buildings.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand simple AC/DC motor principles</p> <ul style="list-style-type: none"> ◆ Understand basic operating principles of single-phase and three-phase AC motors ◆ Understand the relationship between speed and torque of AC/DC motors ◆ Understand the current difference between star connection and delta connection of three-phase AC motors ◆ Understand the relationship between starting methods of DC motors and current <p>6.2 Select appropriate AC/DC motors for electrical and mechanical installations</p> <ul style="list-style-type: none"> ◆ Calculate the power, current and voltage of AC/DC motors ◆ Assess general operation performance of AC/DC motors, such as the relationship between speed and torque, efficiency and power factor ◆ Assess the performance of general starting methods for AC/DC motors, such as direct starting, star-delta starting, etc. ◆ Select appropriate AC/DC motors for electrical and mechanical installations
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to select appropriate type of motors for electrical and mechanical installations.
8. Remarks	

1. Title	Draw schematic single-line diagrams for simple low voltage power supply systems
2. Code	EMELDE208A
3. Range	Applicable to the design of low voltage electrical work. Understand the design concept of basic electrical installation power supply, and draw, according to the design, schematic single-line diagrams of simple low voltage power supply systems directly fed by low voltage underground distribution cables.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the design concept of the basic electrical installation power supply and method of drawing single-line diagrams</p> <ul style="list-style-type: none"> ◆ Understand the basic design concept of low voltage power systems directly fed by low voltage underground distribution cables ◆ Know about the method of drawing schematic single-line diagrams of power systems <p>6.2 Draw schematic diagrams of simple low voltage power systems according to design</p> <ul style="list-style-type: none"> ◆ Draw, according to the design, schematic single-line diagrams of simple low voltage power systems directly fed by low voltage underground distribution cables using: <ul style="list-style-type: none"> • Latest international standard electrical drawing symbols • Techniques of designing and drawing general schematic single-line diagrams
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to draw schematic single-line diagrams for the simple low voltage power systems.
8. Remarks	

1. Title	Master the basic design concept of neon installations
2. Code	EMELDE211A
3. Range	Applicable to neon installation work. Master the design concept of power system from the power supply to the neon installation, and understand the operating principles and characteristics of single-phase and three-phase step-up transformers and neon gas under high voltage.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the basic design concept of neon installations</p> <ul style="list-style-type: none"> ◆ Know about the design concept of power system from the power supply to the neon installation ◆ Know about the operating principles and characteristics of single-phase and three-phase step-up wound transformers ◆ Know about the operating principles and characteristics of single-phase and three-phase step-up electronic transformers ◆ Understand the effect of high voltage on colour temperature and brightness of neon gas ◆ Understand the operating principles and characteristics of neon gas under high voltage ◆ Understand the colour and brightness generated by individual gas or chemical powder and the mixtures of gases or powders <p>6.2 Master the design concept and keypoints of the power systems of neon installations according to relevant electricity regulations and power circuit design drawings</p> <ul style="list-style-type: none"> ◆ Master the design concept and keypoints of the circuit diagram from the power supply to the neon installation circuit, including the overcurrent protection equipment and control circuits, according to relevant electricity regulations and power circuit design drawings
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the basic operating principles and characteristics of neon installations; and</p> <p>(ii) Capable to master the design concept and keypoints of the power systems of neon installations, and assist in the basic design of the power systems of neon installations under instruction.</p>
8. Remarks	

1. Title	Select distribution transformers for power supply to buildings or work sites
2. Code	EMELDE212A
3. Range	Applicable to electrical work. Understand the categories, basic construction and principles of distribution transformers; assess the total load current of facilities in buildings or worksites; and select appropriate distribution transformers in general conditions.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the categories, basic construction and principles of distribution transformers</p> <ul style="list-style-type: none"> ◆ Understand the categories and basic construction of distribution transformers such as auto-coupled and isolated; iron core-type and shell-type; single-phase and three-phase power supplies ◆ Understand the relationship of transformer power to voltage and current ◆ Understand the relationship of transformer turns ratio to voltage and current ◆ Understand the method of cooling transformer <p>6.2 Select distribution transformers for power supply</p> <ul style="list-style-type: none"> ◆ Assess the total load current of facilities in the building or worksite according to the types and distribution of branch circuit load ◆ Analyze the actual situation of the building or worksite, such as the total load current, reserve capacity, equipment transport, space for installation and repair, etc., and select appropriate distribution transformers for power supply to the building or worksite, ensuring that they meet the safety standards and legal requirements
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to select appropriate distribution transformers in general conditions according to the total load current requirement of the facilities in buildings or worksites.</p>
8. Remarks	

1. Title	Perform general electrical assembly and fitting
2. Code	EMCUIN201A
3. Range	Capable to perform general electrical assembly and fitting for electrical and mechanical engineering installation.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Requirements on general electrical assembly and fitting craftmanship</p> <ul style="list-style-type: none"> ◆ Understand the requirements on general electrical assembly and fitting craftmanship, including: <ul style="list-style-type: none"> • Mastering general electrical assembly and fitting craftmanship • Knowing how to use general electrical fitting tools • Understanding the physical properties and fitting methods of different metals <p>6.2 Implement general electrical assembly and fitting</p> <ul style="list-style-type: none"> ◆ Assist in general electrical assembly and fitting work in non live conditions under supervision by using all kinds of basis electrical materials, electrical equipment, tools, etc. ◆ Implement general electrical equipment assembly and fitting for low-voltage power supply system, such as: <ul style="list-style-type: none"> • Main switch and distribution board assembly • Power unit installation and base adjustment • Dismantlement, assembly and calibration of low-voltage cabinet • Busbar system assembly, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the technical requirements on general electrical assembly and fitting craftmanship; and</p> <p>(ii) Capable to implement general electrical assembly and fitting.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Assemble power unit according to installation drawing
2. Code	EMCUIN205A
3. Range	Assemble the power unit in its installation venue according to the installation drawing as well as the actual situation of the work site.
4. Level	2
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Content of document and drawing for general power unit installation</p> <ul style="list-style-type: none"> ◆ Understand the content of drawing for general power unit installation, including the unit assembly drawing, guidelines for unit installation, acceptance specifications for the unit installation, etc. <p>6.2 Perform general power unit assembly</p> <ul style="list-style-type: none"> ◆ Examine the actual restrictions of the work site and plan for the power unit installation procedures, including safety issues, according to the work site situation ◆ Know how to use appropriate tools to perform general power unit assembly ◆ Know how to use appropriate measuring tools to ensure that the power unit installation meets the specifications for acceptance
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to assemble general power units safely and efficiently according to specified installation specifications, manufacturer’s assembly and design drawings as well as the actual situation of the site.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Perform routine wiring tasks		
2. Code	EMCUIN208A		
3. Range	Apply the techniques of electrical wiring and the understanding of relevant code of practice in routine wiring tasks for electrical and mechanical works.		
4. Level	2		
5. Credit	9		
6. Competency	<p style="text-align: right;"><u>Performance Requirements</u></p> <p>6.1 General principles of electrical wiring ♦ Understand the basic requirements, code of practice and relevant standards for wiring, including:</p> <ul style="list-style-type: none"> • Uses and installation methods of conduits and trunkings • Techniques for installation of low voltage sheathed cables and armoured cables • Code of practice for wiring, such as identification of markings • Insulation and continuity testing • Methods of circuit terminal connection <p>6.2 Perform regular wiring tasks ♦ Make electrical wiring conduits according to instructions</p> <ul style="list-style-type: none"> • Use relevant techniques and conduit cutting, bending and assembling tools to make metallic conduits for electrical wiring according to requirements • Make PVC wiring conduits • Install wiring conduits correctly <p>♦ Make electrical wiring trunkings according to instructions</p> <ul style="list-style-type: none"> • Use relevant techniques and trunking cutting and assembling tools to make metallic trunkings for electrical wiring, according to requirements • Make earthing arrangement correctly • Install wiring trunkings correctly <p>♦ Make electrical wiring trunkings according to instructions</p> <ul style="list-style-type: none"> • Install low voltage sheathed cables and armoured cables correctly <p>♦ Undertake electrical wiring properly according to instructions</p> <ul style="list-style-type: none"> • Classify electrical circuits properly according to wiring requirements and the code of practices • Apply relevant techniques in electrical wiring • Attach correct identification markings to cables 		

	<ul style="list-style-type: none"> ◆ Perform insulation and continuity tests for circuits according to instructions <ul style="list-style-type: none"> • Use an insulation tester and continuity tester to perform insulation and continuity tests for circuits according to relevant code of practice and standards • Undertake terminal connection of circuits • Use proper assembling tools and termination accessories to connect cables to electrical devices
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to install wiring for general electrical equipment and systems correctly and safely according to instructions, wiring requirements and the code of practice; make conduits and trunkings, undertake wiring work, install low voltage metal-sheathed cables and armoured cables; and carry out terminal connection and validity tests.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical knowledge.</p>

1. Title	Replace mechanical parts and devices of electric motors
2. Code	EMCUIN221A
3. Range	Capable to replace mechanical parts and devices of electric motors in electrical and mechanical workshops or worksites.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of motor machinery ♦ Understand the operating principles of motor machinery and method of replacing the mechanical parts and devices</p> <p>6.2 Mechanical parts and devices of electric motors ♦ Operate mechanical parts and devices of an electric motor, such as the driving units like bearing, connector, gear, etc., and replace mechanical parts and devices of the motor</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the principles and methods of operating motor machinery; and</p> <p>(ii) Capable to replace mechanical parts and devices safely of the specified motor.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Repair and rewind single-phase motors
2. Code	EMELIN201A
3. Range	Repair and rewind single-phase motors at electric motor repair workshops.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of single-phase motors</p> <ul style="list-style-type: none"> ◆ Understand the construction, types, working principles and scope of application of single-phase motors, including: <ul style="list-style-type: none"> • Split-phase induction motor • Split-phase capacitance motor • Shaded-pole motor • Repulsion motor • Universal-type motor ◆ Understand the winding design of single-phase motor, including number of slots for each pole, number of winds, method of winding connection, etc. ◆ Understand guidelines on repairing and rewinding single-phase motors <p>6.2 Examine, repair and rewind single-phase motors</p> <ul style="list-style-type: none"> ◆ Examine the faults of single-phase motor according to working guidelines, such as: <ul style="list-style-type: none"> • short circuit fault • open circuit fault • earth fault • wrong wiring • bearing fault ◆ Dismantle and assemble single-phase motor ◆ Examine centrifugal switch and replace bearing ◆ Master the techniques of repairing single-phase motors, know the causes of faults and repair them according to procedures ◆ Rewind single-phase motors according to working guidelines <ul style="list-style-type: none"> • Hand wind and wind with wood former for single-phase motors • Rewind single-phase motors, including: <ul style="list-style-type: none"> ▸ Dismantling electric motors and recording original winding information ▸ Making wood formers for winding

	<ul style="list-style-type: none"> › Winding, coils setting, connecting north and south pole of coils › Winding, wrapping and tappings › Re-assembling › Inspecting and testing <p>6.3 Professionalism in repairing and rewinding single-phase motors ♦ Follow the regulations and safety guidelines for the industry to ensure that the rewound single-phase motors can be used safely</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to repair and rewind single-phase motors according to working guidelines.</p>
8. Remarks	

1. Title	Fabricate busbars and switchboard enclosures
2. Code	EMELIN202A
3. Range	Applicable to the installation of electric switchboards. Carry out busbar fabrication, steel plate bending and switchboard enclosure fabrication according to shop drawings.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about techniques and requirements for sheet metal work</p> <ul style="list-style-type: none"> ◆ Know about the tools for sheet metal work such as plate bending machine, tube bending machine, shearing machine tool, file, try square, marking needle ◆ Know about the techniques and requirements for sheet metal work <p>6.2 Fabricate busbars and switchboard enclosures</p> <ul style="list-style-type: none"> ◆ Carry out the procedures of assembling and fabricating busbars, steel plates and switchboard enclosures, such as trimming and bending them, according to the requirements of switchboard enclosures and busbar fabrication diagrams
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the techniques for sheet metal work; and</p> <p>(ii) Capable to carry out the procedures of assembling and fabricating busbars, steel plates and switchboard enclosures, such as trimming and bending them, according to the requirements of switchboard enclosures and busbar fabrication diagrams.</p>
8. Remarks	

1. Title	Install neon installations and various kinds of basic wiring systems
2. Code	EMELIN205A
3. Range	Applicable to general neon installations inside and outside the buildings. Carry out installation of low voltage power supply systems to neon installations and various kinds of basic wiring systems.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about installation principles for neon installations</p> <ul style="list-style-type: none"> ◆ Understand the principles of high voltage discharge lighting appliances ◆ Understand the installation techniques and legal requirements for electrical installations from low voltage distribution board to final circuits, and the Guide on Erection & Maintenance of Advertising Signs issued by the Building Department <p>6.2 Install various kinds of basic wiring systems</p> <ul style="list-style-type: none"> ◆ Carry out neon installation work according to the actual situation of worksite ◆ Install basic wiring systems as required according to the actual situation of worksite and space constraints of all kinds <p>6.3 Professionalism in installing neon installations</p> <ul style="list-style-type: none"> ◆ Ensure that the neon installations abide by the regulations and safety guidelines for the industry
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to install simple neon installations according to the actual situation of worksite; and</p> <p>(ii) Capable to install various kinds of basic wiring systems according to the actual situation of worksite.</p>
8. Remarks	

1. Title	Implement simple site investigations for the purpose of installing electrical installations
2. Code	EMELIN209A
3. Range	Understand the characteristics and constraints of the electrical installation site locations and assist in site investigations for the purpose of installing electrical installations.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Read and understand electrical installation drawings</p> <ul style="list-style-type: none"> ◆ Understand major worksite requirements and concerns of electrical installation drawings such as the length, width and height of floor rooms, beam positions and opening requirements <p>6.2 Carry out simple site investigations</p> <ul style="list-style-type: none"> ◆ Use measuring instruments properly to measure platform level, path for transporting electrical equipment, etc. ◆ Investigate initially the characteristics and constraints of the site location according to the installation procedures of electrical equipment or systems ◆ Investigate initially the characteristics and constraints of the site location, and compile a simple report to be used for the installation of electrical installations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the application list of relevant construction drawings;</p> <p>(ii) Capable to master the installation of electrical equipment or systems and investigate initially the characteristics and constraints of the site location; and</p> <p>(iii) Capable to write simple site investigation reports for record.</p>
8. Remarks	

1. Title	Install simple extra-low voltage installations of buildings
2. Code	EMELIN211A
3. Range	Master the shop drawings and installation specifications of simple extra-low voltage installations of buildings and carry out the installation of various kinds of extra-low voltage installations of buildings.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the basic combination, the details of shop drawings and installation requirements for various kinds of extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Understand common electrical symbols for extra-low voltage installations of buildings ◆ Understand various kinds of drawings of simple extra-low voltage installations of buildings and their functions, such as system diagram, circuit diagram, wiring diagram, equipment layout diagrams ◆ Understand the basic combination and installation requirements for various kinds of extra-low voltage installations of buildings, such as wire type, specifications and technical standard for wiring: TIA/EIA-568A, etc. <p>6.2 Carry out installation of various kinds of extra-low voltage installations of buildings according to relevant legal or contract requirements</p> <ul style="list-style-type: none"> ◆ Follow the details and requirements of installation diagrams for various kinds of extra-low voltage installations of buildings to work out: <ul style="list-style-type: none"> • Installation plan and schedule • List of materials required • List of tools required ◆ Select appropriate materials, tools and procedures for the installation of extra-low voltage installations of buildings according to the contract terms and drawings for various kinds of installations as well as relevant standards and installation codes such as the code of practice of the Office of the Telecommunications Authority
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the basic combination and installation requirements for extra-low voltage installations of buildings specified; and</p> <p>(ii) Capable to apply relevant contract terms, standards and codes to select appropriate materials, tools and procedures for the installation of extra-low voltage installations of buildings.</p>
8. Remarks	

1. Title	Install simple neon installations
2. Code	EMELIN212A
3. Range	Applicable to general neon installations inside and outside the buildings. Understand power equipment and installation arrangements, and use general neon materials and tools to carry out the installation of simple neon installations according to the details of installation drawings.
4. Level	2
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the installation requirements, procedures, and application of tools and materials for neon installations, and the details of various kinds of drawings</p> <ul style="list-style-type: none"> ◆ Understand common electrical symbols for neon installations ◆ Understand various kinds of drawings of neon installations and their functions, such as system diagram, circuit diagrams, wiring diagrams, equipment layout diagrams ◆ Master the general installation requirements, power equipment installation arrangements and electrical work safety procedures for power supply systems of neon installations according to relevant chapters and sections of electricity regulations ◆ Understand the general installation requirements for neon installation structures, basic installation procedures and implementation plan for neon installations according to the Guide on Erection & Maintenance of Advertising Signs issued by the Building Department ◆ Understand the application of general neon materials and tools including: neon gas, neon tube materials, step-up transformers, neon gas injector, heating facilities, cables, conduits, trunking, protection devices, etc. <p>6.2 Carry out installation of simple neon installations according to the details of various kinds of installation diagrams and requirement details</p> <ul style="list-style-type: none"> ◆ Follow the details and requirements of installation diagrams for simple neon installations to work out: <ul style="list-style-type: none"> • Installation plan and schedule • List of materials required • List of tools required ◆ Carry out installation of simple neon installations according to the installation diagrams <p>6.3 Professionalism in installing neon installations</p> <ul style="list-style-type: none"> ◆ Ensure that the neon installations abide by the regulations and safety guidelines for the industry and can be used safely
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use general neon materials and tools to carry out the installation of simple neon installations according to the details of installation diagrams and installation requirements.</p>
8. Remarks	

1. Title	Install control and starter circuits for general low voltage motors
2. Code	EMELIN213A
3. Range	Install control and starter circuit devices in control boxes, and carry out basic connection for control and starter circuits of general low voltage electric motors or small generators at installation and repair locations according to motor control and starter circuit diagrams.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Functions, construction and working principles of control and starter circuits for general low voltage electric motors or small generators</p> <ul style="list-style-type: none"> ◆ Understand the functions and construction of general motor control and starter circuits such as power on and off push-button switch control, timing control, positioning control, multi-point start/stop control, jog control, one-way starter control, 2-way starter control, direct starter, star-delta starter and relevant protection circuits ◆ Understand the operating principles of general motor control and starter circuit diagrams and circuit numbering system ◆ Understand the installation and connection methods in general motor control and starter circuit diagrams <p>6.2 Implement the installation and connection methods and procedures for basic control and starter circuits of general motors</p> <ul style="list-style-type: none"> ◆ Install and connect basic circuits for general motor control and starter according to diagrams ◆ Perform basic function tests for general motor control and starter circuits <p>6.3 Professionalism in basic connection of general motor control and starter circuits</p> <ul style="list-style-type: none"> ◆ Follow the Code of Practice for the Electricity (Wiring) Regulations to connect basic circuits for general motor control and starter
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to install and connect basic circuits for general motor control and starter according to diagrams and relevant codes of practice; and</p> <p>(ii) Capable to perform basic function tests for general motor control and starter circuits.</p>
8. Remarks	

1. Title	Apply commonly used regulations and international standards relevant to electrical installations
2. Code	EMCUIT203A
3. Range	Apply the Electricity (Wiring) Regulations and their Code of Practice, the power supply regulations of the electricity company, and relevant international standards for electrical installations to arrange for simple electricity supply equipment installation where the electrical and mechanical inspection, commissioning and testing works are involved.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Commonly used regulations and international standards relevant to electrical installations</p> <ul style="list-style-type: none"> ◆ Understand commonly used regulations and international standards relevant to electrical installations, such as: <ul style="list-style-type: none"> • Electricity Ordinance of Hong Kong, Electricity (Registration) Regulations, Electricity (Wiring) Regulations and their Code of Practice, Electrical Products (Safety) Regulation, etc. <p>6.2 Apply commonly used regulations and international standards relevant to electrical installations to perform electrical and mechanical work</p> <ul style="list-style-type: none"> ◆ Understand all contract terms and drawings, and apply commonly used regulations and international standards relevant to electrical installations to perform the installation of low-voltage distribution underground cable direct electricity supply system, including the design, installation, inspection, commissioning, testing, running, repair and maintenance, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply commonly used regulations and international standards relevant to electrical installations to arrange for the design, installation, inspection, commissioning, testing, running, repair and maintenance, etc. of the electricity supply network and installation work.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Inspect general electrical installation and fitting
2. Code	EMELIT201A
3. Range	Applicable to general electrical installation and fitting. Carry out general inspection on electrical equipment after installation and fitting according to relevant codes of practice or contract requirements.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand relevant codes of practice or contract requirements on inspection specifications, and general electrical installation and fitting tools and instruments</p> <ul style="list-style-type: none"> ◆ Understand relevant codes of practice or contract requirements on inspection specifications including: leveling, alignment, tightness, smoothness, etc. ◆ Understand various types of testing instruments for electrical fitting such as clamp meter, insulation resistance tester, digital and pointer-type multi-meter ◆ Understand various types of testing tools for electrical installation and fitting such as feeler gauge, speed meter, level, callipers and torque wrench <p>6.2 Carry out general electrical installation and fitting inspection</p> <ul style="list-style-type: none"> ◆ Use various types of testing instruments to inspect electrical installation and fitting performance ◆ Master the actual situation and constraints of the worksite and their effects on the electrical installation and fitting ◆ Master general electrical installation and fitting operation failure and carry out electrical installation and fitting inspection to find out the causes
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the methods of using general electrical fitting tools and instruments; and</p> <p>(ii) Capable to carry out general electrical installation and fitting inspection.</p>
8. Remarks	

1. Title	Inspect busbars and switchboard enclosures
2. Code	EMELIT203A
3. Range	Perform inspection for the fabrication and assembly of busbars and steel enclosures of switchboards at switchboard fabrication workshops or switch rooms.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand keypoints for busbar and switchboard enclosure inspection</p> <ul style="list-style-type: none"> ◆ Understand the mechanical structure of switchboard enclosures ◆ Understand the keypoints for busbar and switchboard enclosure inspection according to relevant international standards <p>6.2 Carry out electrical or mechanical structural inspection on busbars and switchboard enclosures according to relevant international standards</p> <ul style="list-style-type: none"> ◆ Use general testing instruments such as micro-resistance tester and insulation tester to conduct the following tests on busbar assembly: <ul style="list-style-type: none"> • Visual inspection • Insulation resistance test • Micro-resistance test • Tightness test of bolts to connection surface ◆ Use various types of switchboard enclosure testing tools such as feeler gauge, level, callipers and weigh meter to conduct the following tests: <ul style="list-style-type: none"> • Visual inspection • Level inspection • Alignment inspection • Bolt tightness inspectio
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to apply simple theories and operating principles of switchboard and relevant international standards to inspect the standard of busbar assemblies; and</p> <p>(ii) Capable to apply simple principles of switchboard mechanical structure and relevant international standards to inspect the assembly and sheet metal quality for switchboard enclosures.</p>
8. Remarks	

1. Title	Inspect, test and commission simple extra-low voltage installations of buildings
2. Code	EMELIT204A
3. Range	Carry out inspection, testing and commissioning on simple extra-low voltage installations of buildings according to relevant technical indicators.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about various kinds of relevant technical indicators for extra-low voltage installations of buildings</p> <p>6.2 Carry out inspection, testing and commissioning of simple extra-low voltage installations of buildings according to client's requirements</p> <p>◆ Understand various kinds of technical indicators, including the performance of installations, installation specifications and various kinds of performance indicators, according to drawings of extra-low voltage installations of buildings, installation equipment, and supplier's manuals of operation and maintenance</p> <p>◆ Use appropriate instruments and tools to inspect, test and commission simple extra-low voltage installations of buildings according to client's requirements including contract specifications and relevant installation standards and codes</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the technical indicators of specified extra-low voltage installations of buildings; and</p> <p>(ii) Capable to use appropriate instruments and tools to inspect, test and commission simple installations.</p>
8. Remarks	

1. Title	Detect underground power cables
2. Code	EMELIT210A
3. Range	Detect underground power cables at general worksites according to underground power cable layout plans, and record the results and formulate guidelines for road excavation.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the basic principles and methods of detecting underground cables</p> <ul style="list-style-type: none"> ◆ Know about the nature and uses of various kinds of power cables buried underground ◆ Know about the basic principles of detecting underground cables including electromagnetic fundamentals, interference of other underground facilities, passive mode detection, active mode detection, etc. ◆ Understand the details of drawings of underground facilities ◆ Understand the basic principles of detecting underground cables, including: passive mode detection, active mode detection, etc. ◆ Know about the methods and code of practice for topographic survey and field marking ◆ Master the methods of collecting effective survey data including that of: <ul style="list-style-type: none"> • underground cable alignment position • underground cable movement direction • underground cables depth measurement ◆ Master the method of drawing sketches and actual layout plans of underground cables <p>6.2 Implement underground cable detection</p> <ul style="list-style-type: none"> ◆ Implement underground cable detection according to the details of the underground power cable layout plan <ul style="list-style-type: none"> • site boundary perimeter scan technique • site boundary Z-scan technique • confirmation of underground cable alignment position • confirmation of underground cable movement direction • underground cable depth measurement

	<ul style="list-style-type: none"> ◆ Record the detection results and formulate guidelines for road excavation, including the quantity, alignment position, movement direction and depth of underground cables; safety precautions, etc. ◆ Follow the regulations and relevant codes of practice to ensure that underground cable installations are correctly located, and properly protected against damage
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to implement underground cable detection according to the layout plans of underground power cables; and (ii) Capable to record underground cable detection results and formulate guidelines for road excavation.
8. Remarks	

1. Title	Use basic tools and instruments to inspect, test and commission neon installations
2. Code	EMELIT211A
3. Range	Use basic tools and testing instruments to inspect, test and commission simple neon installations at workshops or external worksites according to contract requirements and relevant codes of practice.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the use of basic tools and testing instruments, the operating principles of neon installations, codes of practice and shop drawings</p> <ul style="list-style-type: none"> ◆ Understand the requirements on inspecting, testing and commissioning neon installations, including the requirements of the Code of Practice for the Electricity (Wiring) Regulations, the Guide on Advertisement Signs issued by the Buildings Department, client’s contracts and international standards ◆ Understand the use of basic tools and testing instruments ◆ Understand the operating principles of neon installations, relevant codes of practice, guidelines and shop drawings <p>6.2 Carry out inspection, testing and commissioning on neon installations</p> <ul style="list-style-type: none"> ◆ Carry out inspection, testing and commissioning on neon installations, including: <ul style="list-style-type: none"> • Inspecting the point of strength, torque and elements of lever mechanics of the neon installations to achieve the maximum security strength • Inspect and test wiring installation • Inspect and commission the air pressure and support of neon tube • Test control and safety circuit <p>6.3 Professionalism in inspecting, testing and commissioning neon installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that neon installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand various commissioning indicators for the inspection, testing and commissioning of neon installations; and</p> <p>(ii) Capable to use basic tools and testing instruments to inspect, test and commission neon installations.</p>
8. Remarks	

1. Title	Service generators and accessories	
2. Code	EMCUMA205A	
3. Range	Use typical servicing and inspection instruments and tools or tailor-made mechanical tools to repair or maintain single-phase or three-phase AC and DC generators and accessories at generator and accessories servicing workshops or locations with generators.	
4. Level	2	
5. Credit	4	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and working principles of generators and accessories</p> <ul style="list-style-type: none"> ◆ Understand the structure and working principles of single-phase or three-phase AC and DC generators, including: <ul style="list-style-type: none"> • Stator and winding • Rotor and winding • Exciter winding rectifier • Other kinds of winding e.g. interpole freed compensation • Mechanical parts e.g. bearing • Commutator ◆ Understand the structure and working principles of generator accessories, including: <ul style="list-style-type: none"> • Charging device • Battery <p>6.2 Methods and procedures of servicing generators and accessories</p> <ul style="list-style-type: none"> ◆ Capable to service a generator effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to service generator accessories effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to test various devices of generator accessories according to standards ◆ Capable to use typical servicing and inspection instruments and tools or tailor-made tools for generator installation and dismantling effectively <p>6.3 Professionalism in repairing and maintaining generators and accessories</p> <ul style="list-style-type: none"> ◆ Capable to perform general repair and maintenance of generators and accessories according to servicing instructions and standards ◆ Understand the legal requirements on work safety and the code of practice when performing repair and maintenance of generators and accessories 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to check and maintain a three-phase generator effectively and correctly according to servicing standards; and (ii) Capable to commission and set various core accessories effectively.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of servicing electrical equipment.</p>

1. Title	Service control, protection and indicator of generators	
2. Code	EMCUMA206A	
3. Range	Use typical servicing and inspection instruments and tools to repair, maintain and set control, protection and indicator of single-phase or three-phase AC and DC generators at servicing workshops or locations with generators according to servicing instructions and standards.	
4. Level	2	
5. Credit	4	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles of control, protection and indicator of generators</p> <ul style="list-style-type: none"> ◆ Understand the working principles of control, protection and indicator of single-phase or three-phase AC and DC generators, including: <ul style="list-style-type: none"> • Output voltage control • Load regulator • Speed regulator ◆ Understand the working principles of control, protection and indicator of generators, including: <ul style="list-style-type: none"> • Output voltage protection • Short circuit protection • Leakage protection • Unbalanced load protection • Overspeed protection • Output voltage, current and frequency indication • Other relevant output data indication <p>6.2 Methods and procedures of servicing control, protection and indicator of generators</p> <ul style="list-style-type: none"> ◆ Capable to service control, protection and indicator of single-phase or three-phase AC and DC generators effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to test and set control, protection and indicator of generators according to standards ◆ Capable to use typical servicing and inspection instruments and tools effectively <p>6.3 Professionalism in repairing and maintaining control, protection and indicator of generators</p> <ul style="list-style-type: none"> ◆ Capable to perform general repair and maintenance of control, protection and indicator of generators according to servicing instructions and standards ◆ Understand the legal requirements on work safety and the code of practice when performing repair and maintenance of control, protection and indicator of generators 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to check, maintain and set control, protection and indicator of three-phase generator effectively and correctly according to servicing standards; and (ii) Capable to commission and set various control, protection and indicator effectively.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of servicing electrical equipment.</p>

1. Title	Master the construction, working principles, operation, repair and maintenance of various kinds of electrical products
2. Code	EMELOR202A
3. Range	Master the construction, working principles, operation, repair and maintenance of various kinds of electrical products.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the construction and working principles of various kinds of electrical products</p> <ul style="list-style-type: none"> ◆ Understand the basic construction and working principles of various kinds of electrical products including electric heating products, small electric motors and refrigeration products ◆ Understand basic operation, repair and maintenance of various kinds of electrical products <p>6.2 Master general operation, repair and maintenance of various kinds of electrical products</p> <ul style="list-style-type: none"> ◆ Understand various types of electrical products using thermal effects of current, such as electric oven, electric water heater, hot melt machine and electric stove ◆ Understand the basic construction and working principles of general small electric motors and related electrical products such as exhaust fan, portable power drill, power saw and grinding machine ◆ Understand the working principles of mechanical refrigeration system, and electrical products using cooling circulation system, such as: refrigerator, water cooler, dehumidifier and air-conditioner ◆ Master the operation, repair and maintenance of various kinds of electrical products, including regular inspection ◆ Master the causes, troubleshooting and repair of 跳火, short circuit, overheat and overcurrent of general electrical products
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the construction and working principles of various kinds of electrical products; and</p> <p>(ii) Capable to master the operation, repair and maintenance of various kinds of electrical products.</p>
8. Remarks	

1. Title	Perform the operation, repair and maintenance for simple extra-low voltage installations of buildings
2. Code	EMELOR204A
3. Range	Perform the operation, repair and maintenance for simple extra-low voltage installations of buildings.
4. Level	2
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the content of diagrams and operation and maintenance manuals of simple extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Understand the content of diagrams of simple extra-low voltage installations of buildings such as: system diagram, circuit diagram and wiring diagram ◆ Understand the content of operation and maintenance manuals of simple extra-low voltage installations of buildings ◆ Understand the techniques and procedures of operating, repairing and maintaining simple extra-low voltage installations of buildings <p>6.2 Perform the operation, repair and maintenance of simple extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Use appropriate instruments and tools to perform the operation, repair and maintenance for simple extra-low voltage installations of buildings according to simple installation plans, methods and procedures listed in supplier's manuals of operation and maintenance
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand the content of diagrams and operation and maintenance manuals of simple extra-low voltage installations of buildings, and perform the operation, repair and maintenance for specified extra-low voltage installations of buildings.</p>
8. Remarks	

1. Title	Perform the operation, repair and maintenance for neon installations
2. Code	EMELOR205A
3. Range	Perform the operation, repair and maintenance for neon installations at external neon installation sites.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about normal operation, faults, repair, maintenance and troubleshooting of neon installations and equipment</p> <ul style="list-style-type: none"> ◆ Understand normal operation and different faults of neon installations and equipment such as transformer fault, control circuit fault, high voltage switch mechanical fault, cable fault and neon tube aging ◆ Understand methods for regular repair and maintenance of neon installations, including cleaning, arranging, examining, testing and completing records of them <p>6.2 Perform the operation, repair and maintenance for neon installations</p> <ul style="list-style-type: none"> ◆ Follow the Code of Practice for the Electricity (Wiring) Regulations to perform the operation, repair and maintenance for neon installations. Neon installations facilities and devices include transformers, switches, control circuits, protection devices and neon tubes ◆ Master the operation and faults of different neon installations and equipment ◆ Follow the Guide on Erection & Maintenance of Advertising Signs issued by the Building Department to perform repair and maintenance for neon installation structures ◆ Use appropriate instruments and different tracking methods to troubleshoot and restore neon installations <p>6.3 Professionalism in operating, repairing and maintaining neon installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that neon installations can be used safely
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to perform the operation, repair and maintenance for neon installations and devices.
8. Remarks	

1. Title	Perform the operation, repair and maintenance for simple low voltage power systems and associated installations
2. Code	EMELOR207A
3. Range	Applicable to the operation, fault repair and maintenance of low voltage power systems directly fed by low voltage underground distribution cables. Perform maintenance for simple low voltage power systems and associated installations according to maintenance plans, and carry out general fault repair and electrical equipment operation.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the process of operation and basic repair and maintenance concepts for simple low voltage power systems and associated installations directly fed by low voltage underground distribution cables</p> <ul style="list-style-type: none"> ◆ Understand the procedures and method of operating, repairing and maintaining simple low voltage power systems and associated installations directly fed by low voltage underground distribution cables according to codes of repair and maintenance as well as relevant circuit diagrams, including cleaning, operating, arranging, examining, testing, repairing, replacing parts and completing records of them ◆ Understand the meanings of symbols and tabulated data and circuit logic of various types of power supply schematic single-line diagrams and control circuit diagrams for operation ◆ Understand materials used for general electrical installations, such as the specifications and using methods of cables, conduits, trunking, protective devices, circuit breaker, contactor, rising mains ◆ Understand the daily records of operation log <p>6.2 Perform regular maintenance and testing, trouble shoot and make rectifications</p> <ul style="list-style-type: none"> ◆ Perform regular maintenance for simple low voltage power systems and associated installations according to established plans and procedures, including: including cleaning, assembling and disassembling, arranging, replacing accessories, examining, testing, calibrating and completing records of them ◆ Use simple instruments to detect the faults of low voltage power systems and associated installations of simple low voltage electrical installations by means of inspection, measuring and tracking according to circuit diagrams/manuals ◆ Troubleshoot and find out the cause of fault to prevent same faults happening again

	<p>6.3 Professionalism in operating, repairing and maintaining low voltage distribution equipment</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that low voltage distribution equipment can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to perform regular inspection and maintenance for simple low voltage power systems and associated installations according to established maintenance plans; and (ii) Capable to troubleshoot default installations.
8. Remarks	

1. Title	Find out general faults in various types of low voltage electrical installations
2. Code	EMELOR209A
3. Range	Applicable in worksites with low voltage electrical installations. Use various types of basic fault finding methods to find out general faults in low voltage electrical installations.
4. Level	2
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and operating principles of general electrical installations</p> <ul style="list-style-type: none"> ◆ Understand the structure and operating principles of general electrical installations, including: <ul style="list-style-type: none"> • Structure and operating principles of simple electrical installations • Operating principles of simple power supply circuits <p>6.2 Find out faults in low voltage electrical installations</p> <ul style="list-style-type: none"> ◆ Through observation, such as by means of visual, smell and hearing, examine the fault of electrical equipment and make preliminary judgement ◆ Use instrument testing method to find faults <ul style="list-style-type: none"> • Use various types of simple instruments to measure and evaluate the operation or fault conditions for electrical installations and equipment • Use various types of simple instruments for tracking measurement according to circuit diagrams in order to detect the faults
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to find out the faults in low voltage electrical installations, equipment or circuits correctly through observation or using the methods of tracking measurement.</p>
8. Remarks	

1. Title	Repair control and starter circuits of general low voltage motors
2. Code	EMELOR210A
3. Range	Repair power control components and starter circuits of electric motor equipment like general low voltage electric motors or small generators at installation or repairing sites.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Types, functions, construction and working principles of power control components of general electric motor equipment</p> <ul style="list-style-type: none"> ◆ Use Ohm’s law to calculate simple DC and AC circuits ◆ Understand how to connect single-phase power systems and three-phase power systems ◆ Understand the types, functions, construction and working principles of overload protectors, electromagnetic contactors and time relays <p>6.2 Methods and procedures of repairing and maintaining power control components and starter circuits of general electric motor equipment</p> <ul style="list-style-type: none"> ◆ Repair and maintain overload protectors, electromagnetic contactors and time relays ◆ Repair and maintain self-holding (self-locking) circuits, interlock control circuits and sequence starter circuits ◆ Perform basic function tests for general motor control and starter circuits <p>6.3 Professionalism in repairing and maintaining power control components and starter circuits of general electric motor equipment</p> <ul style="list-style-type: none"> ◆ Follow the Code of Practice for the Electricity (Wiring) Regulations to repair and maintain power control components and starter circuits of general electric motor equipment safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to repair and maintain power control and protection components and starter circuits of general electric motor equipment according to drawings; and</p> <p>(ii) Capable to follow relevant codes of practice when performing electrical work.</p>
8. Remarks	

1. Title	Repair and maintain electrical products
2. Code	EMELOR211A
3. Range	Carry out examinations and tests on faulty electrical products to detect the faults and repair and maintain them at customer service center or electrical appliance repair workshops.
4. Level	2
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand functions and operational performance characteristics of various kinds of electrical products</p> <ul style="list-style-type: none"> ◆ Understand the functions, controlling methods and operational performance characteristics of various kinds of electrical products ◆ Understand the mechanical structure, circuit principle and regulations of various kinds of electrical products such as electric cooker, oven, water heater, portable power drill, jigsaw and lighting appliances ◆ Understand the functions of popular hand tools and instruments ◆ Understand the methods of repairing and maintaining various kinds of electrical products <p>6.2 Repair and maintain electrical products</p> <ul style="list-style-type: none"> ◆ Analyze the faults of electrical products such as: <ul style="list-style-type: none"> • Difficulty in starting • Abnormal turning speed • Noise during operation • Overheat of electrical products • Burnt smell • Smoke • Not functioning ◆ Employ visual inspection, insulation resistance test, resistance test, etc. and apply the working principles of electrical products to detect the faults of electrical products ◆ Carry out maintenance for various kinds of electrical products, including: <ul style="list-style-type: none"> • Lubricating the turning parts • Cleaning the filters regularly ◆ Select appropriate hand tools to disassemble components of electrical products ◆ Follow the circuit diagrams and manuals and use instruments and various measuring methods to detect the mechanical or electrical faults of electrical products ◆ Troubleshoot and replace damaged parts ◆ Reassemble and perform tests before and after power on

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to conduct inspection, testing, repair, maintenance, troubleshooting, parts replacement and testing for electrical products according to their functions and operational performance characteristics.
8. Remarks	

1. Title	Make simple plans for general low voltage electrical installation projects
2. Code	EMELPM201A
3. Range	Applicable to project management of electrical installations. Make simple plans, budgets, estimates of materials and completion time for general low voltage electrical installation projects directly fed by low voltage underground distribution cables.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand basic methods of formulating simple project management plans ♦ Understand the basic methods of formulating simple project management plans, including:</p> <ul style="list-style-type: none"> • Assessing the amount of materials • Estimate of manpower • Assessing the completion time <p>6.2 Plan, estimate and assess materials required and completion time ♦ Make simple plans for general low voltage electrical installation projects directly fed by low voltage underground distribution cables, including:</p> <ul style="list-style-type: none"> • Assessing the amount of materials • Estimate of manpower • Assessing the completion time for each work process
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Formulate simple project management plans for general low voltage electrical installation projects.
8. Remarks	

1. Title	Apply effective communication skills in discussions of electrical and mechanical issues
2. Code	EMCUOM204A
3. Range	With regard to electrical and mechanical operation management, apply effective communication skills to actively discuss, exchange ideas and respond to electrical and mechanical related issues (e.g. design, installation, inspection, commissioning, testing, running, repair, maintenance, occupational safety and health, project management, quality management, sales and marketing, etc.).
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Effective communication skills</p> <ul style="list-style-type: none"> ◆ Understand effective communication skills, including speaking skill, listening skill, summarizing skill and interpersonal skill ◆ Understand the functions of different communication media / tools <ul style="list-style-type: none"> • Using email or fax • Using telephone for liaison and communication • Holding meetings, etc. ◆ Understand common terminology and technical terms used in the electrical and mechanical engineering services industry <p>6.2 Understand work scope of the electrical and mechanical services, and apply effective communication skills to exchange ideas and foster discussion</p> <ul style="list-style-type: none"> ◆ Understand the work scope of the electrical and mechanical services, such as design, installation, inspection, commissioning, testing, running, repair, maintenance, occupational safety and health, project management, quality management, sales and marketing, etc.; and be capable to apply effective communication skills to exchange ideas and foster discussion so as to achieve the purpose of idea exchange and information delivery
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply effective communication skills and common terminology and technical terms used in the industry to take part in the discussion of electrical and mechanical issues.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Know about common Chinese terminologies of electrical and mechanical services
2. Code	EMCUOM207A
3. Range	Capable to identify common Chinese terminologies and basic technical terms of electrical and mechanical services to meet basic need of daily operation in order to communicate effectively and complete the specified tasks in electrical and mechanical workplaces.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about common Chinese terminologies of electrical and mechanical services</p> <ul style="list-style-type: none"> ◆ Know about common Chinese terminologies and basic technical terms of the following electrical and mechanical branches: <ul style="list-style-type: none"> • Railway electrical and mechanical engineering • Electrical engineering • Air-conditioning and refrigeration engineering • Lift and escalator engineering • Gas engineering • Fire services • Plumbing services • Mechanical (plant) engineering • Ship repair engineering • Aircraft engineering <p>6.2 Apply common Chinese terminologies of electrical and mechanical services in daily work</p> <ul style="list-style-type: none"> ◆ Apply common Chinese terminologies of electrical and mechanical services in daily work to communicate effectively in order to complete the specified tasks
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand common Chinese terminologies and basic technical terms of electrical and mechanical services; and</p> <p>(ii) Capable to apply common Chinese terminologies of electrical and mechanical services in daily work to communicate effectively in order to complete the specified tasks.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of Chinese language.

1. Title	Perform basic tasks of operation for low voltage electrical installation projects
2. Code	EMELOM201A
3. Range	Applicable to the operation management of electrical installation projects directly powered by low voltage underground distribution cables. Implement operational routines and crisis measures, including deployment and logistics of capital, manpower, materials, tools and instruments, for simple electrical installation projects.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand basic way of operation , concept and crisis measures for general low voltage electrical projects</p> <ul style="list-style-type: none"> ◆ Understand the basic way of operation and crisis measures for electrical projects directly powered by low voltage underground distribution cables including: <ul style="list-style-type: none"> • Basic capital flow management • Basic human resources management • Basic division of work of engineering personnel • Process flow management • Logistic management of general materials, tools , instruments • General crisis measures <p>6.2 Implement basic operations and crisis measures for low voltage electrical installation projects</p> <ul style="list-style-type: none"> ◆ Implement the basic operations for electrical installation projects directly powered by low voltage underground distribution cables such as: <ul style="list-style-type: none"> • Basic quotation procedures • Procedures for project implementation • Logistic management of general materials, tools , instruments • Basic procurement procedures • Basic human management • Division of work, responsibilities and authority of engineering personnel • Basic project budget • Project schedule , application of flow chart ◆ Correctly select and implement default crisis measures in emergencies
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to implement the basic operations for general low voltage electrical installation projects; and</p> <p>(ii) Capable to correctly select and implement default crisis measures according to different incidents.</p>
8. Remarks	

1. Title	Implement basic operational arrangements of low voltage electrical installations
2. Code	EMELOM203A
3. Range	Implement basic operational arrangements, including: deployment and logistics of manpower , materials, tools and instruments, for the management of electrical installation projects directly powered by low voltage underground distribution cables
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: right;"><u>Performance Requirements</u></p> <p>6.1 Understand different conditions of low voltage electrical installation projects</p> <ul style="list-style-type: none"> ◆ Understand different conditions for the progress of distribution installation projects directly powered by low voltage underground distribution cables <p>6.2 Implement appropriate operational arrangements according to the progress of work</p> <ul style="list-style-type: none"> ◆ Implement resource deployment or operational arrangements for electrical installations powered by low voltage underground distribution cables according to the progress of work, such as: <ul style="list-style-type: none"> • Allocation of frontline personnel • Basic operational arrangements for project delay • Income and expenditure arrangements for completion of project • Logistic arrangements for general materials and basic installations
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement appropriate operational arrangements for small scale electrical installation projects according to the progress of work</p>
8. Remarks	

1. Title	Apply basic risk assessment methods
2. Code	EMCUSH205A
3. Range	Capable to apply basic risk assessment methods to perform basic risk assessment related to electrical and mechanical engineering in electrical and mechanical work sites.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic risk assessment methods</p> <ul style="list-style-type: none"> ◆ Understand basic risk assessment methods, including <ul style="list-style-type: none"> • Manual handling operation • Works in confined spaces • Work site hazards • Simple mechanism for risk grading • Risk assessment guidelines • Operating hazards analysis <p>6.2 Conduct basic risk assessment</p> <ul style="list-style-type: none"> ◆ Apply basic risk assessment methods to conduct simple risk assessment of the hazards and risks likely to occur in the electrical and mechanical work site, including the identification of hazards, the acceptability of risks, the clearance and minimization of risks, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply basic risk assessment methods to effectively conduct simple risk assessment related to electrical and mechanical engineering services.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge and competency of the following units of competency:</p> <p>EMCUSH108A Use general personal protective equipment</p> <p>EMCUSH109A Implement manual handling operation</p> <p>EMCUSH110A Safety operation in confined spaces</p> <p>EMCUSH111A Comply with the legal requirements on electrical and mechanical occupational safety and health.</p>

1. Title	Implement work site occupational health and safety management
2. Code	EMCUSH206A
3. Range	Apply basic occupational health and safety management in electrical and mechanical workshops or work sites to assist in performing work site occupational health and safety management so as to minimize the risks in work sites.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of occupational safety management</p> <ul style="list-style-type: none"> ◆ Understand general knowledge of occupational health and safety and its application ◆ Understand the basic requirements on occupational health and safety for general work sites <p>6.2 Application of basic occupational health and safety management</p> <ul style="list-style-type: none"> ◆ Capable to apply basic knowledge of occupational safety management to assist in performing occupational health and safety management in work sites so as to minimize the risks. Management items include: <ul style="list-style-type: none"> • Work site safety inspection • Follow-up of protective measures • Basic risk assessment • Follow-up investigation of accident • Assisting in safety promotion events • Assisting in the implementation of safety policy and management targets for the company or clients • Assisting in organizing group meetings
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to perform occupational health and safety management and implement management items correctly and effectively in electrical and mechanical workshops or work sites.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.

1. Title	Handle general industrial accidents
2. Code	EMCUSH208A
3. Range	Handle general industrial accidents in electrical and mechanical engineering workplaces according to the code of practice for industrial accidents.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Common industrial accidents</p> <ul style="list-style-type: none"> ◆ Understand types and causes of general industrial accidents, including: electric shock, fall of person, fire, burn, gas poisoning, explosion, contusion, etc. ◆ Understand ways of handling and preventing general industrial accidents, such as preventive measures, working guidelines, working permit system, emergency handling measures, safety management system, occupational safety and health scheme, personal protection facilities, etc. <p>6.2 Handle general industrial accidents</p> <ul style="list-style-type: none"> ◆ Capable to handle general industrial accidents on site, including adopting simple contingencies, according to the code of practice for accidents <p>6.3 Professionalism in handling industrial accidents</p> <ul style="list-style-type: none"> ◆ Handle general industrial accidents properly according to the requirements of the code of practice for industrial accidents ◆ Timely report to the supervisor
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand types and causes of general industrial accidents; and</p> <p>(ii) Capable to implement and complete measures on handling general industrial accidents, including adopting simple contingencies, according to the code of practice for accidents, and timely report to the supervisor.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.

1. Title	Obtain data and information of occupational safety and health and environmental protection to compile relevant statistics
2. Code	EMCUSH211A
3. Range	Obtain data and information of occupational safety and health and environmental protection, and use percentage and graphic data to make simple analysis and statistics.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Data and information of occupational safety and health and environmental protection</p> <ul style="list-style-type: none"> ◆ Understand how to use percentage and graphic data to make simple calculations and statistics for the performance of occupational safety and health and environmental protection <ul style="list-style-type: none"> • Analyze information and data of occupational safety and health and environmental protection; use percentage and graphs to make simple calculations and statistics based on the data obtained, and come up with simple conclusions <p>6.2 Compile relevant statistics according to data and information of occupational safety and health and environmental protection</p> <ul style="list-style-type: none"> ◆ Use percentage and graphs to compile relevant statistics based on the data and information of occupational safety and health and environmental protection ◆ Obtain data and information of occupational safety and health and environmental protection to compile relevant statistics, and come up with simple conclusions <ul style="list-style-type: none"> • Obtain data required from all kinds of engineering information including accident investigation report, risk assessment report, operational hazards analysis report, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to obtain data required from engineering information to make analysis for the performance of occupational safety and health and environmental protection; use percentage and graphs to compile statistics, and come up with simple conclusions</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic calculation knowledge.

1. Title	Implement preventive measures on general occupational safety and health
2. Code	EMCUSH212A
3. Range	Understand the characteristics and limitations of the workplace and take preventive measures on general occupational safety and health for occupational safety and avoid accidents in electrical and mechanical engineering workplaces.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Protection for general occupational safety and health</p> <ul style="list-style-type: none"> ◆ Understand ways for occupational safety and health, and hazards that may occur, and to prevent accidents ◆ Understand the restrictions of electrical and mechanical engineering workplace, and follow the safety working procedures to take effective protection steps for the following: <ul style="list-style-type: none"> • Work at height • Chemicals • Noisy environment • Biohazard • High humidity and temperature • Remote areas <p>6.2 Preventive measures on occupational safety and health</p> <ul style="list-style-type: none"> ◆ Implement preventive measures on general occupational safety and health according to safety legislations and working instructions for occupational safety and health and avoid accidents during electrical and mechanical engineering works. Preventive measures include: <ul style="list-style-type: none"> • Eye protector • Ear protector • Safety belt • Chemical handling procedures • Environmental hygiene, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Under different conditions/environments, choose different working procedures and use appropriate preventive measures on occupational safety and health so as to comply with the legal requirements and work safety instructions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.

1. Title	Gas test in confined spaces
2. Code	EMCUSH213A
3. Range	Conduct gas test in a confined electrical and mechanical engineering space according to work safety procedures, and decide whether the air condition of the confined space is safe to enter according to the test result.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of gas test</p> <ul style="list-style-type: none"> ◆ Understand the work safety procedures for gas test ◆ Know about the harmful gases generally existing in confined spaces like sewage. These gases include carbon oxide(CO), hydrogen sulphide(H₂S), methane(CH₄) and other flammable gases ◆ Know how to use appropriate test equipment and correct testing method ◆ Know how to calibrate and maintain test instruments and devices as advised by the manufacturers ◆ Know how to choose the location and way of obtaining samples from the confined space <p>6.2 Gas test</p> <ul style="list-style-type: none"> ◆ Follow the work safety procedures to test the gas, including the oxygen content in the air, and whether the oxygen consists of flammable, poisonous or harmful gases, smoke or vapour ◆ Use test instruments and devices correctly as advised by the manufacturers ◆ Calibrate and maintain test instruments and devices <p>6.3 Determine what types of gases need testing</p> <ul style="list-style-type: none"> ◆ Determine what types of gases need testing with reference to the characteristics of different confined spaces and items previously stored or now storing in these spaces
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to conduct gas test correctly with gas test instruments and devices in a confined electrical and mechanical engineering space according to work safety procedures to ensure that the environment is safe to enter.</p> <p>(ii) Capable to determine what types of gases need testing in different confined spaces.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of safety.

1. Title	Launch basic marketing and sales courses and training programmes
2. Code	EMELMS202A
3. Range	Applicable to marketing and sales of electrical equipment and engineering services. Launch basic marketing and sales courses and training programmes.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the details of electrical equipment or services to be sold, and relevant marketing and sales methods and operation of company system</p> <ul style="list-style-type: none"> ◆ Understand general information such as the functions, characteristics, prices and competitors of the electrical equipment or services to be sold ◆ Understand the operation of the basic marketing and sales system of the company <p>6.2 Launch basic marketing and sales courses and training programmes</p> <ul style="list-style-type: none"> ◆ Launch basic marketing and sales courses and training programmes according to supervisor's instructions, including: <ul style="list-style-type: none"> • Demonstrating the operation of various electrical equipment and services • Decorating the training venue • Producing promotional leaflets • Producing training handouts
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand general information on the electrical equipment or services to be sold; and</p> <p>(ii) Capable to launch general marketing and sales training plans according to supervisor's instructions.</p>
8. Remarks	

1. Title	Conduct market research to assist in marketing and sales
2. Code	EMELMS205A
3. Range	Applicable to marketing and sales of electrical equipment and engineering services. Conduct market research and know the characteristics and constraints of every market, and obtain necessary information so as to assist in marketing and sales work.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the characteristics, constraints and importance of general markets</p> <ul style="list-style-type: none"> ◆ Understand general market research methods ◆ Understand the characteristics, constraints and importance of general markets, such as: <ul style="list-style-type: none"> • Service scope for electrical works demanded by the market • Difference or hindrance in market culture, language and value • Legal requirements for different areas and markets <p>6.2 Conduct market research to assist in marketing and sales work</p> <ul style="list-style-type: none"> ◆ Conduct market research under instruction to obtain information needed and understand the characteristics, constraints and importance of target market to assist in marketing and sales work such as: <ul style="list-style-type: none"> • Service scope, demand and prices of electrical engineering services demanded by the market • Service scope, demand and prices of electrical equipment products demanded by the market • Changes in the market demand trend for electrical engineering services or electrical equipment products • Number of competitors in the market and market share • Difference or hindrance in market culture, language and value • Legal requirements for different areas and markets
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand market research methods and conduct general market research under instruction; and</p> <p>(ii) Capable to understand the characteristics, constraints and importance of target market in order to assist in marketing and sales work.</p>
8. Remarks	

**Competencies for Practitioners of
the Electrical Engineering Branch
in the Electrical & Mechanical Services
Industry**

Competency Level 3

1. Title	Use programmable logic controller (PLC) to write circuit control programme
2. Code	EMCUDE306A
3. Range	Use PLC high level programming commands to write circuit control programme for electrical and mechanical engineering design, and compare and upgrade the PLC control programme.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principles of computing and concept of information coding</p> <ul style="list-style-type: none"> ◆ Understand the principles of computing, including the conversion and arithmetics of binary number, decimal number, hexadecimal number ◆ Understand the concept of information coding, and the principles of binary coding (BCD code) and ASC II code <p>6.2 Use PLC to write circuit control programme and test it</p> <ul style="list-style-type: none"> ◆ Use PLC basic and high level programming commands to write control programme for general electrical and mechanical work, e.g. control circuit of the carpark vehicle access management system, control circuit of the automatic switching system for several water pumps, etc. ◆ Test, rectify and upgrade PLC control programme <ul style="list-style-type: none"> • Test the circuit control programme written with basic and high level programmed commands • Debug and rectify the PLC control programme • Compare and upgrade the PLC control programme
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use PLC basic and high level programming commands to write circuit control programme for general electrical and mechanical work according to the functional requirements, and test and debug the programme; and</p> <p>(ii) Capable to use PLC high level programming commands to upgrade the PLC control programme according to the functional requirements.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic computer knowledge.

1. Title	Apply diodes and transistors in electronic control circuits
2. Code	EMCUDE311A
3. Range	Understand the structure, properties and working principles of basic electronic components (diode and transistor); and use these components in rectifier, amplifying and logic circuits to meet the functional requirements of the control circuit design.
4. Level	3
5. Credit	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure, properties and working principles of diode and transistor</p> <ul style="list-style-type: none"> ◆ Understand the structure, properties and working principles of diode and transistor ◆ Understand the working principles of rectifier circuit and stabilizing circuit <p>6.2 Use diodes and transistors in electronic control circuits</p> <ul style="list-style-type: none"> ◆ Use diodes and related components to design the following electronic control circuits according to the functional requirements of the control circuit design <ul style="list-style-type: none"> • Bridge type rectifier circuit • stabilizing circuit ◆ Use transistors in amplifying circuit and switch circuits according to the functional requirements of the circuit design <ul style="list-style-type: none"> • Use transistors and related components to connect as an amplifying circuit based on the understanding in the structure of transistor and working principles of amplifying circuit and • Apply the following connecting methods to achieve different amplifying effects and results <ul style="list-style-type: none"> ▸ Common base connection ▸ Common emitter connection ▸ Common collector connection • Use transistors and related components to design a switch circuit according to the functional requirements of the circuit design

	<ul style="list-style-type: none"> ◆ Use diodes and transistors in logic circuits according to the functional requirements of the circuit design • Use diodes, transistors and related components to connect in the following logic circuits <ul style="list-style-type: none"> ▸ 'OR' Gate ▸ 'AND' Gate ▸ 'Not' Gate ▸ 'Exclusive OR' Circuit ▸ 'NAND' Gate ▸ 'NOR' Gate
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to design an electronic control circuit according to the functional requirements of the circuit design, with the functions of full wave rectification and stabilization, electronic control switch, logic control and signal amplification.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electricity.</p>

1. Title	Use computer to draw for complicated electrical engineering drawings
2. Code	EMCUDE316A
3. Range	Use computer to draw complicated electrical engineering drawings in electrical and mechanical workplaces.
4. Level	3
5. Credit	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Techniques and methods of using computer to draw electrical engineering drawings ♦ Understand the techniques and methods of using computer to draw complicated electrical engineering drawings</p> <p>6.2 Use computer to draw complicated mechanical engineering drawings ♦ Use the computer to draw complicated electrical engineering drawings according to design</p> <ul style="list-style-type: none"> • Draw the main circuit layout of multi-layer power system and electrical installation with protection device according to design • Draw the circuit wiring layout of multi-layer power system and electrical installation with protective and control equipment according to design • Draw the complex control circuit layout according to design <ul style="list-style-type: none"> ▸ Logic electronic circuit ▸ Electrical and electronic control equipment circuits
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to draw a main circuit layout, control circuit layout and wiring layout of an electrical installation, including the electrical and electronic control equipment, according to design; and</p> <p>(ii) Capable to integrate several electrical distribution and wiring layouts into a comprehensive power supply and wiring layout for a multi-storey building according to design.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of drawing basic electrical and mechanical drawings with computer.

1. Title	Use computer to draw combined services drawings of building services
2. Code	EMCUDE317A
3. Range	Use computer to draw combined services drawings of building services as electrical and mechanical engineering design is involved.
4. Level	3
5. Credit	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Computer engineering drawing techniques and methods</p> <ul style="list-style-type: none"> ◆ Understand the techniques and methods of using computer to draw combined services drawings of building services, including: <ul style="list-style-type: none"> • Setting layer rules for combined services drawings of building services • Difference between drawing the equipment on layout plan directly and drawing on external reference drawings • Management and application of external reference drawings • Setting of configuration and drawing specifications <p>6.2 Application of computer in engineering drawing</p> <ul style="list-style-type: none"> ◆ Use the computer to draw combined services drawings of building services, including: <ul style="list-style-type: none"> • Copy the electrical and mechanical drawing layer needed from an electrical and mechanical layout plan to another electrical and mechanical layout plan to form a combined services drawings of building services • Compile the drawing layer of electrical and mechanical facilities with reference to external sources • Use information saved in files or databank to improve the efficiency of drawing ◆ Retrieve, manage and apply external reference drawings efficiently
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to draw a combined services drawings of building services according to design by including and merging building services drawings of different floors of the building and form a comprehensive building services drawing ; and</p> <p>(ii) Capable to use information saved in files or databank, including the external reference drawings, to improve the efficiency of drawing.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of drawing basic electrical and mechanical drawings with computer.

1. Title	Choose typical materials for electrical and mechanical work
2. Code	EMCUDE318A
3. Range	Choose appropriate materials commonly used in electrical and mechanical work to perform the work of design, installation and repair.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Functions, properties and range of application of common electrical and mechanical materials</p> <ul style="list-style-type: none"> ◆ Understand the functions, properties and range of application of common metallic and non-metallic materials, including: <ul style="list-style-type: none"> • Physical properties and chemical properties such as electric induction, thermal induction, expansion and contraction, anti-corrosion, solubility, etc. • Mechanical properties such as strength, hardness, resilience, fatigue limit, high-temperature strength, etc. • Processing properties such as casting, extension, welding, machining, heat treatment, etc. • Understand the functions and range of application of common metallic and non-metallic materials, such as their functions, application conditions and limitations for applying to the branches of electricity, air-conditioning, ship repair machinery and plant engineering, etc. <p>6.2 Choose electrical and mechanical materials needed</p> <ul style="list-style-type: none"> ◆ Capable to choose appropriate materials commonly used in electrical and mechanical work according to their properties and range of application as well as the engineering requirements and specifications in order to perform the work of electrical and mechanical design, installation and repair ◆ Capable to choose and check the materials to ensure that they comply with the safety specifications
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to choose appropriate materials commonly used in electrical and mechanical work according to their functions, properties and range of applications as well as the safety specifications in order to perform the work of electrical and mechanical design, installation and repair.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical and mechanical materials.

1. Title	Apply basic AC and DC circuit theories to assess general design performance of electrical machines
2. Code	EMELDE301A
3. Range	Applicable to general electrical machinery design. Apply a series of knowledge relevant to the start-up of AC and DC circuits, transformers, electric motors and generators, etc. to assess the design performance of simple AC and DC circuits and general electrical machinery.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master basic AC and DC circuit calculations</p> <ul style="list-style-type: none"> ◆ Master basic DC circuit calculations such as the application of various kinds of basic circuit theories, properties of materials and resistance, temperature coefficient of conductors, voltage drop and electric power, etc. ◆ Master the calculations of circuit impedance, voltage, current, phase difference, power factor, and the application of basic circuit theories of AC circuits, etc. <p>6.2 Assess general electrical machinery and transformer design performance</p> <ul style="list-style-type: none"> ◆ Calculate the copper loss, core loss and mechanical loss of simple electrical machinery and transformers and understand the causes and improvements for the loss ◆ Understand electrical machinery the relationship between efficiency and the loss and use formulae to calculate the work efficiency of electrical machinery ◆ Assess design performance of simple electrical machinery in no load and full load conditions including: running current, starting current, output torque, input electric power, power factor control, turning speed, temperature rise, stable limit, output power, etc. ◆ Assess transformer input and output design performance
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to assess the design performance of simple electrical machinery; and (ii) Capable to assess the design performance of simple transformers.
8. Remarks	

1. Title	Apply basic AC and DC circuit theories to design simple extra-low voltage installations
2. Code	EMELDE302A
3. Range	Applicable to the design work for extra-low voltage installations of buildings. Apply basic knowledge of electricity and AC and DC circuit theories to design simple extra-low voltage installations of buildings.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand basic knowledge of electricity and AC and DC circuit theories</p> <ul style="list-style-type: none"> ◆ Understand basic knowledge of electricity relevant to AC and DC such as: impedance triangle and power triangle, voltage, current, active power, surface power and non-active power, etc. ◆ Understand basic AC and DC circuit theories such as: Kirchhoff's first and second law, Norton's theorem, etc. and calculate general AC circuits ◆ Understand phasor diagrams of AC circuits and use vector drawing method to calculate all branch current, voltage, etc. <p>6.2 Apply basic AC and DC theories to design simple extra-low voltage installation systems of buildings</p> <ul style="list-style-type: none"> ◆ Apply basic AC and DC theories to design simple extra-low voltage installation systems of buildings including: <ul style="list-style-type: none"> • Extra-low voltage electrical installations for medical use • Extra-low voltage installations inside buildings such as: communication system, CCTV, public antenna's power supply and wiring systems
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to apply basic knowledge of electricity and AC and DC circuit theories; and (ii) Capable to simple extra-low voltage installation systems of buildings.
8. Remarks	

1. Title	Draw schematic diagrams of various kinds of extra-low voltage installations of buildings
2. Code	EMELDE303A
3. Range	Applicable to the design work of extra-low voltage installations of buildings. Draw schematic diagrams of various kinds of extra-low voltage installations of buildings.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand various kinds of extra-low voltage installations of buildings ♦ Understand various kinds of extra-low voltage installations of buildings including:</p> <ul style="list-style-type: none"> • Difference of extra-low voltage installations and general low voltage electrical installations in design • Planning of extra-low voltage installations inside buildings • Equipment for extra-low voltage installations • The latest development of extra-low voltage products <p>6.2 Draw schematic single-line diagrams of various kinds of extra-low voltage installations of buildings ♦ Use basic techniques and symbols to draw schematic diagrams of various kinds of extra-low voltage installations of buildings such as:</p> <ul style="list-style-type: none"> • Security system • CCTV • Public antenna • Satellite TV system • Broadband network, etc.
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to understand various kinds of extra-low voltage installations of buildings ; and (ii) Capable to draw schematic single-line diagrams of various kinds of extra-low voltage installations of buildings.
8. Remarks	

1. Title	Master the design of various kinds of extra-low voltage installations of buildings
2. Code	EMELDE304A
3. Range	Applicable to the design work of extra-low voltage installations of buildings. Master the design of various kinds of extra-low voltage installations of buildings, including the arrangement and protection of installation wiring, technical requirements for various installation facilities and devices, etc..
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand various kinds of extra-low voltage installations of buildings and accessories</p> <ul style="list-style-type: none"> ◆ Understand various kinds of extra-low voltage installations of buildings and accessories including: <ul style="list-style-type: none"> • Extra-low voltage power supply systems of buildings • Security system • CCTV • Public antenna • Satellite TV system • Broadband network, etc. <p>6.2 Master various kinds of extra-low voltage designs for buildings</p> <ul style="list-style-type: none"> ◆ Master the design of various kinds of extra-low voltage installations of buildings including: <ul style="list-style-type: none"> • Technical requirements for the worksites of extra-low voltage installations of buildings • Skills in operating, testing and repairing equipment device of extra-low voltage systems of buildings • Wiring arrangement and system protection for extra-low voltage installations of buildings
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to master the design of various kinds of extra-low voltage installations of buildings, and perform relevant design tasks independently.
8. Remarks	

1. Title	Draw schematic diagrams of power supply from power system to neon installations
2. Code	EMELDE306A
3. Range	Applicable to neon installations electrical projects. Independently apply drawing techniques to draw schematic diagrams of power supply from power system to neon installations.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand common electrical symbols, basic arrangement and design requirements for electrical installations and the functions, relationship and importance of various kinds of drawings</p> <ul style="list-style-type: none"> ◆ Understand names and symbols of three-phase or single-phase components for power supply from distribution board to neon installations for different buildings, basic arrangement and design requirements for neon installations ◆ Understand and the functions, relationship and importance of various kinds of drawings such as: schematic diagrams of power supply, circuit diagrams, working diagrams, electrical installations layout plans, 3D assembly drawings, etc. <p>6.2 Draw schematic single-line power supply diagrams of neon installation power supply systems</p> <ul style="list-style-type: none"> ◆ Use drawing techniques to draw schematic single-line diagrams of three-phase or single-phase power supply systems for power supply from distribution board to neon installations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use electrical symbols to draw schematic single-line diagrams for power supply from distribution board to neon installations; and</p> <p>(ii) Capable to follow the specified requirements on electrical installation arrangement, protection system, design and assembly to draw suitable working diagrams of neon installations.</p>
8. Remarks	

1. Title	Master the installation and technical requirements for extra-low voltage installations of buildings
2. Code	EMELDE309A
3. Range	Master the installation of various kinds of extra-low voltage installations of buildings, including the assembly, installation technique and work site requirements for various installation facilities and devices, etc.
4. Level	3
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points for the installation of various kinds of extra-low voltage installations</p> <ul style="list-style-type: none"> ◆ Understand the key points for various kinds of extra-low voltage installations of buildings, including the composition, installation key points, circuit separation, system protection, etc. <p>6.2 Master technical requirements for installing various kinds of installations</p> <ul style="list-style-type: none"> ◆ Master technical requirements for installing various kinds of extra-low voltage installations of buildings, such as communication wiring standard, network standard, relevant regulations and codes of the Office of the Telecommunications Authority, etc. ◆ Select appropriate equipment and set the installation requirements according to information concerning the system requirements for various kinds of extra-low voltage installations of buildings, site constraints, approved standards and code of practice, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the installation techniques for various kinds of extra-low voltage installations of buildings; and</p> <p>(ii) Capable to select appropriate system equipment and set the installation requirements according to the design and site constraints for various kinds of extra-low voltage installations of buildings.</p>
8. Remarks	

1. Title	Master the design concept of high voltage distribution or generation installations
2. Code	EMELDE310A
3. Range	Applicable to the design work of high voltage distribution facilities (not including Power Generation Stations). Master the design concept of high voltage distribution or generation power supply installations, including the arrangement and basic protection of electrical installations.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the characteristics of general high voltage distribution facilities or generation installations</p> <ul style="list-style-type: none"> ◆ Know about the characteristics of general high voltage distribution or generation facilities, including current output, stability of operation, pressure proof, off flow, etc. <p>6.2 Master the design concept of high voltage distribution or generation installations</p> <ul style="list-style-type: none"> ◆ Master the design concept of high voltage distribution installations, including customer load, power demand, supplier's mode of power supply, high voltage distribution arrangement, protection installation requirement, earthing systems, lightning protection system, construction engineering requirements, etc. ◆ Master the design of high voltage generation installations, including methods of high voltage generation, control arrangement of power generation, synchronization arrangement of distribution network, generating capacity, high voltage distribution arrangement, protection installation requirement, earthing systems, lightning protection system, civil requirements, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to master the design concept of high voltage distribution or generation installations in order to perform installation and relevant tasks for the installations.</p>
8. Remarks	

1. Title	Draw schematic single-line diagrams for the power supply of simple high voltage distribution or generation systems
2. Code	EMELDE311A
3. Range	Applicable to the works of high voltage distribution or generation systems (not including Power Generation Stations). Know about the basic arrangement of high voltage distribution or generation systems and common electrical graphic symbols, and draw schematic single-line diagrams of simple power supply systems for high voltage distribution or generation.
4. Level	3
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the basic arrangement of high voltage distribution or generation systems and common electrical graphic symbols</p> <ul style="list-style-type: none"> ◆ Understand the basic arrangement of high voltage distribution system, such as distribution equipment, distribution equipment, protection system, etc. ◆ Understand the basic arrangement of generation system, such as generation equipment, distribution equipment, earthing arrangements, distribution equipment, protection system, etc. ◆ Understand the names and symbols of various kinds of high voltage distribution or generation equipment such as high voltage main switchboard, cables, transformers, electric motors, protection device, etc. <p>6.2 Draw single-line planning diagrams of simple power supply systems for high voltage distribution or generation</p> <ul style="list-style-type: none"> ◆ Master common techniques of drawing power systems, and draw schematic single-line diagrams of simple high voltage distribution or generation systems according to basic requirements for electrical drawings
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to draw schematic single-line diagrams of simple power supply systems for high voltage distribution or generation.
8. Remarks	

1. Title	Conform to regulations and international standards for designing high voltage distribution or generation installations
2. Code	EMELDE312A
3. Range	Applicable to engineering work of high voltage distribution or generation systems (not including Power Generation Stations). Design high voltage distribution power supply network or generation installations according to the Electricity (Wiring) Regulations and their Code of Practice, as well as relevant international standards for the products and services of electrical installation.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand international standards and main design specifications relevant to high voltage distribution or generation installations</p> <ul style="list-style-type: none"> ◆ Understand international standards relevant to high voltage distribution or generation installation products and services, including: <ul style="list-style-type: none"> • International Electric Community Standards (IEC) • British EU Standards (BSEN) • Chinese National Standard (GB) ◆ Understand main specifications relevant to the design of high voltage distribution or generation installations, including: current capacity, protection, control and interlocking arrangements of distribution or generation equipment, earthing arrangements, supplier's specifications for the design of distribution or generation installations, codes of practice for distribution or generation installations, codes of practice for energy efficiency, environmental protection regulations, fire services regulations, etc. <p>6.2 Carry out general design of high voltage distribution power supply network or generation installations</p> <ul style="list-style-type: none"> ◆ Carry out general design of high voltage distribution power supply network or generation installations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand international standards relevant to specific high voltage distribution or generation installation products and services; and</p> <p>(ii) Capable to carry out general design of high voltage distribution or generation installations.</p>
8. Remarks	

1. Title	Master data and information to conduct analyses on electrical engineering projects
2. Code	EMELDE313A
3. Range	Applicable to tasks related to electrical projects. Make reference to regulations, international standards, data and information provided by professional organizations like engineering institutions, etc., and skillfully use various types of different and non-common data and information obtained at work sites for electrical engineering calculations and analyses of familiar engineering projects.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master necessary power system data and information ♦ Make reference to publications of government, research bodies, engineering institutions, etc. and master relevant data and information including:</p> <ul style="list-style-type: none"> • Power demand distribution of different buildings • Safety and stability of electrical equipment • Durability • Power consumption of different loads • Energy efficiency of electrical equipment <p>6.2 Use relevant power system data and information to conduct analyses on engineering projects ♦ Use various types of different and non-common data and information obtained at work sites for calculations and analyses of electrical projects, including the following areas:</p> <ul style="list-style-type: none"> • Maximum power demand of the installation • Area and locations for transformer room, main switch room, meter room, electrical pipes and backup generator room • Safety facilities and backup power supply • Size of backup generator • Energy consumption of electrical and mechanical facilities • Human resources and costs required in every stage of the project • Time required for preliminary study, design, work implementation, testing and commissioning for the project • Human resources and costs involved in operation, repair and maintenance after completion of project • Quality assurance data

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to use data and information to analyze works and specified areas of the engineering project.
8. Remarks	

1. Title	Assess the performance of DC and single-phase AC circuits
2. Code	EMELDE314A
3. Range	Apply basic electrical theories to assess the performance of DC and single-phase AC circuits for general electrical works, such as finding cable faults and selecting cables.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand basic circuit theories ♦ Understand basic AC and DC circuit theories including: Ohm's law, Kirchhoff's law, superposition principle, Thevenin's theorem, Norton's theorem and delta/star conversion techniques</p> <p>6.2 Apply common electrical theories and circuit conversion techniques to assess the performance of DC and single-phase AC circuits ♦ Apply common electrical theories and circuit conversion techniques to assess the performance of DC and single-phase AC circuits including;</p> <ul style="list-style-type: none"> • Voltage, current, circuit impedance and power • Phase angle and power factor in voltage and current phasers • Draw phaser diagrams • Effect of the phase difference between voltage and current on power
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply basic circuit theory to assess the performance of AC/DC circuits.</p>
8. Remarks	

1. Title	Assess the performance of three-phase AC circuits
2. Code	EMELDE315A
3. Range	Apply basic electrical theories to assess the performance of three-phase AC circuits for general electrical and mechanical works, such as: finding cable faults and selecting cables, assessing the loading conditions of three-phase circuits and current distribution, etc.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand basic AC circuits theories ♦ Understand basic AC and DC circuit theories including: the voltage, current, circuit impedance, power and power factor of three-phase three-wire balanced load AC circuits and three-phase four-wire unbalanced load circuits</p> <p>6.2 Assess the performance of three-phase AC circuits ♦ Apply basic AC circuits theories to assess the performance three-phase AC circuits including:</p> <ul style="list-style-type: none"> • The relationship between line voltage and phase voltage of three-phase three-wire star and delta connection load, the relationship between line current and phase current, and drawing relevant phaser diagrams • Data of voltage, current, circuit impedance, power and power factor of three-phase three-wire star and delta connected balanced load circuits (max. two electrical components per phase load), and drawing relevant phaser diagrams • Data of voltage, current, circuit impedance, power and power factor of three-phase four-wire star connected unbalanced load circuits(max. two electrical components per phase load), and drawing relevant phaser diagrams
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to apply basic AC circuit theories to assess the performance of three-phase balanced power system in various aspects; and</p> <p>(ii) Capable to apply basic AC circuit theories to assess the performance of three-phase unbalanced power systems in various aspects.</p>
8. Remarks	

1. Title	Assess the performance of AC/DC motors
2. Code	EMELDE316A
3. Range	Apply basic AC/DC circuit theories to assess the performance of AC/DC motors for general electrical and mechanical work such as large-scale compressors and exhaust fan.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand common AC/DC circuit theories and basic characteristics of general motors</p> <ul style="list-style-type: none"> ◆ Understand common AC/DC circuit theories ◆ Understand the classification of common motor types ◆ Understand basic characteristics of general DC motors, including magnetic flux, the relationship between speed, torque and voltage, armature reaction and its effects ◆ Understand basic characteristics of general AC motors, including torque characteristics of single-phase motors, synchronous speed of three-phase motors, the relationship between slip and speed <p>6.2 Apply basic AC/DC circuit theories to assess the performance of AC/DC motors</p> <ul style="list-style-type: none"> ◆ DC motors : draw the circuits of separately-excited, series-excited, shunt-excited and compound-excited DC motors, and assess the data of basic electrical, magnetic and mechanical performance ◆ Single-phase motors : master torque characteristics of single-phase electric motors, and understand their start-up characteristics ◆ Three-phase motors : <ul style="list-style-type: none"> • Calculate the synchronous speed of three-phase motors, and calculate the relationship between slip and speed • Use torque-speed characteristic diagram to understand steady-state operating points of three-phase motors
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to apply basic AC/DC circuit theories to assess the data of basic electrical, magnetic and mechanical performance of common AC/DC, single-phase and three-phase motors.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of “EMELDE207A - Select appropriate AC/DC motors for electrical and mechanical installations”.

1. Title	Assess the performance of transformers
2. Code	EMELDE317A
3. Range	Applicable to electrical work. Understand the basic classification and construction of transformers, and use turns ratio to assess the current and voltage output of common power transformers.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand basic electromagnetic principles</p> <ul style="list-style-type: none"> ◆ Understand exciting current, flux density, magnetic field strength, iron loss and copper loss ◆ Understand the relationship between exciting current and iron loss ◆ Understand the relationship of iron loss to voltage and frequency ◆ Understand turns ration of transformers <p>6.2 Understand the basic classification and construction of transformers, and use turns ratio to assess the current and voltage output of transformers</p> <ul style="list-style-type: none"> ◆ Understand the basic classification and construction of transformers ◆ Understand methods of cooling transformers ◆ Understand basic transformers principles ◆ Use turns ratio to assess the current and voltage output of transformers
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency is:</p> <p>(i) Capable to understand the operating principle of single-phase transformers and use turns ratio to assess the current and voltage output of transformers.</p>
8. Remarks	

1. Title	Assess the performance of power electronic control circuits
2. Code	EMELDE318A
3. Range	Assess the pertaining performance of common power electronic control circuits for general electrical and mechanical work, such as variable speed drive, soft starter and uninterruptible power supply system.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand common power electronics semiconductor devices ♦ Understand the characteristics of common power electronics individual components such as silicon-controlled rectifier (SCR), triode for alternating current (TRIAC) and transistor</p> <p>6.2 Understand the control principle of power electronic control circuits and assess the performance of power electronic control circuits ♦ Use simple input waveform graph to understand the current and voltage characteristics of power electronic switching components and the effect of gate current on them so as to control the load current</p> <p>♦ Calculate the voltage and current waveform at different point of the control circuit</p> <p>♦ Calculate the switching frequency, maximum current, etc. that the components can bear</p> <p>♦ Assess the performance of power electronic control circuits</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the conductivity of common power electronic switching components;</p> <p>(ii) Capable to calculate the voltage and current data at different points of the power electronic control circuits, and draw their waveforms; and</p> <p>(iii) Capable to assess the performance of power electronic control circuits.</p>
8. Remarks	

1. Title	Design neon installation systems
2. Code	EMELDE319A
3. Range	Applicable to designing neon installations. Master the arrangement and protection concept of electrical installations, techniques for various neon facilities and devices, various site constraints, etc. and design neon installation systems.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand local legal requirements on the design of neon installations</p> <ul style="list-style-type: none"> ◆ Follow local electricity regulations and Buildings Department’s guidelines on the installation and repairs of advertising signs, and understand the legal requirements on the design of neon installations in different work site environments including external walls, indoor, roofs of buildings, places of entertainment, etc. ◆ Understand the basic requirements of Code of Practice for the Electricity (Wiring) Regulations on the design of neon installations power supply systems ◆ Understand neon installations the design concept of such as: site requirements, supporting structures, other supporting frames and repair ladder racks, etc. of neon installations <p>6.2 Design power supply systems of neon installations</p> <ul style="list-style-type: none"> ◆ Design supporting structures for neon installations ◆ Design power supply and protection systems of neon installations, such as overcurrent protectors and earthing arrangement, neon tube control and protection circuit arrangement, wiring arrangement for electrical installations, etc. ◆ Draw various shop drawings of neon installations including: <ul style="list-style-type: none"> • Neon tube control and protection circuits • Circuit diagrams of electrical installations • Electrical installation layout plans • Shop drawings of electrical installations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to design supporting structures of neon installations;</p> <p>(ii) Capable to design power supply systems of neon installations; and</p> <p>(iii) Capable to draw various shop drawings of neon installations.</p>
8. Remarks	

1. Title	Design specific motor control and starter circuits
2. Code	EMELDE320A
3. Range	Applicable to electrical equipment system control design. Design appropriate electric machine control, protection and starter circuits according to the specific operational requirements for electric machine control and startup, and properly arrange the configuration, wiring and circuit terminal coding of circuit components inside and on the surface of the control cabinet.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of operating various kinds of motor control circuits</p> <ul style="list-style-type: none"> ◆ Master the operational requirements for various kinds of single-phase and three-phase electrical equipment systems ◆ Master the working principles of various kinds of control and protection circuits and working properties of relevant components ◆ Master the working principles of various kinds of electric machine starter circuits and technical requirements for relevant components ◆ Master the techniques of drawing motor control and starter circuit diagrams <p>6.2 Design specific electric machine control, protection and starter circuits</p> <ul style="list-style-type: none"> ◆ Design single-phase and three-phase electric machine control, protection and starter circuits, including to : <ul style="list-style-type: none"> • Design and draw electric machine control, protection and starter circuit diagrams, such as power control, electrical interlocking, sequential control and starter circuits, etc. • Design and draw the configuration, wiring and circuit terminal coding of circuit components of control cabinet • Calculate the quantity of materials required for control, protection and starter circuits and estimate the capacity grades <p>6.3 Professionalism in handling electrical equipment control, protection and starter circuits</p> <ul style="list-style-type: none"> ◆ Follow the Code of Practice for the Electricity (Wiring) Regulations to design various kinds of electric machine control, protection and starter circuits
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to design control, protection and starter circuits according to the specific operational requirements for electrical equipment control and startup.
8. Remarks	

1. Title	Design basic low voltage power supply systems
2. Code	EMELDE321A
3. Range	Applicable to the design, installation and project management of electrical work. Implement the basic design of low voltage power supply systems directly fed by low voltage underground distribution cables, including relevant power supply arrangement and protection and control circuits.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Interpret the basic design of low voltage power supply systems ♦ Interpret the basic design concept related to the power supply arrangement, protection and control circuits, wiring method and various kinds of final circuits of low voltage power systems directly fed by low voltage underground distribution cables, such as:</p> <ul style="list-style-type: none"> • Circuit isolation, circuit organization management, classification of circuits • Over-current protection and earthing fault protection • Earthing system • Calculation of current demand and selection of cables • Surface wiring system • Concealed wiring system • Ring and radial socket circuits • Various kinds of lighting circuits <p>6.2 Implement basic distribution and final circuit design for low voltage electrical installations according to low power system design requirements ♦ Implement the design of basic distribution and final circuits for low voltage electrical installations according to low voltage power system design and legal requirements, such as the distribution arrangement, protection and control circuits, wiring method, earthing system, various kinds of final circuits</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to interpret the basic design concept of low voltage power systems directly fed by low voltage underground distribution cables; and</p> <p>(ii) Capable to implement the design of basic distribution and final circuits for low voltage electrical installations.</p>
8. Remarks	

1. Title	Analyze electrical engineering data and information
2. Code	EMELDE322A
3. Range	Applicable to electrical and mechanical engineering design. Obtain electrical engineering data and information and perform design and analyses according to relevant regulations and guidelines on design from organizations such as engineering societies, etc.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Electrical engineering data and information</p> <ul style="list-style-type: none"> ◆ Follow electrical engineering design details, and understand relevant regulations, guidelines on design from organizations such as engineering societies, etc. and electrical engineering data and information <ul style="list-style-type: none"> • Relevant technical guidelines include: <ul style="list-style-type: none"> ▸ Electricity (Wiring) Regulations and their code of practice ▸ IEE Wiring Regulations (BS7671) ▸ Relevant design guidelines by Institute of Building Services Engineers ▸ Electrical and Mechanical Services Department's codes of practice for energy efficiency of lighting and electrical installations to formulate energy consumption indicators and benchmarks • Electrical engineering data and information such as: <ul style="list-style-type: none"> ▸ Demand of major electrical and mechanical facilities e.g. air-conditioning and ventilating systems, lifts, fire service and water pumps, etc. ▸ Estimate the installation's maximum power demand (kVA/m²) according to the uses of the building ▸ Expected short-circuit current of the source of supply of the installation ▸ Earth fault loop impedance of the system outside the installation ▸ Safety facilities and backup power supply, etc.

	<p>6.2 Analyze electrical engineering data and information</p> <ul style="list-style-type: none"> ◆ Obtain electrical engineering data and information and perform design and analyses. Design items include: <ul style="list-style-type: none"> • Maximum power demand of the installation • Area and locations for transformer room, main switch room, meter room, electrical pipes and backup generator room • Low voltage switchboard, generators, cables, various kinds of switches, protection and control devices, lighting appliances, earthing and lightning protection system, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to, base on the electrical engineering data and information obtained, to perform design and analyses according to design guidelines from relevant engineering institutions.</p>
8. Remarks	

1. Title	Repair and rewind three-phase motors
2. Code	EMCUIN304A
3. Range	Understand the construction and types of three-phase motors, and repair and rewind them in servicing stations or work sites.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure, type, working principles and examination method of three-phase motor</p> <ul style="list-style-type: none"> ◆ Understand the structure, types, working principles and range of application of three-phase motor, including: <ul style="list-style-type: none"> • General induction motor • Multipolar three-phase motor • Two-speed three-phase motor ◆ Understand the winding design of three-phase motor, including number of slots for each pole, number of winds, method of winding connection, etc. ◆ Understand the methods to examine the faults of three-phase motor, including: <ul style="list-style-type: none"> • Testing of short circuit • Testing of circuit break • Testing of earth fault • Testing of wiring fault • Testing of bearing fault ◆ Methods of dismantling and assembling three-phase motor ◆ Methods of replacing bearing <p>6.2 Repair three-phase motor faults</p> <ul style="list-style-type: none"> ◆ Identify the faults of a three-phase motor and repair them according to procedures ◆ Rewind a three-phase motor
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the structure, types and working principles of three-phase motor;</p> <p>(ii) Capable to identify the faults of a three-phase motor and repair them according to procedures; and</p> <p>(iii) Capable to rewind a three-phase motor.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring
2. Code	EMCUIN306A
3. Range	Interpret the engineering drawings of electrical devices, circuits and wiring and able to apply relevant information for electrical and mechanical works.
4. Level	3
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Uses of the drawings of electrical devices, circuits and wiring</p> <ul style="list-style-type: none"> ◆ Understand the uses of various types of engineering drawings of electrical works ◆ Identify different versions of engineering drawings of electrical works ◆ Capable to apply electrical symbols, scaling calculations and relevant engineering drawings of electrical works <p>6.2 Obtain relevant information of electrical devices, control circuits and wiring drawings to complete installation and testing of electrical systems</p> <ul style="list-style-type: none"> ◆ Obtain suitable electrical engineering drawings according to project requirements ◆ Capable to obtain relevant information of the main circuit, including: <ul style="list-style-type: none"> • Connection of the main circuit • Details of power distribution • Power switch interlock ◆ Capable to obtain relevant information of electrical equipment and control circuits, including: <ul style="list-style-type: none"> • Principles of control • Control circuits • Control components, including circuit breakers, relays, push-buttons and their contacts • Electronic control circuits ◆ Capable to obtain information of control circuit and wiring drawings, including: <ul style="list-style-type: none"> • Selection of cables • Classification of cables • Laying of cables • Wiring conduits • Wiring trunkings • Identification and marking of cables • Connection of cables

	<ul style="list-style-type: none"> ◆ Capable to obtain relevant information from drawings of electrical devices, circuits and wiring for performing an electrical and mechanical task, such as the information below for installation and testing of a starter circuit for a three-phase AC motor: <ul style="list-style-type: none"> • Principles of control circuit interlock • Conduits and trunkings required • Laying of cables • Connection of cables • Identification and marking of cables
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to select suitable engineering drawings of electrical works, and obtain relevant information from drawings for completion of installation and testing of an electrical and mechanical system and equipment, such as the installation and testing of a power distribution system in a multi-storey building.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electricity.</p>

1. Title	Use measuring tools and instruments to install, connect or measure overhead line installations
2. Code	EMCUIN309A
3. Range	Use measuring tools and instruments to measure accurately, install and connect overhead line onto overhead line poles.
4. Level	3
5. Credit	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of overhead line measuring tools and instruments</p> <ul style="list-style-type: none"> ◆ Understand the operating principles of overhead line measuring tools and instruments <p>6.2 Use measuring tools and instruments to install and connect overhead line</p> <ul style="list-style-type: none"> ◆ Use measuring tools and instruments for pre-installation positioning ◆ Use measuring tools and instruments to install the overhead line according to the details of the drawing, including tension of the cable, insulation and isolation devices on the overhead line pole, etc. ◆ Connect cables on the two sides of the overhead line support or pole and ensure the safety of the insulation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use measuring tools and instruments correctly and effectively to install and connect overhead line, and to connect cables on the two sides of the overhead line support with insulation and grounding devices for protection.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Install overhead line isolator control circuit
2. Code	EMCUIN310A
3. Range	Capable to perform disconnection switch installation on overhead line pole according to installation instructions and drawings, including installing control circuit of the isolator, so as to comply with the electricity safety requirements.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Content of installation drawing and operating principles of various types of isolator</p> <ul style="list-style-type: none"> ◆ Understand the installation drawing and instructions, all kinds of symbols and the control circuit of the isolator ◆ Understand the operating principles of various types of isolators <p>6.2 Methods of operating various types of isolators and their control circuits</p> <ul style="list-style-type: none"> ◆ Know all common types of isolators, and be capable to install overhead line isolators and ensure that they meet the requirements of the electricity legislations and code of practice for isolating high-voltage electrical equipment ◆ Know the methods of operating the isolator control circuits
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to install typical isolators and their control circuits according to installation drawing instructions and requirements; and</p> <p>(ii) Capable to ensure that the safety of the isolators meet the requirements of the electricity legislations and code of practice for isolating high-voltage electrical equipment.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical and mechanical drawings.

1. Title	Perform general lifting machinery and lifting equipment inspection
2. Code	EMCUIN313A
3. Range	Perform general lifting machinery and lifting equipment inspection, according to relevant legal requirements, in general industrial plants or electrical and mechanical workplaces where lifting and handling work is involved, and be capable to perform related inspection independently and assist the registered professional engineer in arranging trial loading test for large lifting machinery.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of general lifting machinery and lifting equipment and legislations related to inspection</p> <ul style="list-style-type: none"> ◆ Understand the operating principles of general lifting machinery and lifting equipment ◆ Understand the legal requirements on general lifting machinery and lifting equipment inspection ◆ Understand the overhauling procedures for general lifting equipment, including the operation, repair, maintenance, inspection, complete check, testing and components of lifting machinery <p>6.2 General lifting machinery and lifting equipment inspection</p> <ul style="list-style-type: none"> ◆ Perform regular inspection on general lifting machinery according to legal requirements and working instructions, including performing routine check, assisting the registered professional engineer to conduct the overhaul and loading test, etc. ◆ Perform regular inspection on general lifting equipment according to legal requirements and working instructions
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to perform routine check for general lifting machinery and lifting equipment according to legal requirements, and assist the registered professional engineer to conduct thorough inspection and loading test.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of using general loading and lifting equipment.

1. Title	Operate and maintain abrasive wheels safely
2. Code	EMCUIN315A
3. Range	Operate all kinds of abrasive wheels in workshops or work sites.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Methods of operating abrasive wheels</p> <ul style="list-style-type: none"> ◆ Be familiar with the safe operation of abrasive wheels, including: <ul style="list-style-type: none"> • Maximum permissible speed of abrasive wheel in different size (speed of abrasive wheel) • Speed of spindle • Protective guard for moving abrasive wheel • Gap between the cutter block and abrasive wheel • Ensure that the abrasive wheel has been fitted securely before use • Effective devices to connect and disconnect power supply must be available for the abrasive wheel used in the machinery • Suitable working environment e.g. no materials without tied <p>6.2 Maintenance of abrasive wheel</p> <ul style="list-style-type: none"> ◆ Be familiar with the maintenance of abrasive wheel, including: <ul style="list-style-type: none"> • Repair of the protective guard • Repair of the rest • Reconditioning of the abrasive wheel <p>6.3 Operation and maintenance procedures for abrasive wheel</p> <ul style="list-style-type: none"> ◆ Know how to choose suitable abrasive wheels for different kinds of work ◆ Know the needs and principles of regularly repairing and maintaining abrasive wheel, including the procedures of inspection, maintenance and alignment ◆ Use general repairing and checking instruments and tools effectively
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to operate abrasive wheels safely;</p> <p>(ii) Capable to choose suitable abrasive wheels for different kinds of work; and</p> <p>(iii) Capable to perform routine maintenance and fault repair of abrasive wheels effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of occupational safety and machinery/materials.

1. Title	Implement assembly, fitting and dismantling of large-scale transformers, electric motors and switchboards
2. Code	EMELIN301A
3. Range	Applicable to various types of electrical equipment engineering works. Implement assembly, fitting and dismantling of high voltage transformers, high voltage or large-scale low voltage electric motors, generating units and switchboards according to various types of installation specifications, manufacturer's assembly drawings and design plans.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the methods and tools for transporting high voltage transformers, high voltage or large-scale low voltage electric motors, generators and switchboard modules</p> <p>6.2 Implement assembly, fitting and dismantling of high voltage transformers, high voltage or large-scale low voltage electric motors, generators and switchboards according to various types of installation specifications, manufacturer's assembly drawings and design plans</p> <p>◆ Understand the methods and tools for transporting high voltage transformers, high voltage or large-scale low voltage electric motors, generators and switchboard modules, including setting of the loading points and places for putting lifting appliances at the work site, selection and considerations of lifting methods, etc.</p> <p>◆ Implement assembly, fitting and dismantling of high voltage transformers, high voltage or large-scale low voltage electric motors, generators and switchboards according to various types of installation specifications, manufacturer's assembly drawings and design plans</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to assembly, fitting and dismantling of high voltage transformers;</p> <p>(ii) Capable to implement assembly, fitting and dismantling of high voltage or large-scale low voltage electric motors and generating units; and</p> <p>(iii) Capable to implement assembly, fitting and dismantling of high voltage or large-scale low voltage switchboards.</p>
8. Remarks	

1. Title	Carry out basic installation of extra-low voltage installations
2. Code	EMELIN302A
3. Range	Applicable to work sites with extra-low voltage installations. Carry out basic installation of various kinds of extra-low voltage installations of buildings.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points of drawings of extra-low voltage installations of buildings and methods of installing various installations</p> <ul style="list-style-type: none"> ◆ Understand the details and key points of design shop drawings of extra-low voltage installations of buildings ◆ Understand methods of installing various extra-low voltage installations of buildings ◆ Understand main requirements for as-built drawings of extra-low voltage installations of buildings <p>6.2 Carry out basic installation of extra-low voltage installations</p> <ul style="list-style-type: none"> ◆ Carry out basic installation of extra-low voltage installations according to the details of design shop drawings and the actual situation of work site ◆ Draw as-built drawings of extra-low voltage installations of buildings for record
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to carry out basic installation of extra-low voltage installations according to the actual situation of work site and details of shop drawings; and</p> <p>(ii) Capable to draw as-built drawings of extra-low voltage installations of buildings according to the work results.</p>
8. Remarks	

1. Title	Draw shop drawings of extra-low voltage installations of buildings
2. Code	EMELIN303A
3. Range	Applicable to installation of extra-low voltage installations of buildings. Draw shop drawings of extra-low voltage installations of buildings according to the actual situation and constraints of the work site.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the methods of installing extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Understand the working requirements and installation methods for extra-low voltage installations of buildings according to installation specification, building construction plans and plans for other building facilities <p>6.2 Analyze actual situation and working constraints of work site, and use appropriate drawing techniques to draw and modify the installation drawings of extra-low voltage installations</p> <ul style="list-style-type: none"> ◆ Investigate the work site situation and working constraints on site under different situations ◆ Ensure that the work site environments and the installation requirements for extra-low voltage installations of buildings complies with each other ◆ use appropriate drawing techniques to draw and modify the installation drawings of extra-low voltage installations according to the work site situation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use appropriate drawing techniques to draw and modify the installation drawings of extra-low voltage installations according to work site situation.</p>
8. Remarks	

1. Title	Install high voltage power distribution or generation facilities
2. Code	EMELIN304A
3. Range	Applicable to the installation sites of high voltage power distribution or generation facilities. Analyze the actual situation and constraints of the worksite according to the shop drawings required in order to implement the setting of the installation and protection system for high voltage power distribution or generation facilities.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the actual situation and constraints of the work site</p> <ul style="list-style-type: none"> ◆ Investigate the work site on purpose at different working stages to understand the actual situation of the work site ◆ Understand the installation work of high voltage power distribution or generation facilities and master constraints and problems of the work site <p>6.2 Install high voltage power distribution or generation facilities according to design shop drawing and set the protection system</p> <ul style="list-style-type: none"> ◆ Implement the configuration and installation of power supply installations according to design shop drawings. High voltage electrical facilities and devices include generators, transformers, SF6 insulated high voltage switches, control panel, overhead lines, cables, electric motors, earthing systems, lightning protection system, etc. ◆ Set the protection system according to the protection scheme for high voltage power distribution or generation installations ◆ Make improvements to the protection plan according to the basic protection concept and actual situation <p>6.3 Professionalism in installing high voltage power distribution or generation installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that high voltage distribution or generation power supply installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to analyze the work site situation and point out the constraints and work site problems for the installation of high voltage power distribution or generation facilities;</p> <p>(ii) Capable to implement the configuration and installation of high voltage power distribution or generation facilities according to the design shop drawing; and</p> <p>(iii) Capable to set the protection system according to the protection scheme for specified high voltage distribution or generation power installations, and make improvements to the protection scheme according to the basic protection concept and actual situation specified.</p>
8. Remarks	

1. Title	Draw shop drawings of high voltage power distribution or generation facilities
2. Code	EMELIN305A
3. Range	Applicable to installation sites of high voltage power distribution or generation facilities. Understand the installation methods for high voltage power distribution or generation facilities, including the basic arrangements of electrical installations, floor layout plan requirements, etc. Draw shop drawings of high voltage power distribution or generation installations and analyze the actual situation and constraints of the work site.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the installation methods for high voltage power distribution or generation facilities, the actual situation and working constraints of the work site</p> <ul style="list-style-type: none"> ◆ Understand the installation specifications and installation requirements for high voltage power distribution or generation facilities, including the civil requirements such as the arrangements of electrical installations, floor space, and arrangements of accessory facilities ◆ Understand the methods of site investigation and master the actual situation and working constraints of the work site so as to assist in compiling shop drawings with remarks of high voltage power distribution or generation installations ◆ Understand the electricity ordinance ◆ Understand the specifications and system of international drawing standards <p>6.2 Apply appropriate drawing techniques to draw or improve the shop drawings of high voltage power distribution or generation installations</p> <ul style="list-style-type: none"> ◆ Apply appropriate drawing techniques to draw the shop drawings of high voltage distribution or generation installations ◆ Improve the shop drawings of high voltage power distribution or generation installations according to the actual situation and working constraints of the work site
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to apply appropriate drawing techniques to draw or improve the shop drawings of high voltage power distribution or generation installations according to the actual situation of the work site.
8. Remarks	

1. Title	Draw shop drawings for assembling electrical machine unit
2. Code	EMELIN306A
3. Range	Draw shop drawings for assembling works of electrical machine unit at various levels, and analyze the actual situation of the work site so as to point out the problems of the work site.
4. Level	3
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the key points of shop drawings for assembling electrical machine unit</p> <ul style="list-style-type: none"> ◆ Understand the key points of shop drawings for assembling electrical machine unit, including the drawing standards and arrangement techniques <p>6.2 Draw shop drawings for assembling electrical machine unit and analyze the actual situations and constraints of work site</p> <ul style="list-style-type: none"> ◆ Draw the shop drawings for assembling electrical machine unit according to the real features of the unit and its assembling procedures ◆ Draw the shop drawings for assembling electrical machine unit according to various installation specifications and the design plan of power supply as well as the assembling procedures of the power unit ◆ Have site visits before conducting the assembling work ◆ Conduct analysis according to the actual situation of the work site, and point out the site constraints affecting the assembly of the power unit and relevant site issues including the load, height and width limits on the roads that the power unit is being transported
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to draw shop drawings for assembling electrical machine unit; and</p> <p>(ii) Capable to analyze the actual situation and constraints of the work site, and point out the site constraints and relevant issues affecting the assembly of the electrical machine unit.</p>
8. Remarks	

1. Title	Install motor control and starter circuits of particular design
2. Code	EMELIN308A
3. Range	Master the operating principles of various kinds of motor control and starter circuits; install and connect motor control and starter circuit components in switchboard or control box at installation or repair locations according to the drawings of specially designed motor control, protection and starter circuits.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of motor control circuit operation, installation and configuration</p> <ul style="list-style-type: none"> ◆ Understand the working principles of various kinds of single-phase and three-phase electric machine control, protection and starter circuits ◆ Master motor control, protection and starter circuit diagrams such as: <ul style="list-style-type: none"> • Motor operation control, protection and starter circuit diagram • Configuration and wiring diagram for components in the control box ◆ Master the configuration and installation methods for motor control, protection and starter circuit components <p>6.2 Install motor control and starter circuits of particular design</p> <ul style="list-style-type: none"> ◆ Install and connect motor control, protection and starter circuits, including: <ul style="list-style-type: none"> • Estimating the number of components according to engineering drawings and installation requirements, including push-button switch, overload protector, limit switch, relay, contactor and timer, for installation of operation control, protection and starter circuits • Install and connect specially designed power control, electrical interlock and sequence control and starter circuits for various kinds of single-phase and three-phase motors • Install and connect linkage and starter control circuits for backup generators • Conduct electrical and operation tests for various kinds of motor control, protection and starter circuits <p>6.3 Professionalism in installing motor control and starter circuits of particular design</p> <ul style="list-style-type: none"> ◆ Follow the Code of Practice for the Electricity (Wiring) Regulations to install and connect various kinds of electric machine control, protection and starter circuits safely

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (ii) Capable to install and connect various kinds of electric machine control, protection and starter circuits according to drawings; and (iii) Capable to conduct electrical and operation tests for various kinds of motor control and starter circuits.
8. Remarks	

1. Title	Install low voltage power systems fed by a single transformer
2. Code	EMELIN309A
3. Range	Install low voltage power systems directly fed by a single transformer and associated devices at switch rooms or similar locations according to the details of installation drawings of electrical installations.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master the details of installation drawings and technical requirements for electrical installations</p> <ul style="list-style-type: none"> ◆ Master and analyze the details of installation drawings and all technical requirements for low voltage electrical installations directly fed by a single transformer, and list out the required installation items and schedule for implementation <p>6.2 Master the actual situation and constraints of the work site so as to implement the installation of simple low voltage electrical installations</p> <ul style="list-style-type: none"> ◆ Inspect the actual situation and constraints of the worksite, and work out solutions accordingly ◆ Implement the installation of simple low voltage power systems directly fed by a single transformer, distribution circuit and associated devices including low voltage switchboard, bus slot, riser, wiring system, power equipment, drive system, protection and control system, power supply quality control system, earthing system, lightning protection system and lighting system <p>6.3 Professionalism in installing low voltage distribution equipment</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that low voltage distribution equipment can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to list out the required installation items and schedule for implementation;</p> <p>(ii) Capable to inspect the actual situation and constraints of the worksite and work out relevant solutions accordingly; and</p> <p>(iii) Capable to carry out the installation of low voltage electrical installations according to the details of the installation diagrams and technical requirements for the electrical installations.</p>
8. Remarks	

1. Title	Carry out installation of low voltage power systems and associated facilities according to the details of shop drawings
2. Code	EMELIN310A
3. Range	Applicable to electrical installation work. Master the details of shop drawings of electrical installations and perform installation of low voltage power systems and associated facilities directly fed by low voltage underground distribution cables.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the details and requirements of installation drawings of electrical installations ♦ Master the details and requirements of installation drawings of simple electrical installations in normal situations, and analyze and list out installation items and schedules for implementation</p> <p>6.2 Master the actual situation and constraints of the worksite in order to implement installation of low voltage electrical installations ♦ Implement installation of low voltage power systems and associated facilities directly fed by low voltage underground distribution cables according to the actual situation and constraints of the worksite, including: general wiring system, power equipment, drive system, protection and control system, power supply quality control system, earthing system, lightning protection system, lighting system, etc.</p> <p>6.3 Professionalism in installing low voltage distribution equipment ♦ Follow the regulations and safety guidelines for the industry to ensure that low voltage distribution equipment can be used safely</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to list out installation items and schedules for implementation;</p> <p>(ii) Capable to master the actual situation and constraints of the work site; and</p> <p>(iii) Capable to carry out installation of low voltage electrical installations according to the details and requirements of installation drawings of electrical installations.</p>
8. Remarks	

1. Title	Inspect, test and commission high voltage power distribution or generation facilities and devices
2. Code	EMELIT303A
3. Range	Applicable to electrical installation work. Use basic inspection tools and testing instruments to inspect, test and commission high voltage power distribution facilities and devices, and record the testing data to judge their effectiveness.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the using methods of basic inspection tools and testing instruments</p> <ul style="list-style-type: none"> ◆ Understand the methods of using basic inspection tools and carry out inspection for high voltage power distribution installations, such as torque wrench, level gauge, levelling mirror, hanging cone, ruler, etc. ◆ Understand the methods of using basic testing instruments and carry out testing and commissioning for high voltage distribution installations, such as insulation resistance tester, AC and DC high voltage withstand tester, DC vacuum tube checker, primary and secondary injection test instruments, insulating oil high voltage withstand tester, high voltage capacitance loss test, etc. <p>6.2 Inspect, test and commission high voltage power distribution or generation facilities and devices</p> <ul style="list-style-type: none"> ◆ Master the methods of operating various kinds of high voltage distribution or generation facilities and devices including high voltage distribution switches, transformers, overhead lines, cables, electric motors, capacitors, generators, protection device, protection and control circuits, etc. ◆ Master the manufacturers' methods and procedures of inspecting, testing and commissioning high voltage power distribution or generation installations, and relevant standards ◆ Inspect, test and commission high voltage power distribution or generation facilities and devices such as high voltage distribution switches, transformers, overhead lines, cables, electric motors, capacitors, generators, protection device, protection and control circuits, earthing systems, lightning protection system, etc. ◆ Record the testing data systematically ◆ Understand various standards for testing, summarize the testing data and judge the effectiveness

	<p>6.3 Professionalism in inspecting, testing and commissioning high voltage power distribution or generation installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that high voltage power distribution or generation installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to understand the methods of using basic inspection tools and testing instruments; (ii) Capable to perform inspection, testing and commissioning on specified high voltage power distribution or generation facilities and devices, and record the testing data systematically; and (iii) Capable to master various standards for testing, summarize the testing data and judge the effectiveness.
8. Remarks	

1. Title	Detect underground facilities
2. Code	EMELIT304A
3. Range	Applicable to underground pipe detection. Read various kinds of underground facilities layout plans, use different active detection methods to implement underground facilities detection, accurately analyze the results, write detailed detection report and records, and formulate guidelines for road excavation.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the characteristics of various kinds of underground facilities, the method of reading underground facilities layout plans, and technologies for active mode detection</p> <ul style="list-style-type: none"> ◆ Know about the nature and uses of various kinds of metal and non-metal pipes ◆ Know about the nature and uses of various kinds of cables for non-power purpose ◆ Understand various kinds of active detection methods, principle, scanning application technologies and constraints such as: radar, direct signal injection, signal transmission probe, signal tracking rod, noise detection system, intelligent label sensor, pipe CCTV inspection, etc. ◆ Understand the content of various kinds of underground facilities layout plans ◆ Know about the methods and code of practice for topographic survey and field marking ◆ Master the methods of collecting effective survey data including that of: <ul style="list-style-type: none"> • underground facilities alignment position • underground facilities movement direction • underground facilities depth measurement ◆ Master the method of drawing sketches and actual layout plans of underground facilities <p>6.2 Implement underground facilities detection</p> <ul style="list-style-type: none"> ◆ Implement detection of underground facilities, except power cables, according to the technical requirements and drawings of underground facilities such as: <ul style="list-style-type: none"> • Communications cable • Fresh water pipe • Sewer • Rainwater pipe • Gas main

	<ul style="list-style-type: none"> ◆ Accurately analyze the distribution of underground facilities according to detection data, and draw the actual layout plan for the underground facilities ◆ Write a detailed detection report, record and actual layout for the underground facilities, and formulate guidelines for road excavation, including the quantity, alignment position, movement direction and depth of underground facilities; safety precautions, etc. ◆ Follow the regulations and relevant codes of practice to ensure that underground facilities are correctly located, and properly protected against damage <p>6.3 Professionalism in detecting underground facilities</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to implement underground facilities detection according to the drawings of underground facilities; and (ii) Capable to write a detailed detection report on the detection results of the underground facilities, and record the actual layout plan of the underground facilities.
8. Remarks	

1. Title	Inspect, test and commission low voltage power systems fed by a single transformer
2. Code	EMELIT305A
3. Range	Use basic inspection tools and testing instruments to inspect, test and commission low voltage power systems and associated installations directly fed by a single transformer, and record the testing data to judge their effectiveness at switch rooms and similar locations.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the using methods of basic inspection tools and testing instruments</p> <ul style="list-style-type: none"> ◆ Understand the methods of using basic inspection tools and carry out inspection for low voltage power systems and associated installations directly fed by a single transformer, such as torque wrench, level guage, etc. ◆ Understand the methods of using basic testing instruments and carry out testing and commissioning for low voltage electrical installations, such as insulation resistance tester, high voltage withstand tester, primary and secondary injection test instruments, etc. <p>6.2 Inspect, test and commission low voltage electrical installations</p> <ul style="list-style-type: none"> ◆ Inspect, test and commission low voltage electrical installations such as: low voltage power distribution switches, cables, electric motors, capacitors, generators, protection device, protection and control circuits, earthing systems, lightning protection system, etc. ◆ Record the inspection and testing data effectively ◆ Understand various standards for testing, summarize the testing data and judge the effectiveness <p>6.3 Professionalism in inspecting, testing and commissioning low voltage electrical installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that low voltage electrical installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the methods of using basic inspection tools and testing instruments;</p> <p>(ii) Capable to perform inspection, testing and commissioning on specified low voltage power systems and associated installations, and record the testing data systematically; and</p> <p>(iii) Capable to master various standards for testing, summarize the testing data and judge the effectiveness.</p>
8. Remarks	

1. Title	Inspect, test and commission low voltage power systems
2. Code	EMELIT306A
3. Range	Applicable to simple power supply systems directly fed by low voltage underground distribution cables. Inspect, test and commission low voltage power systems and associated installations.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the structure of low voltage power distribution system, and keypoints for inspecting, testing and commissioning different installations or circuit protection devices</p> <ul style="list-style-type: none"> ◆ Know about the content of documents for testing and commissioning low voltage power systems and associated installations directly fed by low voltage underground distribution cables. The documents include contract terms, drawings, proposals for inspection, testing and commissioning, and manufacturers' inspection and testing guides for electrical equipment ◆ Know about the keypoints and criteria for inspecting, testing and commissioning low voltage power system installations and devices <p>6.2 Carry out simple inspection, testing and commissioning</p> <ul style="list-style-type: none"> ◆ Assist in basic inspection, testing and commissioning for low voltage power systems and associated installations directly fed by low voltage underground distribution cables, including various kinds of switches, busbar box, distribution board, mains, power supply quality control system, operation control system, earthing system, lightning protection system, lighting system, etc. with the use of various kinds of testing instruments such as multi-meter, clamp meter, insulation resistance tester and earth fault loop impedance meter <p>6.3 Professionalism in inspecting, testing and commissioning low voltage power systems</p> <ul style="list-style-type: none"> ◆ Judge whether the low voltage power systems and associated installations examined meet the standard according to the inspection, testing and commissioning report, the client's requirements and specifications required by international standards
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the inspection, testing and commissioning items according to specified contract terms, drawings and proposals for inspection, testing and commissioning;</p> <p>(ii) Capable to carry out inspection, testing and commissioning for low voltage power systems and associated installations; and</p> <p>(iii) Capable to judge whether the installations examined meet the standard according to the inspection, testing and commissioning results.</p>
8. Remarks	

1. Title	Repair electrical devices for electric traction control system
2. Code	EMCUMA302A
3. Range	Repair devices for electric traction control system, with the use of electrical and pneumatic equipment, at servicing stations or work sites.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principles of devices for electric traction control system</p> <ul style="list-style-type: none"> ◆ Understand the structure and principles of devices for electric traction control system <p>6.2 Methods of repairing electrical devices for electric traction control system</p> <ul style="list-style-type: none"> ◆ Repair DC traction motor <ul style="list-style-type: none"> • Apply repairing techniques in maintenance of DC traction motors, including commutators, brushes and brush holders, winding, bearing and insulation devices, according to instructions • Measure and replace brushes; grind brush springs and adjust their strength • Test the performance of DC motors ◆ Repair AC traction motors <ul style="list-style-type: none"> • Apply repairing techniques in maintenance of AC traction motors, including checking and repairing winding, bearing and insulation devices, according to instructions • Test the performance of AC motors ◆ Repair the control circuit and equipment of traction motors <ul style="list-style-type: none"> • Check and maintain control equipment, including forward/reverse switches, contactors and relays, according to repairing instructions • Perform visual inspection of the control circuit of a traction motor • Check and maintain transmission gear and gearboxes according to repairing instructions

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to repair DC traction motors and adjust the strength of their brush springs correctly and effectively according to instructions; (ii) Capable to repair DC motors, measure the resistance of winding and test the motor performance correctly and effectively according to repairing instructions; and (iii) Capable to repair the control circuits and equipment of traction motors correctly and effectively according to instructions.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.</p>

1. Title	Repair electronic control equipment for traction control system and main current transformer
2. Code	EMCUMA303A
3. Range	Use electronic control equipment repairing techniques to service electronic control equipment for traction control system and main current transformer at servicing stations or work sites.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic principles of operating control equipment for traction control system and main current transformer</p> <ul style="list-style-type: none"> ◆ Understand the basic principles of operating control equipment for traction control system and main current transformer, including: <ul style="list-style-type: none"> • Main electronic power circuit equipment for traction control system • Electronic power control circuit equipment for traction control system • Main electronic power circuit equipment for main current transformer • Electronic power control circuit equipment for main current transformer <p>6.2 Methods of repairing traction control system and main current transformer</p> <ul style="list-style-type: none"> ◆ Use electronic power control equipment repairing techniques to repair main electronic power circuit equipment for traction control system, including: <ul style="list-style-type: none"> • Power control components • Reactor • Main circuit ◆ Use electronic control equipment repairing techniques to repair electronic power control circuit equipment for traction control system, including: <ul style="list-style-type: none"> • Testing electronic power protection devices • Set various electronic control units ◆ Use inverter repairing techniques to repair service main electronic power circuit equipment for main current transformer, including: <ul style="list-style-type: none"> • Power control components • Reactor • Main circuit

	<ul style="list-style-type: none"> ◆ Use electronic control equipment repairing techniques to repair electronic power control circuit equipment for main current transformer, including: <ul style="list-style-type: none"> • Testing electronic power protection devices • Set various electronic control units • Check and test data logging functions
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to repair, test and set all electronic power control units for traction control system correctly and effectively; and (ii) Capable to repair, test and set all electronic power control units for main current transformer correctly and effectively.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electronic control equipment for traction control system and main current transformer.</p>

1. Title	Repair overhead line equipment (feeder, insulation, suspension and earthed systems)
2. Code	EMCUMA305A
3. Range	Use repairing and checking instruments and tools to repair overhead line equipment along the railway lines.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Uses and functions of different kinds of overhead line equipment</p> <ul style="list-style-type: none"> ◆ Understand the uses, structure and working principles of different kinds of overhead line equipment including feeder, insulation, suspension and earthed systems <p>6.2 Way of servicing overhead line equipment (feeder, insulation, suspension and earthed systems)</p> <ul style="list-style-type: none"> ◆ Perform checking and regular replacement needed for overhead line system (including feeder, insulation, suspension and earthed systems) according to the maintenance procedures ◆ Perform overhead line system servicing according to the safety regulations and code of practice <p>6.3 Professionalism in servicing overhead line equipment (feeder, insulation, suspension and earthed systems)</p> <ul style="list-style-type: none"> ◆ Carry out overhead line equipment (feeder, insulation, suspension and earthed systems) servicing according to the safety regulations and code of practice
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to carry out regular servicing for overhead line system (including feeder, insulation, suspension and earthed systems) according to the servicing procedures, safety regulations and code of practice.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Service overhead power system equipment (isolator, power supply system switchboard and control circuit)
2. Code	EMCUMA306A
3. Range	Use servicing and checking instruments and tools to maintain and repair overhead power system equipment (isolator, power supply system switchboard and control circuit) along the railway lines and in switch rooms.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Uses and functions of overhead power system equipment (isolator, power supply system switchboard and control circuit) ♦ Understand the uses, structure and working principles of overhead power system equipment including isolator, power supply system switchboard and control circuit</p> <p>6.2 Servicing and maintenance of overhead power system equipment (isolator, power supply system switchboard and control circuit) ♦ Perform checking and servicing for overhead power system equipment (isolator, power supply system switchboard and control circuit) according to maintenance schedule and procedures</p> <p>6.3 Professionalism in servicing overhead power system equipment (isolator, power supply system switchboard and control circuit) ♦ Carry out overhead power system equipment (isolator, power supply system switchboard and control circuit) servicing according to the safety regulations and code of practice</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement maintenance procedures correctly and efficiently according to the safety regulations and code of practice to repair overhead power system equipment (isolator, power supply system switchboard and control circuit).</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of power system.

1. Title	Apply fault finding techniques to find the root causes of fault
2. Code	EMCUOR301A
3. Range	Analyze the fault and performance information on the maintenance records of the electrical and mechanical equipment, and apply the fault finding techniques to find out the root causes of fault.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Analyze the fault and record of the electrical and mechanical equipment</p> <ul style="list-style-type: none"> ◆ Understand the classification and techniques to retrieve fault information on the maintenance of the electrical and mechanical equipment <p>6.2 Apply fault finding techniques to find the root of fault</p> <ul style="list-style-type: none"> ◆ Analyze the fault information and performance record of the equipment, and enhance the effectiveness of fault finding with the help of the following : <ul style="list-style-type: none"> • Bath tub curve • The failure of similar equipment ◆ Apply the following fault finding techniques to enhance the effectiveness detecting the electrical and mechanical faults <ul style="list-style-type: none"> • Middle point tracing technique • Input signals injection technique for tracing fault origin • Use potential divider method to calculate the location of fault
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to retrieve and analyze the fault information effectively on maintenance record of the electrical and mechanical equipment, and apply the fault finding techniques to find out the root cause of fault effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Repair faults in current transformers and control equipment
2. Code	EMCUOR304A
3. Range	Repair the faults in current transformers and control equipment at servicing stations or external sites.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles of current transformer</p> <ul style="list-style-type: none"> ◆ Understand the structure and working principles of current transformer <p>6.2 Repair current transformer</p> <ul style="list-style-type: none"> ◆ Repair main circuit of current transformer <ul style="list-style-type: none"> • Measure and check the main circuit of current transformer to find out the root causes of fault according to the fault symptoms and the working principles of current transformer • Repair the identified fault of faulty equipment or components ◆ Repair the power electronic control equipment of the current transformer <ul style="list-style-type: none"> • Measure and check the control unit of current transformer to find out the origin of fault according to the fault symptoms as well as the structure and working principles of current transformer control system • Repair the fault after finding out the fault equipment or component ◆ Use the information stored in the data logging device to enhance the efficiency of fault finding <ul style="list-style-type: none"> • Access and use the information of the data logging device to enhance the efficiency of finding the fault in the current transformer <p>6.3 Professionalism in repairing current transformer and its control equipment</p> <ul style="list-style-type: none"> ◆ Repair current transformer and its control equipment according to the safety instructions and code of practice

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to find out the fault in the main circuit of a current transformer within a reasonable period of time according to the signs of fault; and (ii) Capable to find out the fault in the electronic power control equipment of a current transformer within a reasonable period of time according to the symptoms of fault.
8. Remarks	<p>This unit of competency is suitable for training electrical engineering personnel. The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical installation.</p>

1. Title	Repair faults in generator and its accessories
2. Code	EMCUOR307A
3. Range	Repair the faults in generator and its accessories at servicing stations or external sites.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and working principles of generator and its accessories ♦ Understand the structure and working principles of generator and its accessories</p> <p>6.2 Find and repair faults in generator and its accessories ♦ Repair the fault in a generator</p> <ul style="list-style-type: none"> • Check the following generator components and accessories to find out the root of fault according to the signs of fault and based on the understanding of the working principles of generator: <ul style="list-style-type: none"> ▸ All magnetic coils in the generator ▸ Magnetic circuit and equipment ▸ Overspeed mechanical protector ▸ Auxiliary generator ▸ Battery unit • Repair the fault after finding out the fault equipment or component <p>6.3 Professionalism in repairing generator and its accessories ♦ Repair the generator and its accessories according to the safety regulations and code of practice</p> <p>♦ Write a simple repair report according to the damage of the generator and its accessories</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to find out the faults in generator and its accessories within a reasonable period of time according to the symptoms of fault;</p> <p>(ii) Capable to handle and eliminate the fault in generator and its accessories effectively; and</p> <p>(iii) Capable to write simple repair reports.</p>
8. Remarks	<p>This unit of competency is suitable for training electrical and mechanical engineering personnel involving in the work of generators. The credit value of this unit of competency is set on the presumption that the person already possesses basic competency of repairing generator and its accessories.</p>

1. Title	Repair faults in control and protection device of diesel engines and generators
2. Code	EMCUOR309A
3. Range	Repair faults in control and protection device of diesel engines and generators in servicing stations or external sites.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Composition and working principles of control and protection device of diesel engines and generators</p> <p> ♦ Understand the composition and working principles of control and protection device of diesel engines and generators</p> <p>6.2 Find and repair faults in control and protection device of diesel engines and generators</p> <p> ♦ Repair faults in control equipment of diesel engines and generators</p> <p> • Check the control equipment of diesel engines and generators, including the following, to find out the root of fault according to the signs of fault by applying the working principles of control equipment of diesel engines and generators:</p> <p> › Speed controller of the diesel engine</p> <p> › Magnetic field control circuit and equipment of the generator</p> <p> › Load regulator of the generator and its control circuit</p> <p> › Control circuit of the auxiliary generator</p> <p> › Control circuit of the battery unit</p> <p> › Circuit breaker and relay</p> <p> • Repair the fault after finding out the faulty equipment or component</p>

	<ul style="list-style-type: none"> ◆ Repair the fault in protection device of diesel engines and generators <ul style="list-style-type: none"> • Repair the protection device of diesel engines and generators, including: <ul style="list-style-type: none"> ▸ Engine and generator overspeed protection circuit ▸ Engine overheat alarm ▸ Water thermometer ▸ Generator overload protector • Measure data output of the generator • Repair the fault after finding out the faulty equipment or component <p>6.3 Professionalism in repairing control and protection device of diesel engines and generators</p> <ul style="list-style-type: none"> ◆ Repair the control and protection device of diesel engines and generators according to the safety regulations and code of practice ◆ Write a simple repair report according to the damage of the control and protection device of diesel engines and generators
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to find out the fault in the control and protection device of a diesel engine within a reasonable period of time according to the symptoms of fault; (ii) Capable to find out the fault in the control and protection device of a generator within a reasonable period of time according to the symptoms of fault; (iii) Capable to handle and eliminate effectively the fault in the control and protection device of diesel engines and generators; and (iv) Capable to write simple repair reports.
8. Remarks	<p>This unit of competency is suitable for training electrical and mechanical engineering personnel involving in the work of diesel generator. The credit value of this unit of competency is set on the presumption that the person already possesses basic competency of repairing control and protection device of diesel engines and generators.</p>

1. Title	Apply various fault finding methods for high voltage distribution or generation facilities and devices
2. Code	EMELOR302A
3. Range	Applicable to the operation, repair and maintenance management of electrical work. Apply effective fault finding methods and use various instruments to check out the fault location of faulty electrical installations and equipment.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand codes of safety on operation and various types of fault finding methods for high voltage distribution or generation facilities and devices</p> <ul style="list-style-type: none"> ◆ Understand codes of safety on operation of high voltage distribution or generation power facilities and devices ◆ Understand various types of fault finding methods for high voltage distribution or generation facilities and devices <p>6.2 Apply various types of instruments to find the faults in high voltage distribution or generation power installations</p> <ul style="list-style-type: none"> ◆ Apply various types of instruments such as multi-meter, insulation resistance tester, DC vacuum bottle tester, secondary injection test instruments, etc. ◆ Implement various types of fault finding methods to detect the faults in faulty electrical installations and equipment effectively according to relevant drawings or guidelines <p>6.3 Professionalism in finding faults in high voltage distribution or generation power supply installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that high voltage distribution or generation power supply installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand various requirements of the codes of safety on operation of high voltage distribution or generation facilities and devices; and</p> <p>(ii) Capable to apply appropriate instruments to find the faults in faulty power facilities.</p>
8. Remarks	

1. Title	Operate, repair and maintain high voltage power distribution or generation facilities and devices
2. Code	EMELOR305A
3. Range	Analyze the operation and fault conditions of different high voltage power distribution or generation installations and equipment, and perform the operation, repair and maintenance of various high voltage electrical facilities.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master different operation and fault conditions of high voltage power distribution or generation installations; various requirements, working procedures and techniques of relevant codes of safety on operation, repair and maintenance</p> <ul style="list-style-type: none"> ◆ Master different operation and fault conditions of high voltage power distribution or generation installations and equipment such as generator voltage regulator fault, fault alarm incidents, high voltage switch control circuit failure, mechanical fault in high voltage switches, cable fault, air leak in SF6 insulated high voltage switch, etc. ◆ Master various requirements of relevant codes of safety on operation, repair and maintenance for high voltage distribution or generation power facilities and devices according to manufacturers' manuals of operation, maintenance and repair and relevant codes of practice ◆ Master the working procedures and techniques of operating, maintaining and repairing various equipments. High voltage electrical facilities and devices include high voltage distribution switches, transformers, cables, overhead lines, electric motors, capacitors, generators, protection device, protection and control circuits, etc. ◆ Master basic management mechanism for maintenance and repair ◆ Master file record system of the operation, maintenance and repair of electrical equipment <p>6.2 Perform operation, repair and maintenance for high voltage power distribution or generation facilities and devices</p> <ul style="list-style-type: none"> ◆ Follow relevant codes of safety to perform operation, repair and maintenance for various types of high voltage power distribution or generation facilities and devices. High voltage electrical facilities and devices include generators, transformers, SF6 insulated high voltage switches, control panel, overhead lines, cables, electric motors, etc.

	<p>6.3 Professionalism in operating, repairing and maintaining high voltage power distribution or generation facilities</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that high voltage power distribution or generation installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to understand various requirements of relevant codes of safety on operation, repair and maintenance for high voltage power distribution or generation facilities and devices; (ii) Capable to master the operation and fault conditions of high voltage power distribution or generation installations; and (iii) Capable to perform operation, repair and maintenance for high voltage power distribution or generation facilities and devices.
8. Remarks	

1. Title	Repair control and starter circuits of electrical machine systems
2. Code	EMELOR306A
3. Range	Follow motor system control, protection and starter circuit diagrams to investigate circuit component wear or damage and perform circuit component repair and maintenance in switchboard or control boxes.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of motor control circuit operation, repair and maintenance</p> <ul style="list-style-type: none"> ◆ Understand the working principles of control and starter circuits of various kinds of single-phase and three-phase electrical machine systems ◆ Master motor control, protection and starter circuit diagrams such as: <ul style="list-style-type: none"> • Motor operation control, protection and starter circuit diagram • Control component panel layout and wiring diagrams ◆ Master the methods of repairing and maintaining motor control, protection and starter circuit components <p>6.2 Implement methods and procedures of repairing and maintaining motor control circuits</p> <ul style="list-style-type: none"> ◆ Perform repair and maintenance for motor control, protection and starter circuit components according to their wearing and damage conditions, including examining, testing, cleaning, replacing and tuning them ◆ Perform electrical and operation tests for the circuits after repair <p>6.3 Professionalism in handling motor control and starter circuits</p> <ul style="list-style-type: none"> ◆ Follow the Code of Practice for the Electricity (Wiring) Regulations to repair and maintain various kinds of motor control, protection and starter circuits safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(iv) Capable to repair and maintain various kinds of motor control, protection and starter circuits according to the wearing and damage conditions of their components; and</p> <p>(v) Capable to perform electrical and operation tests for various kinds of motor control, protection and starter circuits according to wiring diagrams.</p>
8. Remarks	

1. Title	Repair low voltage power systems fed by a single transformer
2. Code	EMELOR307A
3. Range	Repair and maintain low voltage power systems fed by a single transformer and their devices at switch rooms and similar locations.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master the procedures and techniques of repairing and maintaining low voltage power systems and their devices</p> <ul style="list-style-type: none"> ◆ Master different operating and fault conditions for low voltage power systems fed by a single transformer ◆ Master the procedures and techniques of repairing and maintaining low voltage electrical installations <p>6.2 Implement repair and maintenance of low voltage electrical installations</p> <ul style="list-style-type: none"> ◆ Repair and maintain low voltage power systems fed by a single transformer and their devices, including power distribution switches, cables, electric motors, capacitors, generators, protection device, protection and control circuits, etc. according to manufacturer's maintenance and repair manuals and relevant codes of practice <p>6.3 Professionalism in repairing low voltage power systems</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the repair and maintenance of low voltage power systems and their devices are carried out safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand different operating and fault conditions for low voltage power systems and their devices; and</p> <p>(ii) Capable to carry out the repair and maintenance of low voltage power systems and their devices effectively according to the safety guidelines on repair and maintenance.</p>
8. Remarks	

1. Title	Implement project management plan for low voltage electrical installations
2. Code	EMELPM302A
3. Range	Applicable to project management of electrical installations. Implement project management plan for low voltage electrical installations.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand general engineering project management issues and concept</p> <ul style="list-style-type: none"> ◆ Understand general engineering project management issues and concept, including: <ul style="list-style-type: none"> • Client's requirements • Engineering contract details • Content of basic engineering project plan • Goals and areas of project management • Impact of environmental factors, including social factor, economic factor, environmental protection factor, technological factor, etc. on engineering project • Basic engineering project knowledge and concept such as: planning, organization, project life cycle management, etc. <p>6.2 Implement project management plan for low voltage electrical installations</p> <ul style="list-style-type: none"> ◆ Implement project management plan for low voltage electrical installations, including the following issues: <ul style="list-style-type: none"> • Engineering project work breakdown structure (WBS) • Project management team organization and authority • Project management communication mechanism • Monitoring schedule of the engineering project plan • Income and expenditure list of the engineering project plan • Material procurement management mechanism of the engineering project plan
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to implement project management plan for low voltage electrical installations.
8. Remarks	

1. Title	Perform basic project management for low voltage electrical installation projects at work site
2. Code	EMELPM303A
3. Range	Applicable to project and operation management of electrical installations. Perform basic project management for low voltage electrical installation projects at work site.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand basic project management knowledge</p> <ul style="list-style-type: none"> ◆ Understand all kinds of basic project management theories, e.g. work breakdown structure (WBS), manpower organization, project schedule, income and expenditure list, etc. ◆ Understand project planning, job allocation, authority and responsibilities ◆ Understand supervisory techniques for project management such as mastering the engineering processes, giving orders for different jobs, communicating and reporting effectively, etc. <p>6.2 Perform basic project management for low voltage electrical installation projects at work site</p> <ul style="list-style-type: none"> ◆ Perform basic project management for low voltage electrical installation projects at work site, including: <ul style="list-style-type: none"> • Mastering the key points of work for low voltage electrical facilities and devices • Arranging the work flow, including: dismantling, installation, inspection, testing, commissioning, repair and maintenance • Arranging the transport of materials and electrical equipment • Contacting different kinds of engineering personnel to coordinate the engineering activities for a smooth completion of every work process • Inspecting and reporting on the progress and problems of the low voltage electrical installation project
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand basic project management knowledge;</p> <p>(ii) Capable to understand the key points of work for low voltage electrical facilities and devices;</p> <p>(iii) Capable to implement the methods of supervising the work flow of low voltage electrical installation projects;</p> <p>(iv) Capable to implement the transport system for materials and electrical equipment;</p> <p>(v) Capable to implement the methods and system of liaising various kinds of engineering personnel for coordination of work activities and smooth completion of every work process; and</p> <p>(vi) Capable to implement problem reporting mechanism.</p>
8. Remarks	

1. Title	Procure simple electrical and mechanical engineering equipment and materials
2. Code	EMCUOM301A
3. Range	Know how to procure simple electrical and mechanical engineering equipment and materials, and control the procurement cost for the electrical and mechanical operation management.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Procurement procedures for general and simple electrical and mechanical engineering equipment and materials</p> <ul style="list-style-type: none"> ◆ Understand the procurement procedures for general and simple electrical and mechanical engineering equipment and materials, such as liaising with suppliers, assessing the quality and prices of materials from the suppliers, general ordering and payment procedures, etc. <p>6.2 Procure simple electrical and mechanical engineering equipment and materials</p> <ul style="list-style-type: none"> ◆ List out correctly the details, specifications and standards of the equipment and materials to be procured ◆ Procure equipment and materials needed according to the specifications and requirements for procurement of general and simple electrical and mechanical engineering equipment and materials ◆ Bargain with the suppliers so as to control the procurement costs of the equipment and materials
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to list out the specifications and requirements for procurement of general electrical and mechanical engineering equipment and materials; and</p> <p>(ii) Capable to control the procurement costs of general electrical and mechanical engineering equipment and materials.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Implement operation management plans for low voltage electrical installation projects
2. Code	EMELOM302A
3. Range	Applicable to general electrical works operation management. Implement operation management plans for low voltage electrical installation projects.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand issues and concept of operation management of general low voltage electrical installation projects</p> <ul style="list-style-type: none"> ◆ Understand the issues and concept of operation management of general low voltage electrical installation projects including: <ul style="list-style-type: none"> • Basic engineering project operation management knowledge and concept including: sustainable development operation management, selecting assessment mechanism for engineering projects with profit-making potential, operation cycle management, etc. • Impact of general environmental factors on engineering project management including: social factor, economic factor, environmental protection factor, technological factor, etc. • Goals and areas of engineering project operation management • Influence of interest groups concerned with the engineering project • Contract documents, quotation information, income and expenditure records, manpower management information, etc. for every engineering project • Material supplier information <p>6.2 Implement operation management plans for low voltage electrical installation projects</p> <ul style="list-style-type: none"> ◆ Implement operation management plans for low voltage electrical installation projects including: <ul style="list-style-type: none"> • Goals and areas of engineering project operation management • Engineering project capital arrangements • Budget chart of engineering project cash flow • Relations and communication with the interest groups concerned • Impact of environmental factors on engineering project management • Operation cycle management

	<ul style="list-style-type: none"> • Engineering project quality management • Material supplier management and procurement negotiation strategies • Consolidated estimate of manpower demand at different levels • Estimation of project progress and operational status • Consolidate contract documents, quotation information, income and expenditure records, manpower management information, etc. for every engineering project • Implement contract and service arrangements for clients of different levels
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement operation management plans for low voltage electrical installation projects.</p>
8. Remarks	

1. Title	Implement general acceptance of materials, logistic management and after-sales service
2. Code	EMELOM303A
3. Range	Applicable to the operation management of general electrical works. Implement general acceptance of materials, logistic management and after-sales service management.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the specifications and standards for general engineering materials, the scope of work for logistic management and after-sales service</p> <ul style="list-style-type: none"> ◆ Understand the specifications and standards for various types of engineering materials ◆ Know about logistic management including: logistic supply chain, material delivery and storage system, logistic information system, handling of freight logistic documents, etc. ◆ Understand the scope of work for customer service needs and after-sales service <p>6.2 Implement general acceptance of materials , logistic management and after-sales service management</p> <ul style="list-style-type: none"> ◆ Implement general logistic management for electrical works ◆ Implement general acceptance of materials according to order requirements or contract details ◆ Implement general after-sales service management including: electrical installations fault finding , repair and maintenance, supply of parts, client’s enquiries, client’s complaint response mechanism, etc.
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to implement general acceptance of materials; (ii) Capable to implement general logistic management; and (iii) Capable to implement general after-sales service management.
8. Remarks	

1. Title	Investigate general industrial accidents
2. Code	EMCUSH305A
3. Range	Investigate industrial accidents related to electrical and mechanical services and propose solutions to improve occupational safety and health, and be capable to write accident investigation reports.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 General industrial accident investigation</p> <ul style="list-style-type: none"> ◆ Understand procedures for industrial accident investigation, including investigating by accident type, recording the happening of accident, collecting information and reporting the accident to relevant departments <p>6.2 Handle industrial accidents</p> <ul style="list-style-type: none"> ◆ Investigate industrial accidents related to electrical and mechanical services <ul style="list-style-type: none"> • Be capable to handle and investigate industrial accidents related to electrical and mechanical services according to the code of practice required for handling industrial accidents, including informing employers concerned, the Labour Department, the police and the families of the victims; filling in declaration form; investigating and recording the people, place, time and date, the machinery involved, the course of the accident, causes for it, etc. • Use objective methods and techniques to investigate and collect information. The investigation work include on-the-spot investigation, interviewing the victims/witnesses in person or on the phone, using questionnaire, etc. ◆ Report the accident to relevant departments ◆ Assist relevant departments to investigate the accident ◆ Improvement plans <ul style="list-style-type: none"> • Make improvement plans to reduce similar industrial accidents • Understand the causes of industrial accidents and ways of prevention ◆ Write accident investigation reports <ul style="list-style-type: none"> • Understand the document format and wording required and write accident investigation reports

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to handle and investigate industrial accidents related to electrical and mechanical services according to the code of practice required for handling industrial accidents, to make improvement plans and write accident investigation reports.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.

1. Title	Perform occupational safety and health supervision
2. Code	EMCUSH308A
3. Range	Master safety management techniques and occupational safety and health knowledge to perform occupational safety and health supervision in electrical and mechanical workplaces in order to comply with relevant safety legislations and the engineering contract requirements.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Concepts and techniques of occupational safety and health supervision</p> <ul style="list-style-type: none"> ◆ Understand the concepts and techniques of safety management in order to perform safety supervision, including: <ul style="list-style-type: none"> • Work safety requirements of the electrical and mechanical engineering contract • Safety inspection • Accident investigation • Safety audit and check • Work site tidiness and hygiene • Safety promotion • Risk assessment • Safety committee • Knowledge of latest safety legislations and their recent amendments <p>6.2 Occupational safety and health supervision</p> <ul style="list-style-type: none"> ◆ Apply knowledge and techniques of occupational safety and health supervision to perform occupational safety and health supervision for electrical and mechanical work in order to comply with relevant safety legislations and the engineering contract requirements
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply safety management techniques and occupational safety and health knowledge to perform occupational safety and health supervision for electrical and mechanical work according to relevant safety legislations and contract requirements.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety and health knowledge.

1. Title	Handle and review customers' complaints about electrical and mechanical product or service quality
2. Code	EMCUQM302A
3. Range	With regard to electrical and mechanical service quality management, analyze, review and handle customers' complaints properly, in clearly-defined conditions, according to in-house instructions.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 In-house instructions on handling customers' complaints</p> <ul style="list-style-type: none"> ◆ Understand in-house instructions on handling customers' complaints about electrical and mechanical product or service quality <p>6.2 Analyze, handle and review customers' complaints about electrical and mechanical product quality</p> <ul style="list-style-type: none"> ◆ Analyze and handle customers' complaints about electrical and mechanical product or service quality properly according to in-house instructions, including: <ul style="list-style-type: none"> • Referring the complaints to departments concerned to follow up and review of causes of the issues • Analyzing causes of the complaints and solving the problems with departments concerned • Handling and responding to the customers' complaints about quality or service ◆ Review customers' complaints about electrical and mechanical product quality or service <ul style="list-style-type: none"> • Analyze customers' satisfaction on the handling of complaints based on information from survey questionnaire on complaints • Review the way of handling complaints • Review the performance of handling complaints
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to analyze and handle customers' complaints about electrical and mechanical product quality, and make reviews.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Implement quality control and quality assurance
2. Code	EMCUQM303A
3. Range	Implement quality control and quality assurance according to engineering procedures for electrical and mechanical services to achieve high quality engineering performance.
4. Level	3
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Engineering procedures and quality control points of electrical and mechanical services</p> <ul style="list-style-type: none"> ◆ Understand the engineering procedures for electrical and mechanical services ◆ Understand quality monitoring points of each engineering procedure, including the electrical and mechanical installation procedure, inspection procedure, debugging procedure, commissioning procedure and servicing procedure ◆ Understand the quality control system of the organization and ensure that the service quality meet the requirements, including: <ul style="list-style-type: none"> • Ensuring that the engineering procedures meet the quality requirements and performance indicators • Confirming and rectifying procedures not complying with regulations • Organize teams to formulate quality improvement plans <p>6.2 Implement quality control and quality assurance</p> <ul style="list-style-type: none"> ◆ Follow the quality management scheme, quality assurance procedures and verification specifications to implement quality assurance ◆ Strictly examine the major monitoring points of each engineering procedure to ensure the quality performance of procedures ◆ Record various engineering quality problems and report to the management through the communication mechanism
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement quality control and quality assurance system, master the verification specifications and examine the major monitoring points of each engineering procedure to ensure the quality performance.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Formulate simple quality assurance plan and quality assurance reports
2. Code	EMCUQM304A
3. Range	With regard to electrical and mechanical engineering design, and in clearly-defined conditions, formulate simple quality assurance plan for all process for electrical and mechanical services and compile quality assurance reports on electrical and mechanical services.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Format, key points and relevant concerns of quality assurance reports</p> <ul style="list-style-type: none"> ◆ Understand the format, key points and relevant concerns of quality assurance reports on electrical and mechanical services <p>6.2 Compile quality assurance reports on electrical and mechanical services and formulate simple quality assurance plan</p> <ul style="list-style-type: none"> ◆ Compile quality assurance reports on electrical and mechanical services with correct format ◆ Formulate simple quality assurance plan, including: <ul style="list-style-type: none"> • Quality management standards and technical requirements • Quality management staff's responsibilities • Quality management resources arrangement • Quality management work instructions • Quality monitoring points of electrical and mechanical engineering process • Confirm the method and items of quality assurance and check • Measures to rectify quality deviations • Internal quality audit • File record management system
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to compile quality assurance reports on electrical and mechanical services and formulate simple quality assurance plan.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Record quality issues on electrical and mechanical services
2. Code	EMCUQM306A
3. Range	With regard to quality management of electrical and mechanical services, record all the quality main points of each engineering process, quality issues and problems to provide information for the management to formulate quality assurance reports.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Format and key points of quality assurance report on electrical and mechanical services</p> <ul style="list-style-type: none"> ◆ Understand format, key points and record required of quality assurance report on electrical and mechanical services <p>6.2 Record all kinds of engineering quality issues and problems</p> <ul style="list-style-type: none"> ◆ Strictly examine the major quality main points of each engineering process and record all kinds of engineering quality issues and problems <ul style="list-style-type: none"> • Follow the quality plan in order to execute quality assurance system, master the verification specifications, strictly examine the major control points of each engineering process, record all quality related issues, such as quality level for each action, non-compliance with regulations, errors, defects, deviation, excesses or shortfalls, etc. ◆ Quantify issues and problems on quality management so as to provide sufficient data or information for the management to produce the quality assurance reports
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to examine each engineering process; quantify quality management issues and problems so as to provide sufficient data or information for the management to produce the quality assurance reports.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Apply sales and marketing techniques
2. Code	EMCUMS301A
3. Range	Apply sales and marketing techniques, in workplaces where electrical sales and marketing is involved, to perform sales and marketing related to engineering projects.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic concepts of sales and marketing</p> <ul style="list-style-type: none"> ◆ Understand basic concepts of sales and marketing ◆ Understand the relationship between sales and marketing and different process of an engineering project: <ul style="list-style-type: none"> • Quotation • Preparations for the project • Design and procurement • Electrical and mechanical equipment installation • Requirement details of the inspection, debugging and commissioning of electrical and mechanical equipment • Requirement details of the operation, maintenance and servicing of electrical and mechanical equipment <p>6.2 Sales and marketing techniques</p> <ul style="list-style-type: none"> ◆ Know the application of all types of sales and marketing methods such as: <ul style="list-style-type: none"> • Sales and marketing techniques for general electrical and mechanical installation products and engineering services, e.g. general newspaper advertisement and leaflets by post • Sales and marketing techniques for specific electrical and mechanical installation products and engineering services, e.g. professional advertisement for engineering and business-to-business direct sale • Sales and marketing manpower organizational chart • Authority and responsibilities of sales and marketing staff at different levels • Concepts and limitations of local sales and marketing network • Sales and marketing flowchart • Sales and marketing review
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply sales and marketing techniques to perform sales and marketing related to engineering projects.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Master the market trend of general electrical products and relevant marketing development skills
2. Code	EMELMS301A
3. Range	Applicable to marketing and sales of electrical works. Master the market trend of general electrical products or engineering services and relevant marketing development skills.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the market trend of general electrical products or engineering services</p> <ul style="list-style-type: none"> ◆ Master the market information on electrical products or engineering services and the market trend of general electrical products or engineering services: <ul style="list-style-type: none"> • Characteristics and merits of electrical products or engineering services • Demand for electrical products or engineering services in different markets • Factors affecting the market trend of electrical products or engineering services, including: social factor, economic factor, environmental protection factor, technological factor, etc. • Market competition condition for electrical products or engineering services <p>6.2 Master the marketing development skills for general electrical products or engineering services</p> <ul style="list-style-type: none"> ◆ Master the marketing development skills for general electrical products or engineering services, such as: <ul style="list-style-type: none"> • Media of professional bodies e.g. publications, introduction leaflets and posters of professional bodies • Using IT to promote e.g. putting ads on the internet • Promoting products in exhibitions • Organizing promotional activities e.g. competitions, exchange forums, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the market trend of electrical products or engineering services according to their market information; and</p> <p>(ii) Capable to master the marketing development skills for general electrical products or engineering services in order to perform general electrical product or engineering service promotion.</p>
8. Remarks	

1. Title	Master electrical product design to promote electrical product sales
2. Code	EMELMS303A
3. Range	Applicable to marketing and sales of electrical works. Master electrical product design, including technical design specifications, quality inspection, etc, in order to promote electrical product sales.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the general information on electrical products</p> <ul style="list-style-type: none"> ◆ Understand the general information on electrical products including: <ul style="list-style-type: none"> • Uses and range of application of products • The operating principles of products • Technical standards and specifications of products • Reliability and safety of product quality <p>6.2 Master electrical product design to promote electrical product sales</p> <ul style="list-style-type: none"> ◆ Master electrical product design to promote electrical product sales including: <ul style="list-style-type: none"> • Product value e.g. uses and range of application of products • Product design process e.g. operating principles and system • Technical standards of products, specifications, test methods • Product quality inspection and assurance e.g. reliability, repairability, safety
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to master electrical product design in order to promote electrical product sales.
8. Remarks	

**Competencies for Practitioners of
the Electrical Engineering Branch
in the Electrical & Mechanical Services
Industry**

Competency Level 4

1. Title	Formulate effective storage and updating system for drawings
2. Code	EMCUDE405A
3. Range	Formulate effective storage and updating systems for drawings to support electrical and mechanical services for electrical and mechanical organization.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Storage system for electrical and mechanical engineering documents</p> <ul style="list-style-type: none"> ◆ Understand the entire storage system for electrical and mechanical engineering documents, including the correlational series and classification of typical drawings , and document storage system <p>6.2 Processing of electrical and mechanical engineering documents</p> <ul style="list-style-type: none"> ◆ Arrange drawings and classification of information <ul style="list-style-type: none"> • With engineering senses, classify the correlational series of typical drawings and information effectively for easy management ◆ Formulate system for the issuance of drawings and information, including: <ul style="list-style-type: none"> • Record of drawings and information issued • Marking of versions and dates issued ◆ Formulate retrieval mechanism for old drawings and information <ul style="list-style-type: none"> • Trace the locations of old drawings and information according to the issuance record, and be able to issue the most updated versions of drawings and information • Establish effective communication channels with users of the drawings and information ◆ Make use of information technology to enhance the efficiency of the storage and updating system for drawings and information <ul style="list-style-type: none"> • Use information technology and techniques to formulate systems to enhance the efficiency of storing, issuing, tracing and updating drawings and information
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective storage and updating system for drawings and information to effectively support the electrical and mechanical services.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical and mechanical drawing plans.

1. Title	Apply the electrical principles to assess power network design performance
2. Code	EMELDE401A
3. Range	Applicable to engineering design and management of high voltage transmission installations. Apply the electrical principles to assess the design performance of high voltage transmission network and handle various types of common problems of power network.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the electrical principles related to high voltage transmission network systems</p> <ul style="list-style-type: none"> ◆ Understand the electrical principles and design requirements for high voltage transmission network systems, such as the arrangement and protection design, etc. for the systems <p>6.2 Assess design performance and handle engineering design problems of high voltage transmission network</p> <ul style="list-style-type: none"> ◆ Assess design performance of high voltage transmission network ◆ Identify and confirm the engineering design problems of high voltage transmission network ◆ Analyze the content and impact of design problems in a simple way; report to parties concerned and seek solutions
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to assess the design performance of high voltage transmission network; and</p> <p>(ii) Capable to analyze the content and impact of design problems in a simple way; report to parties concerned and seek solutions.</p>
8. Remarks	

1. Title	Design extra-low voltage installations
2. Code	EMELDE403A
3. Range	Applicable to the design and installation of extra-low voltage installations of buildings. Master client's requirements, including all the terms and conditions in tender specifications or quotations, contract specifications, drawings, project schedules, etc.; implement design items of various kinds of extra-low voltage installations of buildings.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master client's requirements</p> <ul style="list-style-type: none"> ◆ Master client's requirements including various contract specifications, drawings, project schedules, etc. ◆ Consolidate client's requirements, technical specifications and relevant standards; analyze and list out key points of design <p>6.2 Implement the design of various kinds of extra-low voltage installations of buildings according to necessary client's requirements and key points of design</p> <ul style="list-style-type: none"> ◆ Implement the design of various kinds of extra-low voltage installations of buildings according to necessary client's requirements and key points of design including system equipment manufacturer's guidelines, approved standards, related local regulations, etc. <p>6.3 Professionalism in designing extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the design of extra-low voltage installations of buildings are safe and reliable to use
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the key points of design of extra-low voltage installations of buildings; and</p> <p>(ii) Capable to design various kinds of extra-low voltage installations of buildings according to client's requirements, approved standards and related local regulations.</p>
8. Remarks	

1. Title	Formulate schematic diagrams of extra-low voltage installations of buildings
2. Code	EMELDE404A
3. Range	Applicable to the design and installation of extra-low voltage installations of buildings. Master the design of various kinds of extra-low voltage installations of buildings and installation criteria, and apply appropriate drawing techniques to formulate or improve the schematic diagrams of extra-low voltage installation systems of buildings according to client's requirements and the actual situation of the work site.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the design of various kinds of extra-low voltage installations of buildings and installation criteria</p> <ul style="list-style-type: none"> ◆ Understand various kinds of extra-low voltage installations of buildings manufacturer's technical specifications for design and installation ◆ Understand methods and criteria for the installation of various kinds of extra-low voltage installations of buildings ◆ Understand composition of various kinds of extra-low voltage installation systems of buildings and relevant standards <p>6.2 Apply appropriate drawing techniques to formulate or improve the schematic diagrams of installation systems</p> <ul style="list-style-type: none"> ◆ Apply appropriate drawing techniques to formulate the schematic diagrams of extra-low voltage installation systems of buildings according to client's requirements and the actual situation of the work site <p>6.3 Professionalism in formulating schematic diagrams of extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the design of installations of buildings are safe and reliable to use
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the design of various kinds of extra-low voltage installations of buildings and installation criteria; and</p> <p>(ii) Capable to apply appropriate drawing techniques to draw or modify the schematic diagrams of extra-low voltage installation systems of buildings according to client's requirements and the actual situation of the work site.</p>
8. Remarks	

1. Title	Master the techniques of assembling, operating, testing and repairing power supply facilities
2. Code	EMELDE406A
3. Range	Applicable to the design, assembling, operation, testing and repair of electrical power supply facilities. Understand the structure and assembling methods of power facilities and master the techniques of operating, testing and repairing power supply facilities.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the structure and assembling methods of electrical power supply facilities</p> <ul style="list-style-type: none"> ◆ Understand various types of installation specifications and techniques, manufacturer’s assembly diagram and design drawing ◆ Understand the structure and assembling methods of power supply facilities including: transformers, generators, low voltage or high voltage switchboard, various kinds of switches, protection and control devices, etc. <p>6.2 Master the techniques of operating, testing and repairing electrical power supply facilities</p> <ul style="list-style-type: none"> ◆ Understand the characteristics of the running and operation of power supply facilities according to operation and repair manual ◆ Master the inspection, testing, repair and maintenance of power supply facilities according to operation and repair manual ◆ Master the performance and operating methods of various types of testing instruments, testing and repair techniques so as to assist in the design of power supply facilities ◆ Master key points for the operation, testing and repair of power supply facilities, consolidate basic design and formulate relevant working guidelines
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the structure and assembling methods of power supply facilities ; and</p> <p>(ii) Capable to master the techniques of assembling, operating, testing and repairing power supply facilities; and formulate relevant working guidelines.</p>
8. Remarks	

1. Title	Formulate high voltage transmission schematic diagrams and protection control circuits
2. Code	EMELDE407A
3. Range	Applicable to the design of high voltage transmission power supply network and associated installations. Formulate high voltage transmission network power systems and their protection control circuits according to actual needs.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the main points of the planned high voltage transmission network power systems</p> <ul style="list-style-type: none"> ◆ Understand the power demand of high voltage transmission networks in different areas ◆ Understand the main points of the planned high voltage transmission network power systems <p>6.2 Formulate protection and control circuits according to the actual situation of the network</p> <ul style="list-style-type: none"> ◆ Assess the performance or weaknesses of different protection and control circuits, such as safety level, feasibility and reliability, etc. ◆ Formulate or improve high voltage transmission network planning and draw schematic diagrams ◆ Formulate or improve protection and control circuits according to the demerits of protection and control circuits ◆ Formulate protection and control circuits according to the nature of different in/out transmission lines <p>6.3 Professionalism in formulating high voltage transmission schematic diagrams and protection control circuits</p> <ul style="list-style-type: none"> ◆ Ensure that the protection and control circuits of high voltage transmission power supply network and associated installations are safe to use according to the regulations and safety guidelines for the industry
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the main points of the planned high voltage transmission network power systems in order to formulate high voltage transmission network schematic diagrams ; and</p> <p>(ii) Capable to formulate protection and control circuits according to the actual situation of the network.</p>
8. Remarks	

1. Title	Conform to relevant regulations and international standards for implementing power supply network projects
2. Code	EMELDE408A
3. Range	Applicable to electrical engineering works. Conform to electricity regulations and international standards related to electrical supply equipment or electrical engineering services for the implementation of power supply network projects and associated facilities.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand regulations and international standards related to electrical supply equipment or electrical engineering services</p> <ul style="list-style-type: none"> ◆ Understand regulations and international standards related to electrical supply equipment or electrical engineering services such as: <ul style="list-style-type: none"> • International Electric Community Standards (IEC) • British EU Standards (BSEN) • Chinese National Standard (GB) • Electricity Regulations • Environmental Regulations • Fire Regulations <p>6.2 Apply regulations and international standards related to electrical supply equipment or electrical engineering services to perform engineering works</p> <ul style="list-style-type: none"> ◆ Apply regulations and international standards related to electrical supply equipment or electrical engineering services to effectively perform power supply network projects and associated installations <ul style="list-style-type: none"> • High voltage transmission power network and associated installations including various kinds of switches, transformers, generators, cables, transmission overhead lines, protection and control devices, etc. equipment • Electrical projects including design, installation, inspection, commissioning, testing, operation, repair and maintenance, quality management, operation management, project management, etc. ◆ Approve electrical engineering documents such as: assembly diagrams and design drawings, working diagrams of power supply network, installation specifications, working procedures, etc. submitted by manufacturers, contractors, engineering bodies, etc. according to relevant local regulations and international standards

	<p>6.3 Professionalism in handling protection and control circuits of power supply network and associated installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that protection and control circuits of power supply network and associated installations are safe and reliable to use
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to apply regulations and international standards related to electrical supply equipment or electrical engineering services to perform engineering works.
8. Remarks	

1. Title	Use computer application software to enhance engineering efficiency and quality
2. Code	EMELDE409A
3. Range	Applicable to tasks related to electrical and mechanical work. Use various types of computer application software to perform engineering supervision to enhance the efficiency and quality of electrical and mechanical installation project.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand design data related to electrical and mechanical work and the methods of using professional design application software</p> <ul style="list-style-type: none"> ◆ Understand design data and information related to electrical and mechanical work ◆ Understand the methods of using professional design application software <p>6.2 Use various types of computer application software to perform engineering supervision</p> <ul style="list-style-type: none"> ◆ Use various types of computer application software to perform engineering supervision to enhance electrical and mechanical work efficiency and quality. Engineering application software including <ul style="list-style-type: none"> • Designing application software such as: power systems simulation design software, graphics application software, word processing application software, etc. • Project management application software • Running and testing application software • Operation management application software such as: accounting application software, chart application software, etc.
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to use specified computer application software to perform related engineering supervision to enhance engineering efficiency and quality.
8. Remarks	

1. Title	Formulate engineering design solutions
2. Code	EMELDE410A
3. Range	Applicable to tasks related to electrical and mechanical works. Use relevant data and information to perform computation for electrical and mechanical works and formulate engineering design solutions.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand methods of collecting necessary design data for electrical and mechanical works</p> <ul style="list-style-type: none"> ◆ Understand methods of collecting necessary design data for electrical and mechanical work such as international standards, announcements made by engineering societies, site investigations, etc. <p>6.2 Formulate engineering design solutions</p> <ul style="list-style-type: none"> ◆ Obtain data and information for various types of electrical and mechanical projects from relevant regulations, international standards, announcements made by engineering societies, site investigations, etc, including: <ul style="list-style-type: none"> • Maximum demand of the installations • Demand of various electrical and mechanical facilities, required floor space and locations • Human resources and costs involved in every stage of the project • Quality assurance data • Market capacity and share ◆ Use relevant data and information to perform computation for electrical and mechanical works, and formulate engineering solutions for the areas of design, installation, inspection, testing, commissioning, operation, repair, maintenance, project management, engineering operation management, occupational health, safety and environmental protection, quality management, marketing and sales, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to obtain necessary data and information to perform computation for specified electrical and mechanical works, and formulate relevant engineering design solutions.</p>
8. Remarks	

1. Title	Assess the performance of three-phase transformers
2. Code	EMELDE411A
3. Range	Applicable to tasks related to electrical and mechanical work. Assess the performance of three-phase transformers to provide the power system design with the optimum operating condition.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the meanings of various types of basic data for three-phase transformers</p> <ul style="list-style-type: none"> ◆ Understand the meanings of various types of basic data for three-phase transformers such as winding vector group, load current, voltage regulation control, cooling performance data, etc. <p>6.2 Assess the performance of three-phase transformers to provide the power system design with optimum operating condition</p> <ul style="list-style-type: none"> ◆ Assess the performance of three-phase transformers including: various kinds of loss, power, efficiency, voltage regulation data, load current, etc. ◆ Provide optimum operating data for the transformers
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to assess the performance of three-phase transformers to provide the power system design with the optimum operating condition.</p>
8. Remarks	

1. Title	Assess AC-DC traction control system performance
2. Code	EMELDE412A
3. Range	Applicable to tasks related to electrical and mechanical work. Assess AC-DC traction control system performance and provide the best operational status for AC-DC traction control system design.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the basic performance data for AC-DC traction control systems</p> <ul style="list-style-type: none"> ◆ Understand the basic performance data for AC-DC traction control systems including performance data for conduction angles of converters and inverters commonly used, rectifier control circuits, inverter control circuits, voltage control circuits and chopper control circuits ◆ Understand the effect of different voltage and frequencies on three-phase induction motors ◆ Understand the characteristics of three-phase induction motors ◆ Understand the constraints of working temperature on various kinds of controllers <p>6.2 Assess AC-DC traction control system performance to provide the optimum operating condition for AC-DC traction control system design</p> <ul style="list-style-type: none"> ◆ Assess AC-DC traction control system performance including performance data for conduction angle of converters and inverters, output and input voltage and current, three-phase induction motors, rectifier control circuits, inverter control circuits, voltage control circuits and chopper control circuits, etc. ◆ Provide the optimum operating data for AC-DC traction control systems
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to assess AC-DC traction control system performance to provide the optimum operating condition for AC-DC traction control system design.</p>
8. Remarks	

1. Title	Master the details of the electrical engineering project and communicate with the client
2. Code	EMELDE414A
3. Range	Applicable to tasks related to electrical engineering projects. Master the details of the electrical project and use a series of skills to communicate with the client.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the details and key points of the documents for the electrical engineering project</p> <ul style="list-style-type: none"> ◆ Understand the details and key points of the documents for the electrical project, including related regulations and standards, design and installation requirements of client's contract, project proposal, installation guidelines, etc. <p>6.2 Use a series of communication skills to enhance the efficiency of electrical engineering project</p> <ul style="list-style-type: none"> ◆ Use a series of communication skills including: <ul style="list-style-type: none"> • Accurately master the communication target • Accurately master the communication goal • Accurately master client's demand • Accurately describe site constraints and key points for implementing relevant improvements • Carefully listen and analyze information on non-conformed issues in the electrical project • Master the skills of conversation and analyzing the psychology of the communication target
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the key details of the electrical engineering project documents; and</p> <p>(ii) Capable to master client's demand and use communication skills to perform liaison task for the electrical engineering project.</p>
8. Remarks	

1. Title	Design low voltage power systems fed by a single transformer	
2. Code	EMELDE416A	
3. Range	Applicable to the design of low voltage distribution system and associated installations. Implement the design of a low voltage power supply system directly fed by a single transformer, including relevant power supply arrangement and protection and control circuits.	
4. Level	4	
5. Credit	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic design concept of general low voltage power systems directly fed by a single transformer</p> <ul style="list-style-type: none"> ◆ Understand the basic design concept and requirements on the power supply arrangement, protection and control circuits, wiring method and various kinds of final circuits of the directly fed by a single transformer, such as: <ul style="list-style-type: none"> • Low voltage switchboard, busbar, riser capacity calculation and organization • Circuit isolation, circuit organization management, classification of circuits • Overcurrent protection and ground fault protection • Earthing system • Calculation of current demand and selection of cables • Surface wiring system • Concealed wiring system • Ring and radial socket circuit • Various kinds of lighting circuits <p>6.2 Implement basic distribution and final circuit design for low voltage electrical installations</p> <ul style="list-style-type: none"> ◆ Implement basic distribution and final circuit design for low voltage electrical installations according to power supply design requirements for general low voltage power systems, such as the distribution arrangement, protection and control circuits, wiring method, earthing systems, various kinds of final circuits of low voltage switchboard, busbar and riser <p>6.3 Professionalism in designing low voltage power systems directly fed by a single transformer</p> <ul style="list-style-type: none"> ◆ Follow the Electricity (Wiring) Regulations and their Code of Practice to design low voltage power systems directly fed by a single transformer 	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to understand the basic design concept and requirements for low voltage power systems directly fed by a single transformer; and (ii) Capable to implement the design of basic distribution, final circuits, and protection and control circuits for low voltage power systems according to the technical and legal requirements.
8. Remarks	

1. Title	Master the details of drawings and lead the team to perform the assembly and bench fitting of major electrical and mechanical facilities
2. Code	EMELIN402A
3. Range	Applicable to the installation and bench fitting of major electrical and mechanical facilities. Master the details of drawings and lead the team to perform the assembly and bench fitting of major electrical and mechanical facilities.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the assembly and bench fitting skills for electrical and mechanical facilities and the details of engineering drawings of various kinds of major electrical and mechanical facilities</p> <ul style="list-style-type: none"> ◆ Understand the techniques of bench fitting, adjustment, assembly and removal of various kinds of generating units, power units ◆ Understand bench fitting and assembling techniques for various kinds of high voltage and low voltage switchboards ◆ Understand the details of engineering drawings of various kinds of major electrical and mechanical facilities, including various kinds of circuit control diagrams, manufacturer's assembly diagram and design drawing and planning diagrams of plants and work sites <p>6.2 Lead the team to perform the assembly and bench fitting of electrical and mechanical facilities</p> <ul style="list-style-type: none"> ◆ Monitor and lead the working team to perform the assembly and bench fitting of electrical and mechanical facilities ◆ Assess the work progress and ensure that the engineering project quality meets the requirements of the tender specifications or project contract ◆ Ensure that the working methods of the staff meet occupational safety and health and environmental protection requirements <p>6.3 Professionalism in the installation and bench fitting of major electrical and mechanical facilities</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the installation and bench fitting of major electrical and mechanical facilities are performed safely and the facilities are safe to use

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master the assembly and bench fitting skills for electrical and mechanical facilities; (ii) Capable to master the details of engineering drawings of various types of major electrical and mechanical facilities; and (iii) Capable to lead the team to perform the assembly and bench fitting of electrical and mechanical facilities.
8. Remarks	

1. Title	Master technical requirements and to install extra-low voltage installations
2. Code	EMELIN403A
3. Range	Applicable to installation of extra-low voltage installations of buildings. Install extra-low voltage installations of buildings and perform wiring arrangement according to the characteristics and technical requirements for various extra-low voltage installations of buildings facilities and devices and the analysis on the actual situation and constraints of the work site.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the technical requirements for installing various kinds of extra-low voltage installations of buildings</p> <p>6.2 Install extra-low voltage installations</p> <p>6.3 Professionalism in installing extra-low voltage installations</p> <ul style="list-style-type: none"> ◆ Understand the characteristics of and installation requirements for various kinds of installation facilities, such as the wiring arrangement, circuit separation, system protection, extra-low voltage installation systems network standard, etc. ◆ Perform analyses on electromagnetic interference, network communication method, etc. according to the actual situation and constraints of the work site ◆ Follow the technical requirements and site constraints for installation to install various kinds of extra-low voltage installations ◆ Follow the regulations and safety guidelines for the industry to ensure that the installation of extra-low voltage installations are performed safely and the extra-low voltage installations are safe to use
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the characteristics of and installation requirements for various kinds of extra-low voltage installations of buildings and perform the installation work required; and</p> <p>(ii) Capable to properly arrange to install extra-low voltage installations according to the actual situation and constraints of the work site.</p>
8. Remarks	

1. Title	Monitor work progress for high voltage transmission installations
2. Code	EMELIN405A
3. Range	Applicable to the installation of high voltage transmission power supply network and associated installations. Monitor and record installation work progress for electrical installations, and write simple report on it.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the monitoring and reporting mechanism for project management</p> <ul style="list-style-type: none"> ◆ Understand the monitoring and reporting mechanism for project management ◆ Understand the key issues for monitoring and recording, and the timing of reporting <p>6.2 Monitor work progress for high voltage transmission installations</p> <ul style="list-style-type: none"> ◆ Perform analysis and record and report the installation progress for high voltage transmission installations according to the actual working situation for installing high voltage transmission installations ◆ Monitor at different working stages the installation work progress for electrical installations according to the actual working situation for installing high voltage transmission installations; solve problems related to the installation work so as to complete the project on time ◆ Write simple work progress report to follow up with problems unsolved
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to monitor installation work progress for high voltage transmission installations; and (ii) Capable to write simple work progress report to follow up with problems unsolved.
8. Remarks	

1. Title	Apply advanced technologies to the installation of electrical supply facilities
2. Code	EMELIN407A
3. Range	Applicable to installation of electrical installations. Apply advanced technologies relevant to the installation of electrical supply facilities and to enhance work efficiency and accuracy in installing current electrical installations.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand installation skills and relevant advanced technologies for general electrical installations</p> <ul style="list-style-type: none"> ◆ Understand general installation skills and relevant advanced technologies and management methods such as selecting innovative materials and tools suitable for the advanced technologies for installation of electrical installations, using computer aided software to draw shop drawings and as-built drawings, delivery of materials and equipment, storage and utilization management, etc. ◆ Understand the installation techniques and the inadequacies of management for current electrical installations <p>6.2 Apply advanced technologies and management methods to improve or complement general installation weaknesses</p> <ul style="list-style-type: none"> ◆ Apply advanced technologies and management methods to enhance work efficiency and accuracy in installing current electrical installations and handle problems in installing specific electrical installations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the strengths and weaknesses of general installation and management techniques; and</p> <p>(ii) Capable to apply advanced technologies and management methods to improve or complement shortfalls of general installation and handle problems in installing specific electrical installations.</p>
8. Remarks	

1. Title	Install high voltage transmission network facilities	
2. Code	EMELIN409A	
3. Range	Master client's various requirements for various power facilities of high voltage transmission network, and install high voltage transmission network facilities and associated installations.	
4. Level	4	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand client's various requirements</p> <ul style="list-style-type: none"> ◆ Understand client's requirements, including all the clauses of various kinds of tender specifications or quotations, contract terms, drawings, project schedules; list out installation items required to be carried out ◆ Understand the technical requirements for installing high voltage transmission network installations and associated equipment, including manufacturers' technical specifications on installing high voltage transmission installations, system arrangement for electrical installations, system protection plan, etc. <p>6.2 Install high voltage transmission power network and associated installations</p> <ul style="list-style-type: none"> ◆ Investigate the work site on purpose at different stages and analyze according to the actual situation; point out the constraints for installing high voltage transmission power network and associated installations and potential work site problems ◆ Follow client's installation requirements to select appropriate materials, tools and approved installation techniques to perform installation task, including various kinds of switches, transformers, generators, cables, protection and control devices, etc. equipment ◆ Install high voltage transmission power supply network system and associated installations according to the design requirements and working plans for high voltage transmission network installations and associated equipment, including organizing, connecting and communicating various kinds of high voltage switches, transformers, cables, insulated supporting frames, protection and control devices, earthing systems, lightning protection system, etc. ◆ Perform setting of protection system according to the protection schemes for high voltage transmission installations, and improve the protection schemes according to the actual situation 	

	<p>6.3 Professionalism in installing high voltage transmission power supply network and associated installations</p> <p>◆ Follow the regulations and safety guidelines for the industry to ensure that the high voltage transmission power supply network and associated installations are safely installed and are safe to use</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to analyze the actual situation and constraints of the worksite ; and</p> <p>(ii) Capable to install high voltage transmission power network and associated installations according to client's and technical requirements on installation.</p>
8. Remarks	

1. Title	Install low voltage distribution network systems
2. Code	EMELIN410A
3. Range	Applicable to installation of low voltage distribution network and associated installations. Implement various tasks for installing low voltage power supply network system and associated installations directly fed by several transformers.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand various techniques of installing low voltage distribution network installations and associated equipment</p> <ul style="list-style-type: none"> ◆ Understand low voltage power supply network structure directly fed by several transformers according to client's design drawings ◆ Master various techniques and work processes of installing low voltage distribution network installations and associated equipment including arranging technical staff and tools, etc. <p>6.2 Install low voltage distribution network installations and associated equipment</p> <ul style="list-style-type: none"> ◆ Perform analyses at different stages according to the actual situation of the work site; formulate measures to solve the potential problems and constraints of the work site ◆ Select appropriate materials, tools and approved installation techniques to perform installation task according to actual installation progress, including various kinds of switches, transformers, generators, cables, protection and control devices, etc. equipment <p>6.3 Professionalism in installing low voltage distribution network systems and associated installations</p> <ul style="list-style-type: none"> ◆ Follow the Electricity (Wiring) Regulations and code of safe working practice to implement installation of low voltage distribution network systems
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master potential problems and constraints of the work site and formulate solutions; and (ii) Capable to master the application of installation techniques and safely implement the installation of low voltage distribution network installations and associated equipment.
8. Remarks	

1. Title	Inspect, test and commission overhead line equipment and related suspension and earthed installations
2. Code	EMCUIT401A
3. Range	Inspect, test and commission overhead line equipment and related suspension and earthed installations, including inspections on live and / or dead condition, according to instructions and standards for inspection, testing and commissioning of electrical and mechanical services.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles and functions of different kinds of overhead line equipment ♦ Understand the operating principles and functions of different equipment of the overhead line system, including the suspension and earthed installations</p> <p>6.2 Inspect, test and commission overhead line equipment and related suspension and earthed installations ♦ Perform the inspection, testing and commissioning of different equipment of the overhead line system, including inspections on live and / or dead condition; and the testing of suspension , isolation and earthed installations should meet the performance required by the specified standards</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency are:</p> <p>(i) Capable to inspect, test and commission the functions of different equipment of the overhead line system, including conducting inspections on live and / or dead condition, according to guidelines, drawings and standards; and</p> <p>(ii) Capable to inspect, test and commission suspension, isolation and earthed installations to ensure that they meet the performance required by the specified standards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical installations.

1. Title	Inspect, test and commission extra-low voltage installations
2. Code	EMELIT402A
3. Range	Master client's requirements, including contract specifications, drawings, project schedules, etc. and implement inspection, testing and commissioning for various kinds of extra-low voltage installations of buildings.
4. Level	4
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand client's requirements on inspection, testing and commissioning</p> <ul style="list-style-type: none"> ◆ Understand client's requirements and issues on inspection, testing and commissioning according to the terms of various kinds of tender specifications or quotations, contract specifications, drawings, project schedules, etc. <p>6.2 Inspect, test, commission, and analyze various kinds of extra-low voltage installations of buildings</p> <ul style="list-style-type: none"> ◆ Use appropriate instruments, tools and techniques to perform inspection, testing and commissioning for various kinds of extra-low voltage installations of buildings ◆ Analyze the inspection, testing and commissioning results of extra-low voltage installations of buildings according to the standards and codes of practice for extra-low voltage installations of buildings, judge the functional performance of the installations and decide on follow-up actions <p>6.3 Professionalism in inspecting, testing and commissioning extra-low voltage installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that inspection, testing and commissioning of extra-low voltage installations are performed safely, and the extra-low voltage installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the terms of various kinds of tender specifications or quotations, contract specifications, drawings, project schedules, etc.;</p> <p>(ii) Capable to use appropriate instruments, tools and techniques to perform inspection, testing and commissioning for various kinds of extra-low voltage installations of buildings; and</p> <p>(iii) Capable to analyze the inspection, testing and commissioning results of various kinds of extra-low voltage installations of buildings, judge the functional performance of the installations and decide on follow-up actions.</p>
8. Remarks	

1. Title	Draw schematic diagram of high voltage transmissions and improve protection control circuits
2. Code	EMELIT404A
3. Range	Applicable to electrical work. Draw schematic diagrams for the power supply of high voltage transmission power systems in general and improve the protection control circuits.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the techniques of drawing high voltage transmission network schematic diagrams</p> <ul style="list-style-type: none"> ◆ Understand the functions and operating principles of high voltage transmission level power network equipment ◆ Understand the symbols and techniques of drawing high voltage transmission level power network equipment <p>6.2 Draw schematic diagrams of high voltage transmission and improve protection control circuits</p> <ul style="list-style-type: none"> ◆ Draw schematic diagrams of power network of high voltage transmission level ◆ Master the functions and operating principles of high voltage transmission level power network protection control circuits, and improve the inadequacies of protection control circuits after testing
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to draw schematic diagrams of high voltage transmission; and (ii) Capable to point out and improve the inadequacies of protection control circuits.
8. Remarks	

1. Title	Implement advanced technologies on the inspection, testing and commissioning of electrical installations
2. Code	EMELIT407A
3. Range	Applicable to the inspection, testing and commissioning of electrical installations. Use advanced technologies for the inspection, testing and commissioning of electrical installations to enhance the efficiency of the existing inspection, testing and commissioning of electrical installations.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the existing inspection, testing and commissioning techniques and management problems for electrical installations</p> <ul style="list-style-type: none"> ◆ Understand the inadequacies of the existing inspection, testing and commissioning techniques for electrical installations ◆ Understand the existing inspection, testing and commissioning management problems for electrical installations <p>6.2 Implement advanced technologies on the inspection, testing and commissioning of electrical installations</p> <ul style="list-style-type: none"> ◆ Use advanced technologies to make up for the inadequacies of the existing inspection, testing and commissioning techniques and management for electrical installations, and enhance the efficiency and accuracy of work ◆ Handle the inspection, testing and commissioning management problems for specific electrical installations ◆ Implement relevant advanced technologies and management methods for inspection, testing and commissioning such as the use of advanced instruments and equipment, advanced inspection and testing methods, systematic inspection, testing and commissioning procedures, documents and reports, and relevant logistic management
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the uses and the strengths and weaknesses of general inspection, testing and commissioning and management techniques; and</p> <p>(ii) Capable to use advanced technologies in the inspection, testing and commissioning of electrical installations, and use to them to handle the inspection, testing and commissioning problems for specific electrical installations.</p>
8. Remarks	

1. Title	Inspect, test and commission high voltage transmission installations
2. Code	EMELIT409A
3. Range	Applicable to the inspection, testing and commissioning of high voltage transmission power networks and associated installations. Master client's and various technical requirements for various kinds of high voltage transmission power network facilities, associated installations, control equipment and protection devices; perform the inspection, testing and commissioning.
4. Level	4
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand client's requirements and the inspection, testing and commissioning specifications specified by international standards</p> <ul style="list-style-type: none"> ◆ Understand client's requirements and the inspection, testing and commissioning specifications specified by international standards ◆ Understand the requirements of the Safety Rules (Electrical) on inspection, testing and commissioning ◆ Understand the characteristics of high voltage transmission equipment for inspection, testing and commissioning including various kinds of switches, transformers, cables, protection and control devices, etc. ◆ Understand the details of the inspection, testing and commissioning items for various kinds of high voltage transmission equipment, including insulation resistance test, high voltage test, primary injection test for inverter, secondary injection test for various kinds of protection relays, vacuum tube DC high voltage test, etc. ◆ List the details of the inspection, testing and commissioning items required <p>6.2 Implement inspection, testing and commissioning on high voltage transmission installations</p> <ul style="list-style-type: none"> ◆ Inspect the operation of various types of high voltage transmission installations or equipment such as various kinds of high voltage transmission switches, transformers, cables, overhead lines, protection and control devices, earthing systems, lightning protection system, etc. ◆ Implement recognized inspection, testing and commissioning on various types of high voltage transmission installations, such as primary and secondary injection test, insulation resistance test, high voltage withstand test, dielectric strength test, vacuum tube DC high voltage test, etc.

	<ul style="list-style-type: none"> ◆ Implement various types of protection relay tests for protection devices such as: overcurrent relay, earth fault relay, three-phase unbalance protection relay, over or under voltage protection relay, etc. ◆ Analyze the inspection, testing and commissioning results of high voltage transmission installations, and judge whether the installations inspected are qualified <p>6.3 Professionalism in inspecting, testing and commissioning high voltage transmission installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the inspection, testing and commissioning of high voltage transmission installations are safely performed, and the high voltage transmission installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to inspect the operation of various types of high voltage transmission installations or equipment; (ii) Capable to master the using methods and key points for testing instruments; and (iii) Capable to follow the regulations and safety guidelines for the industry to test and adjust various types of high voltage transmission installations and protection devices, and complete the test report.
8. Remarks	

1. Title	Inspect, test and commission low voltage distribution network system installations
2. Code	EMELIT410A
3. Range	Applicable to the inspection, testing and commissioning of low voltage distribution network and associated installations. Master various technical requirements for the low voltage power supply network system directly fed by several transformers, its associated installations, control equipment and protection devices; perform the inspection, testing and commissioning.
4. Level	4
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master client's requirements and the inspection, testing and commissioning specifications specified by international standards</p> <ul style="list-style-type: none"> ◆ Master client's requirements and the inspection, testing and commissioning specifications specified by international standards ◆ Master the requirements of the Safety Rules (Electrical) on inspection, testing and commissioning ◆ Master the characteristics of low voltage power supply network system and associated installations directly fed by several transformers including various kinds of switches, transformers, cables, protection and control devices, etc. ◆ Master the details of various kinds of inspection, testing and commissioning items including insulation resistance test, high voltage withstand test, primary injection test for inverter, secondary injection test for various kinds of protection relays, etc. <p>6.2 Implement inspection, testing and commissioning on low voltage power supply network system and associated installations</p> <ul style="list-style-type: none"> ◆ Inspect the operation of various types of low voltage power supply network system and associated installations such as low voltage power distribution switches, cables, protection and control devices, earthing systems, lightning protection system, etc. ◆ Implement various types of inspection, testing and commissioning such as: primary and secondary injection test, insulation resistance test, high voltage withstand test, etc. ◆ Implement integrated operational test on various types of protection and control circuits such as protection plan, interaction and interlocking control plan, etc. ◆ Analyze the inspection, testing and commissioning results of low voltage power supply network system and associated installations, and judge whether the installations inspected are qualified

	<p>6.3 Professionalism in inspecting, testing and commissioning low voltage power supply network system and associated installations</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the inspection, testing and commissioning of low voltage power supply network system and associated installations are safely and effectively performed
<p>7. Assessment Criteria</p>	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to inspect the operation of low voltage power supply network system and associated installations; (ii) Capable to follow the regulations and safety guidelines for the industry to test and adjust low voltage power supply network system and associated installations, and complete the test report; and (iii) Capable to judge whether the low voltage power supply network system inspected, tested and commissioned are qualified.
<p>8. Remarks</p>	

1. Title	Supervise equipment maintenance work to ensure its quality, standard and efficiency	
2. Code	EMCUMA401A	
3. Range	Supervise, coordinate and support the maintenance working team to perform the repair work for electrical and mechanical engineering equipment.	
4. Level	4	
5. Credit	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Procedures, standard and requirements for repairing engineering equipment</p> <ul style="list-style-type: none"> ◆ Understand the general procedures, standard and requirements for repairing engineering equipment, and analyze and set the procedures, standard and requirements for repairing them according to the repairing instructions and knowledge of relevant repairing techniques <p>6.2 Supervise equipment maintenance work to ensure its quality</p> <ul style="list-style-type: none"> ◆ Support and coordinate the repair work <ul style="list-style-type: none"> • Support the repair work technically and in the aspect of resource allocation • Coordinate all items of repair and pay attention to the progress of crucial procedures ◆ Monitor the repair work <ul style="list-style-type: none"> • Check randomly the repair quality according to the importance of procedure • Take appropriate steps to rectify the repair work not up to the standard, and ensure that rectification continues to be effective and the job can be finished in time ◆ Purchase suitable tools and equipment to enhance the repairing efficiency <ul style="list-style-type: none"> • Apply repairing procedures and techniques, and purchase adequate suitable repairing tools and equipment to enhance the repairing efficiency • Formulate and implement repairing tools and equipment maintenance plan ◆ Maintain good human resources management, time management and interpersonal relationship <ul style="list-style-type: none"> • Analyze and formulate manpower training plans • Implement good time management • Maintain good interpersonal relationship 	

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to support, coordinate and monitor effectively the implementation of repair work; work out methods to ensure the quality, standard and efficiency of the repair work; formulate long-term plans for equipment maintenance with human resources concerned; and maintain good staff interpersonal relationship.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic management knowledge</p>

1. Title	Operate, repair and maintain extra-low voltage installations
2. Code	EMELOR402A
3. Range	Applicable to the installation work of extra-low voltage installations of buildings. Master the operation, repair and maintenance of various kinds of extra-low voltage installations of buildings; formulate plans for the operation, repair and maintenance; and analyze the performance of operation, repair and maintenance of various kinds of installations.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand various kinds of installation drawings, operation and maintenance manuals, client's requirements, relevant codes of practice and standards, etc.</p> <ul style="list-style-type: none"> ◆ Understand the methods and steps stipulated in various kinds of installation drawings, and operation and maintenance manuals provided by suppliers ◆ Understand client's requirements, relevant codes of practice and standards, etc. ◆ Understand faults commonly seen in various kinds of installations and the troubleshooting methods <p>6.2 Operate, repair and maintain extra-low voltage installations</p> <ul style="list-style-type: none"> ◆ Formulate plans for the operation, repair and maintenance of extra-low voltage installations according to client's requirements, operation and maintenance manuals provided by suppliers, relevant codes of practice and standards, etc. ◆ Use appropriate instruments, tools and techniques to perform operation, repair and maintenance ◆ Master faults and their causes commonly seen in various kinds of installations, and use appropriate techniques, instruments and tools to troubleshoot them <p>6.3 Professionalism in operating, repairing and maintaining extra-low voltage installations</p> <ul style="list-style-type: none"> ◆ Follow the law and safety guidelines for the industry to ensure that the repair and maintenance of extra-low voltage installations operation are safely performed, and the extra-low voltage installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to perform operation, repair and maintenance according to various kinds of installation drawings, and operation and maintenance manuals;</p> <p>(ii) Capable to formulate plans for the operation, repair and maintenance of extra-low voltage installations according to client's requirements, operation and maintenance manuals provided by suppliers, relevant codes of practice and standards, etc.; and</p> <p>(iii) Capable to master faults and their causes commonly seen in various kinds of installations, and use appropriate techniques, instruments and tools to perform repair and maintenance.</p>
8. Remarks	

1. Title	Find out faults in faulty high voltage transmission facilities
2. Code	EMELOR404A
3. Range	Applicable to daily operation, repair and maintenance management of electrical work. Master the operation and fault conditions of various types of high voltage transmission installations and equipment, and use various types of appropriate methods to find out faults.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the operation and fault conditions of various types of high voltage transmission installations and equipment</p> <ul style="list-style-type: none"> ◆ Understand the operation and fault conditions such as high voltage switch control circuit failure, mechanical fault in high voltage switches, cable fault, air leak in SF6 insulated high voltage switch, etc. in various types of high voltage transmission installations and equipment <p>6.2 Use appropriate methods to find faults in high voltage transmission equipment</p> <ul style="list-style-type: none"> ◆ Use various types of appropriate instruments such as multi-meter, insulator, withstand tester, injection test instruments, active detector, gas tester, etc. to find faults in high voltage transmission equipment ◆ Use appropriate testing methods such as insulation test, continuity test, withstand test, injection test, etc. to find faults in high voltage transmission equipment
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the operation and fault conditions of various types of high voltage transmission installations and equipment; and</p> <p>(ii) Capable to use various types of appropriate instruments or methods to find out faults in high voltage transmission facilities.</p>
8. Remarks	

1. Title	Provide logistic services of operation, maintenance and repair
2. Code	EMELOR406A
3. Range	Applicable to the operation, repair and maintenance of electrical work. Master corporate logistic service system and procedures, and provide after-sales services to clients for power transmission and distribution networks at all levels and various types of electrical installations and equipment, or provide relevant logistic support services including various types of operation, maintenance and repair services.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand corporate logistic service system and procedures</p> <ul style="list-style-type: none"> ◆ Understand the scope and terms of various kinds of after-sales service contracts ◆ Understand corporate logistic service system and procedures <p>6.2 Implement logistic services of operation, maintenance and repair</p> <ul style="list-style-type: none"> ◆ Provide various kinds of after-sales services according to corporate logistic service system and procedures to meet clients' requirements ◆ Provide after-sales services or relevant logistic support services including various types of operation, maintenance and repair services to clients for power transmission and distribution networks at all levels and various types of electrical installations and equipment
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master the logistic service system and procedures; and (ii) Capable to provide after-sales services of operation, maintenance and repair for power transmission and distribution installations and equipment at all levels.
8. Remarks	

1. Title	Supervise the repair and maintenance of high voltage transmission facilities
2. Code	EMELOR407A
3. Range	Applicable to the operation, repair and maintenance of electrical work. Supervise the subordinates to repair and maintain various types of high voltage transmission installations and equipment.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the guidelines on repairing and maintaining high voltage transmission equipment</p> <ul style="list-style-type: none"> ◆ Understand guidelines of the organization for various types of high voltage transmission repair and maintenance. High voltage transmission facilities and devices include transformers, SF6 insulated high voltage switches, protective instruments or control panel and oil-filled cables <p>6.2 Supervise the subordinates to perform high voltage transmission equipment repair</p> <ul style="list-style-type: none"> ◆ Supervise the subordinates to repair and maintain various types of high voltage transmission installations and equipment correctly according to repair guidelines of the organization <p>6.3 Professionalism in repairing high voltage transmission installations</p> <ul style="list-style-type: none"> ◆ Follow the law and safety guidelines for the industry to ensure that the repair and maintenance of high voltage transmission installations is performed safely and the high voltage transmission installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the guidelines for repairing and maintaining various types of high voltage transmission facilities; and</p> <p>(ii) Capable to supervise the subordinates to perform repair and maintenance on high voltage transmission facilities.</p>
8. Remarks	

1. Title	Use advanced technologies in the operation, maintenance and repair of electrical installations
2. Code	EMELOR408A
3. Range	Applicable to the operation, maintenance and repair of electrical installations. Use advanced technologies to enhance working efficiency and accuracy of the operation, maintenance and repair of current electrical installations.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the inadequacies of existing technologies and management of operation, maintenance and repair of electrical installations</p> <ul style="list-style-type: none"> ◆ Understand the inadequacies of operation, maintenance and repair of current electrical installations ◆ Understand the existing management problems in the operation, maintenance and repair of electrical installations <p>6.2 Use advanced technologies and management methods for operation, maintenance and repair</p> <ul style="list-style-type: none"> ◆ Use advanced management technologies to improve the inadequacies of existing technologies and management of operation, maintenance and repair of electrical installations, and enhance working efficiency and accuracy ◆ Handle the management problems related to the operation, maintenance and repair of specific electrical installations ◆ Implement relevant and management methods for operation, maintenance and repair, such as even-running-hour operation or priority operation management method, protective maintenance management and relevant logistics management, various advanced maintenance and repair techniques
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the uses and the strength and weaknesses of general operation, maintenance and repair techniques and management technologies; and</p> <p>(ii) Capable to use relevant advanced management technologies to handle the inadequacies and management problems of operation, maintenance and repair of electrical installations.</p>
8. Remarks	

1. Title	Operate, repair and maintain high voltage transmission installations
2. Code	EMELOR410A
3. Range	Applicable to the operation, repair and maintenance of electrical work. Master the technical requirements on the operation, repair and maintenance of high voltage transmission installations and equipment; perform the operation, repair and maintenance according to the Safety Rules.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the operation, repair and maintenance and the Safety Rules for various types of high voltage transmission installations and equipment</p> <ul style="list-style-type: none"> ◆ Understand the operating principles of various types of high voltage transmission installations or equipment including various kinds of high voltage transmission switches, transformers, cables, overhead lines, protection and control devices, etc. ◆ Understand the performance and operating methods of various types of high voltage testing instruments ◆ Understand recognized technical requirements on repairing and maintaining various types of high voltage transmission installations, including protective maintenance, routine replacement of parts and emergency fault repair ◆ Understand repair and maintenance technologies for high voltage transmission installation circuit protection relay including replacing advanced microprocessor-based relay, self-monitoring technology, etc. ◆ Master the Safety Rules for high voltage transmission installations and equipment <p>6.2 Follow the Safety Rules to operate, repair and maintain high voltage transmission installations</p> <ul style="list-style-type: none"> ◆ Formulate guidelines on the operation, repair and maintenance of high voltage transmission installations and equipment according to the Safety Rules . ◆ Strictly follow the Safety Rules and working guidelines to operate, repair and maintain high voltage transmission installations and equipment

	<p>6.3 Professionalism in operating, repairing and maintaining high voltage transmission installations</p> <ul style="list-style-type: none"> ◆ Follow the law and safety guidelines for the industry to ensure that the operation, repair and maintenance of high voltage transmission installations are performed safely and the high voltage transmission installations can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to formulate guidelines on the operation, repair and maintenance of high voltage transmission installations and equipment according to the Safety Rules; and (ii) Capable to follow the Safety Rules and working guidelines to operate, repair and maintain high voltage transmission installations and equipment.
8. Remarks	

1. Title	Repair and maintain installations of low voltage distribution network system
2. Code	EMELOR411A
3. Range	Perform repair and maintenance for low voltage power supply network system and associated installations directly powered by several transformers according to the code of safe working practice.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master repair and maintenance technologies for various types of low voltage power supply network system and associated installations</p> <ul style="list-style-type: none"> ◆ Master the operating principles of low voltage power supply network system and associated installations directly fed by several transformers, including various kinds of low voltage power distribution switches, backup generators, rising mains, cables, protection and control devices, etc. ◆ Master the performance and operating methods for various types of testing instruments ◆ Master recognized technical requirements on repairing and maintaining various types of low voltage power supply network installations, including protective maintenance, routine replacement of parts and emergency fault repair ◆ Master repair and maintenance technologies for low voltage power supply network system circuit protection relay including replacing advanced microprocessor-based relay, self-monitoring technology, etc. ◆ Master repair and maintenance technologies for various types of low voltage power supply network system according to the code of safe working practice <p>6.2 Perform repair and maintenance for low voltage power supply network system and associated installations</p> <ul style="list-style-type: none"> ◆ Formulate guidelines on repair and maintenance of low voltage power supply network installations according to code of safe working practice ◆ Strictly follow the Safety Rules and working guidelines to repair and maintain low voltage power supply network installations <p>6.3 Professionalism in repairing and maintaining low voltage distribution network systems and associated installations</p> <ul style="list-style-type: none"> ◆ Follow the Electricity (Wiring) Regulations and code of safe working practice to perform repair and maintenance for low voltage distribution network systems

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to formulate low voltage distribution equipment repair and maintenance guidelines according to the code of safe working practice; and (ii) Capable to follow the code of safe working practice to perform repair and maintenance for low voltage distribution equipment.
8. Remarks	

1. Title	Find out and evaluate faults in distribution transformers
2. Code	EMELOR412A
3. Range	Applicable to daily operation, repair and maintenance management of electrical work. Master the operation and fault conditions of distribution transformers and relevant ancillary facilities, and use various types of appropriate methods to find and evaluate faulty points.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master the knowledge of the operation and fault conditions of distribution transformers and ancillary facilities</p> <ul style="list-style-type: none"> ◆ Master the knowledge of the operation and fault conditions, such as abnormal noise, transformer temperature anomalies, mechanical faults in tap changers, transformer temperature monitor failures, insulating oil leakage in transformers, SF6 insulating gas leakage, etc., of distribution transformers and ancillary facilities <p>6.2 Use appropriate methods to find and evaluate the faulty points of distribution transformers and ancillary facilities</p> <ul style="list-style-type: none"> ◆ Analyze repair records for distribution transformer incidents and immediately make a comparison and prelim fault evaluation to on-site operation condition in order to take follow-up actions ◆ Isolate faulty distribution transformers and use various types of appropriate instruments such as multi-meter, insulator, pressure tester, injection test instruments, gas tester, etc. to find and evaluate the faulty points of distribution transformers and ancillary facilities
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the operation and fault conditions of distribution transformers and ancillary facilities ;</p> <p>(ii) Capable to use various types of appropriate instruments or methods to find and evaluate the faulty points of distribution transformers and ancillary facilities.</p>
8. Remarks	

1. Title	Plan the finance, accounts and insurance of engineering projects
2. Code	EMCUPM401A
3. Range	Make proper financial, accounting and insurance arrangements for the management of electrical and mechanical projects.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Cost accounting techniques and concepts of financial and insurance arrangements for electrical and mechanical projects</p> <ul style="list-style-type: none"> ◆ Understand the cost accounting techniques for electrical and mechanical projects in order to assess the funding needs. The accounting techniques include making use of the statement of assets and liabilities, calculation of interest rates, calculation of basic cash flow, calculation of present value, accounting items, etc. ◆ Understand the company's concepts of financial and insurance arrangements for the engineering project <p>6.2 Finance and engineering insurance</p> <ul style="list-style-type: none"> ◆ Know about the financial arrangements, including the arrangements of different kinds of loans, mortgage, lease, hedging, futures, etc. ◆ Know about all kinds of insurance arrangements, including third party insurance, accident insurance, labour insurance, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to plan the financial, accounting and insurance arrangements for the electrical and mechanical project properly to ensure the finance of the project is sound and cost-effective.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of finance, accounting and insurance.

1. Title	Implement logistics support service for various kinds of electrical installations
2. Code	EMELPM402A
3. Range	Applicable to project and operation management of electrical installation projects. Master documents for material procurement specifications, contract details and delivery schedule, and implement logistics support service relevant to project management.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand documents for material procurement specifications, contract details and delivery schedule</p> <ul style="list-style-type: none"> ◆ Understand client's requirements and information on the procurement of various kinds of electrical installation materials ◆ Understand documents for material procurement specifications, contract details and delivery schedule including: international standards, contract terms, inventory period, transport period, size dimensions, supplier, payment terms, insurance, etc. <p>6.2 Implement logistics support service relevant to project management</p> <ul style="list-style-type: none"> ◆ During the electrical installation project period, implement logistics support service for various kinds of electrical installations such as commissioning procedure, transport period, warehousing, payment, maintenance period, insurance reimbursement
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use the information on the procurement of various kinds of electrical installation materials to formulate procurement documents; and</p> <p>(ii) Capable to implement logistics support service for various kinds of electrical installations.</p>
8. Remarks	

1. Title	Use advanced technologies in the implementation of electrical installation project management
2. Code	EMELPM406A
3. Range	Applicable to project management of electrical installations. Use advanced project management techniques relevant to electrical installations to enhance project management efficiency and accuracy of existing electrical installations.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand inadequacy and problems of project management techniques and management for existing electrical installations</p> <ul style="list-style-type: none"> ◆ Understand the inadequacy of project management techniques for existing electrical installation projects ◆ Understand the problems of project management techniques for existing electrical installation projects <p>6.2 Implement relevant advanced project management techniques and management methods</p> <ul style="list-style-type: none"> ◆ Use advanced management skills to improve the inadequacy of project management techniques for existing electrical installation projects and enhance work efficiency and accuracy ◆ Handle specific electrical installation project management problems ◆ Implement relevant advanced project management techniques and management methods such as: cash flow analysis, risk management, ISO10006, CPM, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the uses, strengths and weaknesses of general project management techniques; and</p> <p>(ii) Capable to implement relevant advanced management skills to handle efficiency and accuracy problems related to project management of specific electrical works.</p>
8. Remarks	

1. Title	Implement project management for high voltage transmission installation projects
2. Code	EMELPM408A
3. Range	Applicable to the project management of high voltage distribution electric power supply installations. Master the project management of high voltage transmission system and associated installation projects, analyze interlocking relationship of work processes, arrange the work processes, and implement electrical installation project management.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the actual situation and constraints of the worksite, work processes of engineering project, working methods, project management techniques</p> <ul style="list-style-type: none"> ◆ Master the key points of work site inspection at different work stages ◆ Master the work status of high voltage transmission installation projects, constraints of the worksite and related problems ◆ Understand the details and procedures of every single work process of the high voltage transmission installation project ◆ Understand the interlocking relationship of different work processes of the project ◆ Understand basic project management techniques <p>6.2 Implement high voltage transmission installation project management</p> <ul style="list-style-type: none"> ◆ Implement high voltage transmission installation project management including: <ul style="list-style-type: none"> • Goals and scope of project • Work breakdown structure (WBS) of project, including the design, installation, inspection, testing, commissioning, sourcing of materials and resources arrangement of all kinds of components • Monitoring schedule of project plan • Income and expenditure estimates of project plan • Material sourcing management mechanism of project plan • Manpower organization chart, authority and responsibilities for different job positions, and communication mechanism of project plan • Work progress and problem reporting mechanism of project plan

	<ul style="list-style-type: none"> ◆ Implement project management techniques to supervise the engineering project of high voltage transmission network facilities and devices and ensure that it meets the design performance requirements, including: <ul style="list-style-type: none"> • Analyzing the key points of work for low voltage electrical facilities and devices • Supervising the work flow the high voltage electrical installation project, including: dismantling, installation, inspection, testing, commissioning, repair and maintenance • Arranging the transport of materials and electrical equipment • Contacting different kinds of engineering personnel to coordinate the engineering activities for a smooth completion of every work process • Inspecting and reporting on the progress and problems of the high voltage electrical installation project
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to analyze the actual situation and constraints of the worksite; (ii) Capable to implement project management of the high voltage transmission installation projects; and (iii) Capable to implement basic project management techniques to supervise the transmission network project to ensure that the power network system meets the design performance requirements.
8. Remarks	

1. Title	Implement advanced technologies for the operation management of electrical installations
2. Code	EMELOM404A
3. Range	Applicable to operation management of electrical works. Use advanced operation management skills related to electrical installations to enhance operation management efficiency and accuracy of the existing of electrical installations.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the inadequacy and problems of operation management skills and management of the existing electrical installations</p> <ul style="list-style-type: none"> ◆ Understand the inadequacy of the engineering operation management skills for the existing electrical installations ◆ Understand the problems of engineering operation management skills for the existing electrical installations <p>6.2 Implement relevant advanced operation management skills and methods</p> <ul style="list-style-type: none"> ◆ Use advanced management skills to improve the inadequacy of the operation management skills for the existing electrical installations so as to enhance work efficiency and accuracy ◆ Handle specific operation management problems of electrical installations ◆ Implement relevant advanced operation management skills and methods including: project profit estimate, operational cash flow analysis, operation management risk management, operational information management system, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the uses, strengths and weaknesses of general operation management techniques; and</p> <p>(ii) Capable to implement relevant advanced operation management skills and management methods to handle specific problems in work efficiency and accuracy related to operation management of electrical works.</p>
8. Remarks	

1. Title	Implement engineering operation, supervisory management and human resources management
2. Code	EMELOM405A
3. Range	Perform engineering operation, supervisory management and human resources management for installation and management work of electrical and mechanical services.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand engineering operation, supervisory management and human resources management areas and techniques</p> <ul style="list-style-type: none"> ◆ Understand engineering operation management areas and techniques including: <ul style="list-style-type: none"> • Supervisory management techniques for projects • Human resources management techniques • Management techniques for organizational environment • Workflow of electrical works project <p>6.2 Implement engineering operation, supervisory management and human resources management</p> <ul style="list-style-type: none"> ◆ Implement engineering operation management to ensure that all engineering procedures be carried out properly. The engineering operation management targets include zero breach of contract, zero accident rate, zero delay, timely delivery of material, balance of income and expenditure, etc. ◆ Implement engineering supervisory management such as analyzing and arranging works so that the project can complete in time ◆ Understand the tendering strategy and assist the company in project quotation and bidding tenders ◆ Perform human resources management, including staff training, recruitment and engineering performance appraisal
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement engineering operation, supervisory management and human resources management.</p>
8. Remarks	

1. Title	Perform operation management for high voltage transmission engineering projects
2. Code	EMELOM406A
3. Range	Perform operation management for high voltage transmission engineering projects to ensure that the projects have sustainable development and make profits.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points and operation management skills of general engineering operation management</p> <ul style="list-style-type: none"> ◆ Understand general key points of engineering operation management plans ◆ Understand engineering operation management techniques, including formulation of operational goals, human resources management , operational cost control, quality management, engineering project outsourcing mechanism, materials procuring and storage mechanism, crisis management mechanism, human resources management techniques , engineering project financial management mechanism, etc. ◆ Understand the importance of sustainable development and operating profit of engineering project <p>6.2 Perform high voltage transmission engineering project operation management to ensure that the projects have sustainable development and make profits</p> <ul style="list-style-type: none"> ◆ Perform high voltage transmission engineering project operation management to ensure that the projects have sustainable development and make profits, such as: <ul style="list-style-type: none"> • Mastering income and expenditure items of operation to ensure that the profit goals for the operation of the high voltage transmission installations are achieved • Operating engineering projects with profit-making potential • Streamlining and building efficient engineering teams • Maintaining sufficient operational cash flow • Keeping the logistic support work smooth • Reducing operational risks • Quality control
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to perform high voltage transmission engineering project operation management to ensure that the projects have sustainable development and make profits.
8. Remarks	

1. Title	Apply advanced technologies to occupational safety, health and environmental protection of electrical installations
2. Code	EMELSH401A
3. Range	Applicable to occupational safety, health and environmental protection related to electrical works. Apply advanced technologies to occupational safety, health and environmental protection related to electrical installations to enhance the standard for the existing occupational safety, health and environmental protection management of electrical works.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the inadequacy and risks of the existing occupational safety, health and environmental protection management skills for electrical installation works</p> <ul style="list-style-type: none"> ◆ Understand the inadequacy of the existing occupational safety, health and environmental protection management skills for electrical installation works ◆ Understand the risks of the existing occupational safety, health and environmental protection management skills for electrical installation works <p>6.2 Apply advanced technologies to occupational safety, health and environmental protection management of electrical installations</p> <ul style="list-style-type: none"> ◆ Apply advanced technologies to occupational safety, health and environmental protection management of electrical installations, including: various kinds of risk analysis models (JHA, HAZOP, FMEA, FTA), safety management system, 5-S practice, OHSAS18000 occupational health and safety management system, etc. to enhance occupational safety, health and environmental protection management performance
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to use various kinds of risk analysis models to understand the risks for electrical installation projects; and (ii) Capable to use advanced management skills for occupational safety, health and environmental protection management to enhance occupational safety, health and environmental protection management performance.
8. Remarks	

1. Title	Implement quality management in electrical and mechanical engineering services
2. Code	EMCUQM402A
3. Range	Plan, organize and control effectively the working procedures prior to and during the project so as to achieve the result of minimal cost and high quality for electrical and mechanical project.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Division of procedure for electrical and mechanical installation project</p> <ul style="list-style-type: none"> ◆ Understand and analyze the division of process for electrical and mechanical installation project; set the following for quality control before the project starts: <ul style="list-style-type: none"> • Check points for different stages of the project • Quality management goals such as completion dates for different stages of the project, alert level for the number of items not conforming to the plan, accident rate, productivity, etc. <p>6.2 Implement the quality management plan and organized working procedure of the quality control system effectively</p> <ul style="list-style-type: none"> ◆ Confirm and analyze items not conforming to the rules at different stages of the project, and formulate improvement plans with working teams concerned ◆ Performance indicators for different stages of the project should be set with reference to level of performance specified by the contract, code of practice, and international standards, etc. ◆ Formulate quality management plan, including the following, to control procedure costs and quality in an organized and effective way: <ul style="list-style-type: none"> • Division of procedure for the project • Check points of ‘planning-implementation-commissioning-rectification’ for quality management at different stages of the project • Performance indicators at different stages of the project • Ways to handle items not conforming to the rules • Quality management goals • Mechanism to communicate with relevant teams and formulation of timetables for improvement plans, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate quality management plans effectively, monitor project quality, control costs and improve process not conforming to the rules.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concept of quality management.

1. Title	Promote quality management culture at working level
2. Code	EMCUQM403A
3. Range	Master the knowledge of quality management, lead the quality management working group to promote and foster basic level quality management culture for the electrical and mechanical services.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of quality management</p> <ul style="list-style-type: none"> ◆ Understand the concept of quality management ◆ Understand the goals of organizational quality management culture <p>6.2 Promote and foster basic level quality management culture</p> <ul style="list-style-type: none"> ◆ Promote basic level quality management culture, including: <ul style="list-style-type: none"> • Implement on-the-job training on quality knowhow for frontline staff • Set up frontline staff quality monitoring group to foster quality management culture at working level • Organize quality management culture promotional activities, such as quiz competitions, quality circle, visits, seminars, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to master the knowledge of quality management, and lead the quality management working group to promote and foster quality management culture at working level.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concept of quality management.

1. Title	Conduct site survey and quality control
2. Code	EMCUQM404A
3. Range	Investigate the characteristics and limitations of the work site and conduct quality control and monitoring of engineering projects.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Quality control and monitoring requirements on work site environment</p> <ul style="list-style-type: none"> ◆ Master the progress of design, installation, operation, maintenance and repair, inspection, commissioning and testing necessary for the engineering projects, and understand the quality control and monitoring requirements on work site environment <p>6.2 Conduct site survey and clear obstacles so as to implement quality control of electrical and mechanical installation project</p> <ul style="list-style-type: none"> ◆ Investigate and analyze the characteristics and limitations of the work site, and point out potential problems in and obstacles to the electrical and mechanical design, installation, operation, maintenance and repair, inspection, commissioning and testing of the projects there so as to ensure: <ul style="list-style-type: none"> • The effective implementation of all engineering projects • The effective implementation of quality control scheme • The effective operation of the flow chart of quality control procedures ◆ Suggest solutions to clear the obstacles so as to implement quality control of the electrical and mechanical installation projects
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to demonstrate how to conduct site survey and clear obstacles in order to assist in quality control of the electrical and mechanical installation projects.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Apply specialized electrical principles for quality management
2. Code	EMELQM401A
3. Range	Apply specialized electrical principles for to quality management of high voltage transmission network systems.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand specialized electrical principles related to high voltage transmission network systems</p> <ul style="list-style-type: none"> ◆ Understand specialized electrical principles and design requirements related to high voltage transmission network systems such as the arrangement and protection design principles for high voltage transmission power supply systems <p>6.2 Apply specialized electrical principles to quality management of work processes of high voltage transmission network project</p> <ul style="list-style-type: none"> ◆ Assess the quality assurance performance of high voltage transmission network projects ◆ Apply specialized electrical principles y to quality management of work processes of high voltage transmission network project to reduce electrical work quality problems ◆ Apply advanced quality management skills such as: ISO 9000 quality management and Quality Assurance Series standards, BS ISO 10006 quality management system , etc. to electrical installation projects to enhance quality management performance ◆ Analyze the details and impact of electrical works quality problems, report to parties concerned and find solutions
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to assess the quality assurance performance of high voltage transmission network projects ; and</p> <p>(ii) Capable to analyze the details and impact of electrical works quality problems.</p>
8. Remarks	

1. Title	Implement advanced technologies for the quality management of electrical installations
2. Code	EMELQM402A
3. Range	Applicable to quality management of electrical works. Use advanced quality management skills related to electrical installation projects to enhance quality management efficiency and accuracy of the existing of electrical installation projects.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the inadequacy and problems of quality management skills and management of the existing electrical installation projects</p> <ul style="list-style-type: none"> ◆ Understand the inadequacy and problems of the quality management skills for the existing electrical installation projects <p>6.2 Implement advanced technologies for the quality management of electrical installation projects</p> <ul style="list-style-type: none"> ◆ Use advanced quality management skills to improve the inadequacy of the project management of the existing electrical installations so as to enhance work efficiency and accuracy ◆ Handle specific quality management problems of electrical installations ◆ Apply advanced quality management skills such as: ISO 9000 quality management and Quality Assurance Series standards, BS ISO 10006 quality management system , etc. to electrical installation projects to enhance quality management performance
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the application of advanced quality management skills; and</p> <p>(ii) Capable to use advanced quality management skills or systems to implement quality management of electrical installation projects.</p>
8. Remarks	

1. Title	Launch the products according to the marketing direction preset by the company
2. Code	EMELMS401A
3. Range	Applicable to the marketing and sales of electrical works. Master the marketing techniques and market situation so as to launch the products according to the marketing direction preset by the company.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand relevant information such as the market positioning , etc. of the electrical equipment or services to be sold</p> <ul style="list-style-type: none"> ◆ Understand the pricing and market positioning of the electrical equipment or services to be sold ◆ Understand the characteristics of the target segment of clients <p>6.2 Launch the products according to the marketing direction preset by the company</p> <ul style="list-style-type: none"> ◆ Master different marketing techniques and base on the market positioning of the products so as to launch the products according to the marketing direction preset by the company, including: <ul style="list-style-type: none"> • Implementing works relevant to marketing • Supervising frontline staff to follow • Providing the management level with market information and implementing improvement suggestions
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the market positioning and client market segments of the electrical equipment or services to be sold; and</p> <p>(ii) Capable to base on the market positioning of products to launch them according to the marketing direction preset by the company.</p>
8. Remarks	

1. Title	Implement marketing and sales promotion for low voltage electrical installations
2. Code	EMELMS402A
3. Range	Applicable to the marketing and sales of electrical works. Capable to understand the specifications and standards for the electricity products, to answer the technical problems raised by clients and implement marketing and sales promotion for low voltage electrical installations.
4. Level	4
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the specifications and standards for the low voltage electrical installations and engineering services to be sold</p> <ul style="list-style-type: none"> ◆ Understand the specifications and standards for the low voltage electrical installations and engineering services to be sold, including: <ul style="list-style-type: none"> • Manufacturer’s technical specifications for the low voltage electrical installations • Code of practice for low voltage electrical installations, codes of practice for energy efficiency, Environmental Regulations, Fire Regulations, etc. • International Electric Community Standards (IEC), British EU Standards (BSEN), Chinese National Standard (GB), etc. <p>6.2 Implement marketing and sales promotion for low voltage electrical installations and engineering services</p> <ul style="list-style-type: none"> ◆ Answer the technical problems raised by clients and implement marketing and sales promotion for low voltage electrical installations and engineering services
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to follow relevant specifications and standards to answer the technical problems raised by clients and implement marketing and sales promotion for low voltage electrical installations and engineering services.</p>
8. Remarks	

**Competencies for Practitioners of
the Electrical Engineering Branch
in the Electrical & Mechanical Services
Industry**

Competency Level 5

1. Title	Analyze and assess performance of electrical system and equipment
2. Code	EMCUDE501A
3. Range	Master the theories of electromagnetic field, electromagnetic wave propagation, signal conversion and control circuit, electric motor, etc. with respect to electrical and mechanical engineering design; and apply the knowledge to analyze the performance of the electric motor operation, power transfer and control circuit system.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Performance and operating principles of electric motor</p> <ul style="list-style-type: none"> ◆ Understand the performance and operating principles of single-phase and three-phase induction motor, including the unbalanced operation, dynamic operation, temperature-rise simulation tests and conditioning monitoring <p>6.2 Analyze and assess performance of electrical system and equipment</p> <ul style="list-style-type: none"> ◆ Analyze the harmonic effect of using stepped wave or PWM Inverter for power transfer of the induction motor ◆ Analyze the open-loop control and close-loop control of the motor ◆ Use suitable non-carbon brush DC motor ◆ Apply communication switching technology and mathematical models to analyze and improve the control system <ul style="list-style-type: none"> • Apply analogue/digital converter and digital/analogue converter to optimize the control system • Apply mathematical model to analyze and improve the control system ◆ Analyze the electromagnetic wave propagation and its effect on surrounding signals <ul style="list-style-type: none"> • Apply the Maxwell equation and wave equation to calculate and analyze data propagated by waves and the effect on surrounding signals • Project the wave interference and use shields to protect from it

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to analyze and assess accurately and effectively the performance of an electro-electronic controlled three-phase variable voltage variable frequency heavy induction motor; and (ii) Capable to analyze accurately and effectively the interference of the current of the above-mentioned motor and its effect on surrounding signals, and advise on the improvement measures.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical knowledge.</p>

1. Title	Use programmable logic controller (PLC) to upgrade control equipment
2. Code	EMCUDE502A
3. Range	For electrical and mechanical engineering design, use PLC human-machine interface software, groupware and PLC network system to write monitoring and management system programmes for electrical and mechanical equipment and production; and integrate PLC systems of different levels into a large PLC integrated production control, operation control, monitoring and management system.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of PLC software system</p> <ul style="list-style-type: none"> ◆ Understand the operating principles of PLC software system <p>6.2 Use PLC to upgrade control equipment</p> <ul style="list-style-type: none"> ◆ Use PLC human-machine interface software to set up the production control system <ul style="list-style-type: none"> • Use PLC human-machine interface software, processor emulation software, programmable/testing software and communication software to write programmes and set up human-machine interface PLC electrical and mechanical equipment and production control system • Test and debug the PLC human-machine interface control system • Modify and rationalize the PLC human-machine interface control system ◆ Use PLC human-machine interface groupware to set up the monitoring, alarm and management system <ul style="list-style-type: none"> • Use PLC human-machine interface groupware to set up label database and information list, and use the database to set up the alarm and management system • Use groupware to save group data record, and use the analytical function to analyze group data trend to achieve the alarm and management functions • Manage the safety of groupware data system ◆ Integrate PLC systems of different levels into a large PLC integrated monitoring and management system <ul style="list-style-type: none"> • Use large PLC software and network software to integrate PLC systems of different levels into a large integrated production control, operation control, monitoring and management system • Use PLC software to help analyze data

	<ul style="list-style-type: none"> • Use information technology and network to transfer PLC data and information • Test and debug the large integrated PLC system
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use PLC human-machine interface software to set up a safe, reliable, accurate, convenient and direct operation monitoring, alarm and management system for electrical and mechanical equipment; and</p> <p>(ii) Capable to integrate different levels individual PLC systems of the same production line of a plant into a large integrated monitoring, alarm and management system.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic computer knowledge.</p>

1. Title	Design safe and efficient control, interlocking and protection systems for power supply system						
2. Code	EMCUDE503A						
3. Range	With regard to electrical and mechanical engineering design, understand the working principles of the power supply system (including transmission and distribution systems), and its protection devices, of an electricity company in order to design efficient, effective and reliable control, interlocking and protection systems.						
4. Level	5						
5. Credit	6						
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Working principles of power supply systems(from transmission to distribution) in Hong Kong</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Understand the working principles of power supply systems(including supply, transmission, distribution), and their protection devices, in Hong Kong ◆ Understand the operating principles of protection device of different voltages and zones in a power supply system, such as protection relay, etc. </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Design safe and efficient control, interlocking and interlocking systems</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Calculate data of different protection device in order to set the safe current value and cut-off time ◆ Design control, interlocking and protection systems for power supply system </td> </tr> </table>	6.1	Working principles of power supply systems(from transmission to distribution) in Hong Kong	<ul style="list-style-type: none"> ◆ Understand the working principles of power supply systems(including supply, transmission, distribution), and their protection devices, in Hong Kong ◆ Understand the operating principles of protection device of different voltages and zones in a power supply system, such as protection relay, etc. 	6.2	Design safe and efficient control, interlocking and interlocking systems	<ul style="list-style-type: none"> ◆ Calculate data of different protection device in order to set the safe current value and cut-off time ◆ Design control, interlocking and protection systems for power supply system
6.1	Working principles of power supply systems(from transmission to distribution) in Hong Kong	<ul style="list-style-type: none"> ◆ Understand the working principles of power supply systems(including supply, transmission, distribution), and their protection devices, in Hong Kong ◆ Understand the operating principles of protection device of different voltages and zones in a power supply system, such as protection relay, etc. 					
6.2	Design safe and efficient control, interlocking and interlocking systems	<ul style="list-style-type: none"> ◆ Calculate data of different protection device in order to set the safe current value and cut-off time ◆ Design control, interlocking and protection systems for power supply system 					
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to calculate correctly safe data for protection device of different circuits of the power supply system in order to design efficient, effective and reliable control, interlocking and protection systems.</p>						
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of power supply system.						

1. Title	Analyze quality of electricity data and design suitable device to improve electricity quality						
2. Code	EMCUDE504A						
3. Range	For electrical and mechanical engineering design, understand crucial electricity quality data, such as power factor, weights of different harmonic waves and total harmonic distortion in order to design electricity quality improvement devices and circuits.						
4. Level	5						
5. Credit	6						
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Electricity quality principles and operating principles of electricity quality improvement equipment</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Understand factors affecting electricity quality and reasons why electricity quality is becoming more and more important ◆ Understand the operating principles of various electricity quality improvement equipment, such as star-delta transformer, isolating transformer, filter and active filter </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Design electricity quality improvement device</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Design suitable electricity quality improvement devices according to different electricity quality requirements ◆ Analyze data related to electricity quality, such as power factor and total harmonic distortion, etc. </td> </tr> </table>	6.1	Electricity quality principles and operating principles of electricity quality improvement equipment	<ul style="list-style-type: none"> ◆ Understand factors affecting electricity quality and reasons why electricity quality is becoming more and more important ◆ Understand the operating principles of various electricity quality improvement equipment, such as star-delta transformer, isolating transformer, filter and active filter 	6.2	Design electricity quality improvement device	<ul style="list-style-type: none"> ◆ Design suitable electricity quality improvement devices according to different electricity quality requirements ◆ Analyze data related to electricity quality, such as power factor and total harmonic distortion, etc.
6.1	Electricity quality principles and operating principles of electricity quality improvement equipment	<ul style="list-style-type: none"> ◆ Understand factors affecting electricity quality and reasons why electricity quality is becoming more and more important ◆ Understand the operating principles of various electricity quality improvement equipment, such as star-delta transformer, isolating transformer, filter and active filter 					
6.2	Design electricity quality improvement device	<ul style="list-style-type: none"> ◆ Design suitable electricity quality improvement devices according to different electricity quality requirements ◆ Analyze data related to electricity quality, such as power factor and total harmonic distortion, etc. 					
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to analyze correctly various electricity quality data, design suitable improvement devices according to different electricity quality requirements and power supply arrangements, and analyze the pros and cons of different improvement devices.</p>						
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of power supply system.						

1. Title	Apply SCADA system to remote control design
2. Code	EMCUDE505A
3. Range	Apply the working principles of SCADA system to remote control design in order to transmit signals and data of the power system to the control room at electrical and mechanical engineering workplaces with power system, railway system, etc.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principle of SCADA system</p> <ul style="list-style-type: none"> ◆ Understand the operating principle of SCADA system and list out popular examples of applying SCADA to power system and railway system <p>6.2 Application of SCADA system</p> <ul style="list-style-type: none"> ◆ Master SCADA remote control to transmit data needed by the power system and railway system to the remote control room ◆ Design complex remote control programme to transmit data of different levels to the control rooms concerned
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply the SCADA system, and master and design remote control programme applicable to power system and railway system to transmit relevant data to different control rooms concerned.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electricity.

1. Title	Write all kinds of electrical and mechanical engineering reports in Chinese
2. Code	EMCUDE506A
3. Range	For electrical and mechanical engineering design and operation, use correct report format to write all kinds of electrical and mechanical engineering reports in Chinese, including project management progress report, operation management report, engineering progress report, equipment fault report, accident investigation report, etc.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Key points of all kinds of electrical and mechanical engineering reports and their presentation</p> <ul style="list-style-type: none"> ◆ Understand the key points and purposes of all kinds of electrical and mechanical engineering reports, including: <ul style="list-style-type: none"> • Equipment fault report • Equipment inspection report • Accident investigation report • Operation management report <ul style="list-style-type: none"> ▸ Financial status of the company ▸ Balance of account ▸ Engineering budget • Engineering project management progress report <ul style="list-style-type: none"> ▸ Progress of crucial procedures ▸ Status of implementation of work plan, delay and causes, monitoring indicators and solutions ◆ Understand formats the above-mentioned electrical and mechanical engineering reports and common technical terms of electrical and mechanical services <p>6.2 Write all kinds of electrical and mechanical engineering reports in Chinese</p> <ul style="list-style-type: none"> ◆ Use correct report format to write all kinds of the above-mentioned electrical and mechanical engineering reports in Chinese ◆ Use drawings to strengthen and enrich the contents of the reports, including bar chart, square chart, pie chart, circular chart and flow chart, etc ◆ Write in fluent Chinese
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to write all kinds of electrical and mechanical engineering reports in fluent Chinese with graphs which conform to official document standards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic Chinese level.

1. Title	Write all kinds of electrical and mechanical engineering reports in English
2. Code	EMCUDE507A
3. Range	For electrical and mechanical engineering design and operation, use correct report format to write all kinds of electrical and mechanical engineering reports in English, including project management progress report, operation management report, engineering progress report, equipment fault report, accident investigation report, etc.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Key points of all kinds of electrical and mechanical engineering reports and their presentation</p> <ul style="list-style-type: none"> ◆ Understand the key points and purposes of all kinds of electrical and mechanical engineering reports, including: <ul style="list-style-type: none"> • Equipment fault report • Equipment inspection report • Accident investigation report • Operation management report <ul style="list-style-type: none"> ▸ Financial status of the company ▸ Balance of account ▸ Engineering budget • Engineering project management progress report <ul style="list-style-type: none"> ▸ Progress of crucial procedures ▸ Status of implementation of work plan, delay and causes, monitoring indicators and solutions ◆ Understand formats the above-mentioned electrical and mechanical engineering reports and common technical terms of electrical and mechanical services <p>6.2 Write all kinds of electrical and mechanical engineering reports in English</p> <ul style="list-style-type: none"> ◆ Use correct report format to write all kinds of the above-mentioned electrical and mechanical engineering reports in English ◆ Use drawings to strengthen and enrich the contents of the reports, including bar chart, square chart, pie chart, circular chart and flow chart, etc ◆ Write in fluent English
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to write all kinds of electrical and mechanical engineering reports in fluent English with graphs which conform to official document standards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic English level.

1. Title	Implement the design of high voltage generation or transmission and distribution network
2. Code	EMELDE502A
3. Range	Applicable to the design work of high voltage generation or transmission and distribution network equipment. Critically analyze and assess with evidence all the terms and conditions, contract specifications, design drawings, etc. in client's tender specifications; implement design items for generation or various levels of transmission and distribution network and associated installations.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand various design requirements for high voltage generation or transmission and distribution network</p> <ul style="list-style-type: none"> ◆ Understand engineering contract requirements for high voltage generation or transmission and distribution network, including contract's general specifications, contract's particular specifications, relevant international standards, project schedules, details of work procedures, engineering quotation checklist, tender drawings, etc. ◆ Understand technical requirements on the design of high voltage generation or transmission and distribution network installations and associated equipment, including manufacturer's technical specifications, system arrangement for electrical installations, protection system plan, etc. <p>6.2 Implement the design of high voltage generation or transmission and distribution network according to engineering contract requirements</p> <ul style="list-style-type: none"> ◆ Implement the design of high voltage generation or transmission and distribution network according to engineering contract requirements. Design works include: <ul style="list-style-type: none"> • Consider the characteristics and constraints of the work site to select power facilities and devices that meet the technical requirements such as assembly, operation, testing and repair, etc. • Consider the characteristics and constraints of the work site to select materials that meet the technical requirements, such as insulated tile bottles, stainless steel materials, overhead lines materials, etc. • Draw high voltage generation or transmission and distribution network system single-line diagrams and floor configuration plans for the installations • Consider the operational requirements for generation equipment or transmission and distribution network to select appropriate computer control system software and hardware control and protection circuit • High voltage generation equipment or transmission and distribution network design arrangement

	<p>6.3 Professionalism in designing high voltage generation or transmission and distribution network system and associated installations</p> <p>◆ Follow the regulations and safety guidelines for the industry to ensure that the designs of high voltage generation or transmission and distribution network system and associated installations are safe and reliable to use</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement design tasks for the specified generation equipment or transmission and distribution network according to the engineering contract requirements for high voltage generation equipment or transmission and distribution network.</p>
8. Remarks	

1. Title	Master the performance requirements for power generation or transmission and distribution network to perform design work
2. Code	EMELDE503A
3. Range	Applicable to design work for power generation or transmission and distribution network equipment. Implement the design techniques, conceptual requirements, abstract theories and skills for various types of different installations of various levels of transmission and distribution network, and analyze, re-organize and assess performance information of various types of power systems to perform design work.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the performance requirements on different design techniques, operation, repair and maintenance, etc. for various levels of generation installations and transmission and distribution network, and the operation of the Safety Rules (Electrical)</p> <ul style="list-style-type: none"> ◆ Understand the design performance requirements on operation, testing, repair, remote control and protection system, etc. of various levels of generation installations and transmission and distribution network such as: active power and non-active power control, voltage regulation control, stability, safety, synchronous speed control, transmission and distribution network operation monitoring, etc. ◆ Master the operation of the Safety Rules (Electrical) including: operation, testing, repair, etc. <p>6.2 Implement design tasks for various levels of generation installations and transmission and distribution network</p> <ul style="list-style-type: none"> ◆ Master the operation of the Safety Rules (Electrical) including: operation, testing, repair, etc. to implement transmission and distribution network equipment system design ◆ Master generation installations and transmission and distribution network design performance requirements to implement various levels of generation installations and transmission and distribution network equipment design <p>6.3 Professionalism in designing power network</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that power network design is implemented safely and the power generation or transmission and distribution network are safe and reliable to use

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master the operation of the Safety Rules (Electrical) in order to design transmission and distribution network; and (ii) Capable to implement design tasks for the specified generation installations or transmission and distribution network installations according to different design techniques for various levels of generation installations or transmission and distribution network, the performance requirements on operation, repair and maintenance, etc..
8. Remarks	

1. Title	Formulate the schematic diagrams of power generation or transmission and distribution network and the protection control circuit diagrams
2. Code	EMELDE504A
3. Range	Applicable to design work for power generation or transmission and distribution network equipment. Formulate various levels of transmission and distribution network schematic diagrams and protection control circuit diagrams.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand different drawing techniques and power network design requirements</p> <ul style="list-style-type: none"> ◆ Understand different drawing techniques and the specifications and system of international drawing standards ◆ Understand power network and protection control circuit design requirements <p>6.2 Formulate power generation or power network schematic diagrams and protection control circuit diagrams</p> <ul style="list-style-type: none"> ◆ Apply appropriate drawing techniques according to the specifications and system of international drawing standards to draw and modify power generation or transmission and distribution network schematic diagrams and protection control circuit diagrams ◆ Formulate schematic diagrams of power generation or transmission and distribution network system and protection and control system according to design requirements, including <ul style="list-style-type: none"> • Generation system planning • Transmission system network planning • Distribution system network planning • Generation equipment system protection and control circuit diagrams • Transmission and distribution network system equipment protection and control circuit diagrams <p>6.3 Professionalism in formulating the schematic diagrams of power network, protection and control systems</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the formulated schematic diagrams of power network, protection and control systems are safe to use
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to formulate the schematic diagrams of power generation or transmission and distribution network, protection and control systems.
8. Remarks	

1. Title	Coordinate the design project of power generation or transmission and distribution network
2. Code	EMELDE505A
3. Range	Applicable to design work for power generation or transmission and distribution network equipment. Coordinate various types of resources including: manpower allocation and design data, etc., arrange, monitor and facilitate implementation of the design project of various levels of transmission and distribution network and associated installations until it completes.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand power generation or transmission and distribution network equipment design project requirements, project schedule and resources</p> <ul style="list-style-type: none"> ◆ Understand power generation or transmission and distribution network equipment design project requirements, project schedule, design techniques, corporate management system operation and resources required, etc. <p>6.2 Coordinate various types of resources to perform power generation or transmission and distribution network equipment design project</p> <ul style="list-style-type: none"> ◆ Plan in advance and coordinate according to the design project schedules and actual progress various types of different resources, including manpower, operational capital, design information, data, etc. ◆ Judge, coordinate, arrange and monitor various kinds of design issues and communicate with clients or contractors to ensure that the design project is implemented smoothly ◆ Facilitate the implementation of the design project of various levels of power generation and transmission and distribution network and associated installations until it completes ◆ Regarding a series of different technical, professional or management functions, coordinate various types of resources and facilitate the implementation of the design project until it completes
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to coordinate various types of resources and facilitate the implementation of the design project of power generation or transmission and distribution network equipment.
8. Remarks	

1. Title	Master local regulations and relevant international standards to coordinate engineering works for power supply network
2. Code	EMELDE506A
3. Range	Applicable to electrical work. Apply local regulations and international standards related to electrical installation products and services to coordinate engineering works for power supply network and associated installations.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand relevant local regulations and international standards</p> <ul style="list-style-type: none"> ◆ Understand local regulations and international standards related to engineering works for power supply network and associated installations <p>6.2 Coordinate engineering works for power supply network</p> <ul style="list-style-type: none"> ◆ Follow relevant local regulations and international standards to coordinate engineering works for power supply network and associated installations including design, installation, inspection, commissioning, testing, operation, repair, maintenance, quality management, project management, operation management, safety, health and environmental protection, marketing and sales, etc. to ensure that the engineering works meet relevant legal requirements ◆ Implement engineering works for power supply network and associated installations to ensure that the engineering works meet the safety and quality levels of relevant international standards ◆ Regarding a series of different technical, professional or management functions, coordinate various types of resources, facilitate the engineering works until they complete
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to master relevant local regulations and international standards to coordinate engineering works for the specified power supply network and associated installations.
8. Remarks	

1. Title	Act in emergency to make decisions for and lead the engineering project
2. Code	EMELDE508A
3. Range	Act in emergency related to electrical projects such as using crisis management and emergency mechanism, etc., making decisions systematically and accurately and leading the team to solve unexpected engineering problems or crises.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand working environment potential crises and impacts</p> <ul style="list-style-type: none"> ◆ Understand potential crises and impacts for different working environments including the areas of design, installation, inspection, commissioning, testing, operation, repair, maintenance, quality management, project management, operation management, occupational safety, health and environmental protection, marketing and sales, etc. ◆ Master potential crises including: various work errors, change in work site environment, change in market environment, serious accidents, etc. <p>6.2 Act in emergency and lead the team to solve unexpected engineering problems or crises</p> <ul style="list-style-type: none"> ◆ Act in emergency and make decisions systematically and accurately according to different crises ◆ Ability to act in emergency and make decisions includes using appropriate crisis and risk management plans, contingency measures, risk assessment, etc. ◆ Lead the team to implement emergency mechanism to solve unexpected engineering problems or crises
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master potential crises and impacts for working environment; and (ii) Capable to act in emergency to implement emergency mechanism to solve unexpected engineering problems or crises.
8. Remarks	

1. Title	Formulate large-scale project contract specifications
2. Code	EMELDE510A
3. Range	Formulate large-scale electrical project contract specifications and implement tender process.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the details of large-scale project contract terms</p> <ul style="list-style-type: none"> ◆ Understand large-scale project contract terms, details of operation and spirit of the regulations <p>6.2 Formulate general and particular terms and details of large-scale project contract and implement tender process for large-scale project contract</p> <ul style="list-style-type: none"> ◆ Master the nature and details of various large-scale project contracts such as: <ul style="list-style-type: none"> • Electrical equipment procurement contract • Engineering service contract • Engineering design and installation contract, etc. ◆ Formulate general and particular terms and details of large-scale project contract including: <ul style="list-style-type: none"> • General contract terms • General technical terms • Tender bidding form ◆ Formulate particular terms and details for large-scale project contract including: <ul style="list-style-type: none"> • Standard technical terms • particular contract terms • particular technical terms • Technical drawings for bidding tender • Quotation list ◆ Implement tender process for large-scale project contract including <ul style="list-style-type: none"> • Pre-bid question and answer process related to technical terms and details • Assess bidder's alteration suggestions in technical terms and details • Examine bidder's quotations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to formulate general terms and details for large-scale project contract;</p> <p>(ii) Capable to formulate particular terms and details for large-scale project contract; and</p> <p>(iii) Capable to implement tender process for large-scale project contract.</p>
8. Remarks	

1. Title	Select and use advanced and specialized skills to support electrical engineering design
2. Code	EMELDE511A
3. Range	Applicable to electrical engineering design. Select and use a series of advanced and specialized technical skills to support and enhance electrical engineering design efficiency and quality.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced and specialized technical skills in electrical engineering</p> <ul style="list-style-type: none"> ◆ Understand a series of advanced and specialized technical skills in electrical engineering such as the application of renewable energy, small renewable energy generation systems and connection of power grids, etc. ◆ Understand the uses and strengths and weaknesses of technologies commonly used <p>6.2 Select and use advanced and specialized skills to support related electrical engineering design</p> <ul style="list-style-type: none"> ◆ Analyze, re-organize and assess different data and information, make suitable judgement and use advanced and specialized skills to formulate design solutions and drawings ◆ Select and use advanced and specialized skills to support established practices in electrical engineering design including using various types of computer aided design software to support and enhance work efficiency and quality, implementing planning, design and management tasks, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to select and use advanced and specialized skills to enhance current electrical engineering design performance and quality.</p>
8. Remarks	

1. Title	Use information technology application software to support power generation or transmission and distribution network engineering work
2. Code	EMELDE512A
3. Range	Applicable to works related to power generation or transmission and distribution network equipment. Use various types of information technology application software to support various levels of transmission and distribution power supply network project engineering work to enhance work efficiency.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the uses and strengths and weaknesses of information technology application software</p> <ul style="list-style-type: none"> ◆ Understand the uses and strengths and weaknesses of information technology application software for electrical engineering design, installation, inspection, testing, commissioning, operation, repair, maintenance, quality management, project management, operation management, occupational safety, health and environmental protection, marketing and sales, etc. <p>6.2 Use information technology application software to support project engineering work</p> <ul style="list-style-type: none"> ◆ Use information technology application software to support project engineering work to enhance work efficiency such as: <ul style="list-style-type: none"> • Use information technology application software to obtain data from various levels of transmission and distribution power supply network in order to support the work of design, quality management, project management, operation management, occupational safety, health and environmental protection, marketing and sales, etc. • Monitor various levels of transmission and distribution power supply network operational performance to support the work of design, installation, inspection, testing, commissioning, operation, repair, maintenance, quality management, operation management, etc. • Use information technology application software to control various levels of transmission and distribution power supply network operation, so as to assist the work of installation, inspection, testing, commissioning, operation, repair, maintenance, quality management, operation management, etc.

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master uses and merits and demerits of information technology application software for electrical project works; and (ii) Capable to use different information technology application software to support transmission and distribution network engineering work to enhance work efficiency.
8. Remarks	

1. Title	Make use of power generation or transmission and distribution network data for system performance design purpose
2. Code	EMELDE513A
3. Range	Applicable to works related to power generation or transmission and distribution network equipment. Use various levels of transmission and distribution network project engineering numerical and graphical data to achieve the design goal required in order to assess power generation or transmission and distribution network system performance.
4. Level	5
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand power generation or transmission and distribution network data</p> <ul style="list-style-type: none"> ◆ Understand information and data record on power generation or various levels of transmission and distribution network performance ◆ Understand relevant design standard performance information and data <p>6.2 Use power generation or transmission and distribution network data to point out and solve operational performance problems for power generation and transmission and distribution network system</p> <ul style="list-style-type: none"> ◆ Analyze and assess power generation or various levels of transmission and distribution network performance information and data record and compare with appropriate design standards ◆ Use power generation or various levels of transmission and distribution power supply network project engineering performance information and data record to assess the operational performance problems for power generation or various levels of transmission and distribution network system ◆ Formulate measures to solve operational problems for power generation or power network in order to improve system performance
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use power generation or transmission and distribution network performance information and data record to compare with appropriate design standards; and</p> <p>(ii) Capable to solve problems in power generation or power network operation performance to improve system performance.</p>
8. Remarks	

1. Title	Design low voltage distribution network systems
2. Code	EMELDE514A
3. Range	Applicable to the design of low voltage distribution network and associated installations. Implement the tasks of designing low voltage power supply network system and associated installations directly fed by several transformers.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master the design requirements for low voltage distribution network installations and associated equipment</p> <ul style="list-style-type: none"> ◆ Analyze and master the structure required by the design of low voltage power supply network system directly fed by several transformers according to client's tender requirements ◆ Master the technical requirements for the design of low voltage distribution network installations and associated equipment directly fed by several transformers, including system arrangement for electrical installations, protection and control system plan, etc. <p>6.2 Design low voltage distribution network installations and associated equipment</p> <ul style="list-style-type: none"> ◆ Analyze and point out the design constraints for low voltage distribution network installations and associated installations and potential problems of the work site according to the actual situation of the work site ◆ Design low voltage distribution network installations and associated equipment directly fed by several transformers, including various kinds of switches, transformers, generators, cables, protection and control devices, etc. according to client's requirements, site constraints, equipment manufacturer's technical specifications and requirements, etc. ◆ Draw single-line diagrams of low voltage distribution network systems and floor layout plans for the installations ◆ Formulate low voltage distribution network system plan and protection device setup according to the needs of different networks ◆ Accurately judge and modify the assembly diagram and design drawing submitted by contracted manufacturers of the installations <p>6.3 Professionalism in designing low voltage distribution network systems and associated installations</p> <ul style="list-style-type: none"> ◆ Follow the Electricity (Wiring) Regulations and their Code of Practice to design low voltage distribution network systems

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master client’s requirements on the design of low voltage distribution network systems and associated equipment; (ii) Capable to design low voltage distribution network systems and associated installations according to technical requirements on design; (iii) Capable to formulate low voltage distribution network protection system plan and protection device setup; and (iv) Capable to draw single-line diagrams of low voltage distribution network systems and floor layout plans for the installations.
8. Remarks	

1. Title	Formulate installation instructions for overhead line system
2. Code	EMCUIN501A
3. Range	Formulate instructions on overhead line system installation for the electrical and mechanical services, including the formulation of all information relevant to installation, electrical and mechanical data of cable, requirements and relevant concerns for the installation of isolator and insulator, etc.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principles of the whole overhead line system</p> <ul style="list-style-type: none"> ◆ Understand the structure and working principles of the whole overhead line system, including requirements on voltage variation for all transformers <p>6.2 Formulate installation instructions for the system</p> <ul style="list-style-type: none"> ◆ Formulate installation instructions for the overhead line system, including relevant information, electrical and mechanical data of cable, and data requirements for the isolators and insulators ◆ Formulate installation instructions, illustrate the installation method, tools and instruments required, and noting points, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand the requirements for the whole overhead line system and different voltage variations so as to formulate installation instructions, including the cable type, electrical and mechanical data, requirements for protective devices, and relevant concerns for installation, etc., for installation staff to follow.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electricity.

1. Title	Master the performance requirements for power generation or transmission and distribution network to perform installation work
2. Code	EMELIN502A
3. Range	Applicable to installation of power generation or transmission and distribution network equipment. Master the installation techniques and system performance requirements for various types of different installations of power generation or various levels of transmission and distribution network to perform installation work.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master generation or transmission and distribution system performance specification requirements and the operation of the Safety Rules (Electrical)</p> <ul style="list-style-type: none"> ◆ Master engineering performance requirements for generation or transmission and distribution network, including contract's general specifications, contract's particular specifications, relevant international standards, project schedules, details of work procedures, engineering quotation checklist, tender drawings, etc. ◆ Master the operation including installation, operation, testing, repair, etc. of the Safety Rules (Electrical) ◆ Master a series of operational performance requirements on operation, testing, repair, remote control and protection system, etc. of power generation installations and transmission and distribution network equipment <p>6.2 Implement installation tasks for power generation or transmission and distribution network equipment</p> <ul style="list-style-type: none"> ◆ Follow the engineering specification requirements and the operation of the Safety Rules (Electrical) to implement transmission and distribution network installation, including: <ul style="list-style-type: none"> • Considering the characteristics and constraints of the work site to select power facilities and devices that meet the technical requirements such as assembly, operation, testing and repair, etc. • Considering the characteristics and constraints of the work site to select materials that meet the technical requirements, such as insulated tile bottles, stainless steel materials, overhead lines materials, etc. • Implementing the moving in and warehousing of materials • Consider the operational requirements for generation equipment or transmission and distribution network to select appropriate computer control system software and hardware control and protection circuit

	<ul style="list-style-type: none"> ◆ Follow the performance requirements on operation, testing, repair, remote control and protection, etc. to implement installation of various levels of generation installations and transmission and distribution network equipment, including on-site and remote control operation, load current control, voltage regulation control, stability, safety, synchronous speed control, transmission and distribution network operation monitoring, etc. ◆ Follow the regulations and safety guidelines for the industry to ensure that power network equipment installation is implemented safely and the power generation or transmission and distribution network is safe to use
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master the operation of the Safety Rules (Electrical) in order to install power generation or transmission and distribution network equipment; and (ii) Capable to implement installation tasks for the specified generation installations or transmission and distribution network installations according to different installation techniques for various levels of generation installations or transmission and distribution network, the performance requirements on operation, repair and maintenance, etc.
8. Remarks	

1. Title	Coordinate the installation project of power generation or transmission and distribution network
2. Code	EMELIN503A
3. Range	Applicable to power generation or transmission and distribution network equipment installation. Coordinate various types of resources including various levels of frontline engineering personnel, tools, materials, instruments, information and data on design indicators, etc., and arrange, monitor and facilitate the installation project of power generation or various levels of transmission and distribution network and associated installations until it completes.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand power generation or transmission and distribution network equipment installation project requirements, work progress and resources allocation</p> <ul style="list-style-type: none"> ◆ Understand power generation or transmission and distribution network equipment installation project schedules and actual progress, installation project requirements, allocation of various levels of frontline engineering personnel, operational capital, and various kinds of tools, instruments and materials, etc. <p>6.2 Coordinate various types of resources to perform power generation or transmission and distribution network equipment installation</p> <ul style="list-style-type: none"> ◆ Plan in advance and coordinate according to project schedules and actual progress various types of resources including: allocation of various levels of frontline engineering personnel, operational capital, and various kinds of tools, instruments and materials, etc. ◆ Coordinate, arrange and monitor various kinds of equipment installation issues and communicate with clients or contractors to ensure that installation project is implemented smoothly ◆ Facilitate the implementation of installation project of various levels of power generation and transmission and distribution network and associated installations until it completes ◆ Regarding a series of different technical, professional or management functions, coordinate various types of resources and facilitate the implementation of the installation project until it completes
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to coordinate various types of resources and facilitate power generation or transmission and distribution network equipment installation project.
8. Remarks	

1. Title	Select and use advanced and specialized skills to support engineering management for electrical installation projects
2. Code	EMELIN504A
3. Range	Applicable to electrical installation work. Select and use a series of advanced and specialized technical skills to support and enhance electrical equipment installation work efficiency and quality.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced and specialized technical skills in electrical engineering</p> <ul style="list-style-type: none"> ◆ Understand a series of advanced and specialized technical skills in electrical engineering such as using various types of computer aided software to draw working diagrams, as-built drawings and electrical and mechanical facility integration plans to enhance work efficiency and quality, selecting innovative materials and tools, using advanced technologies in installation work for electrical projects, implementing management of delivery, storage and utilization of materials and equipment, etc. ◆ Understand the uses and strengths and weaknesses of technologies commonly used ◆ Understand specialized and environmental friendly installation technologies for electrical projects such as the application of renewable energy, small renewable energy generation systems and connection of power grids, etc. <p>6.2 Select and use advanced and specialized skills to support electrical equipment installation work</p> <ul style="list-style-type: none"> ◆ Analyze, re-organize and assess interlocking relationship of installation procedures for every equipment in various types of engineering projects, make suitable judgement and use advanced and specialized skills to formulate installation plans, shop drawings, improvements, etc. ◆ Select and use advanced and specialized skills to support established practices in installation for electrical projects including using various types of computer aided software to draw working diagrams, as-built drawings and electrical and mechanical facility integration plans to enhance work efficiency and quality, selecting innovative materials and tools, using advanced technologies in installation work for electrical projects, implementing management of delivery, storage and utilization of materials and equipment, etc. to enhance work efficiency and quality and implement installation planning and management tasks, etc.

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master uses, and strengths and weaknesses of general installation techniques; and (ii) Capable to select and use advanced and specialized skills to enhance current electrical installation performance and quality.
8. Remarks	

1. Title	Formulate instructions on overhead line system inspection, testing and commissioning
2. Code	EMCUIT501A
3. Range	Formulate instructions on overhead line system inspection, testing and commissioning so that engineering personnel who involve in such work could commission the equipment according to the instructions.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Requirements on various overhead line system equipment</p> <ul style="list-style-type: none"> ◆ Understand the requirements on various overhead line system equipment in order to formulate commissioning instructions and standards ◆ Understand relevant safety instructions and pay attention to possible hazards for inspection staff <p>6.2 Formulate instructions and standards, and provide information necessary for commissioning</p> <ul style="list-style-type: none"> ◆ Formulate the instructions and standards according to the requirements on various equipment and the overall overhead line system for the inspection staff to carry out inspection, testing and commissioning on various equipment and the overall overhead line system ◆ Formulate relevant safety instructions for inspection staff to protect their work safety
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate instructions and standards on various equipment of the overhead line system for the inspection staff to carry out inspection, testing and commissioning; and to ensure their safety by listing out the safety instructions and potential hazards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electricity.

1. Title	Formulate instructions on inspection, testing and commissioning of switchboard, control circuit, protector and electricity quality improvement device
2. Code	EMCUI502A
3. Range	Formulate instructions on inspection, testing and commissioning of switchboard, control circuit, protector and electricity quality upgrading device so that engineering personnel who involve in such work could commission the installations and improve the devices according to the instructions.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Installation requirements and standards for electrical works</p> <ul style="list-style-type: none"> ◆ Understand clearly requirements and standards for all installations of electrical works, including switchboard, control circuit and protector <p>6.2 Formulate requirements and standards for inspection staff to follow</p> <ul style="list-style-type: none"> ◆ Formulate requirements and standards according to installation requirements and the overall electrical works system for inspection staff to carry out inspection, testing and commissioning of all installations, including live test ◆ Formulate testing and commissioning instructions and standards for electricity quality improvement devices including filter power factor improvement device ◆ Know clearly the potential hazards for commissioning staff and formulate relevant safety instructions to protect their work safety
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate instructions and standards on various equipment of the electrical works system for the inspection staff to carry out inspection, testing and commissioning; and to ensure their safety by listing out the safety instructions and potential hazards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electricity.

1. Title	Master the performance requirements for power generation or transmission and distribution network to perform inspection, testing and commissioning
2. Code	EMELIT502A
3. Range	Applicable to inspection, testing and commissioning of power generation or transmission and distribution network equipment. Master the inspection, testing and commissioning techniques for various types of installations of power generation or various levels of transmission and distribution network, and analyze, re-organize and assess power system performance information to perform inspection, testing and commissioning.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master generation or transmission and distribution system performance specification requirements and the operation of the Safety Rules (Electrical)</p> <ul style="list-style-type: none"> ◆ Master engineering performance requirements for generation or transmission and distribution network, including contract's general specifications, contract's particular specifications, relevant international standards, project schedules, details of work procedures, engineering quotation checklist, tender drawings, etc. ◆ Master the operation of the Safety Rules (Electrical) including operation, inspection, testing, commissioning, repair, etc. ◆ Master a series of operational performance requirements on operation, testing, repair, remote control and protection system, etc. of power generation installations and transmission and distribution network equipment <p>6.2 Implement inspection, testing and commissioning tasks for power generation or transmission and distribution network equipment</p> <ul style="list-style-type: none"> ◆ Follow the engineering specification requirements and the operation of the Safety Rules (Electrical) to implement transmission and distribution network inspection, testing and commissioning, including: <ul style="list-style-type: none"> • Selecting tools and instruments that meet the technical requirements for inspection, testing and commissioning of power facilities and devices • Considering the characteristics and constraints of the work site to use tools and instruments that meet the technical requirements for inspection, testing and commissioning • Using appropriate computer control system software and hardware control and protection circuit for inspection, testing and commissioning

	<ul style="list-style-type: none"> • Implementing the arrangement of inspection, testing and commissioning of power generation or transmission and distribution network equipment • Completing approved testing record documents and assessing test results ◆ Follow the performance requirements on operation, inspection, commissioning, testing, repair, remote control and protection, etc. to implement inspection, testing and commissioning of various levels of generation installations and transmission and distribution network equipment, including on-site and remote control operation, load current control, voltage regulation control, insulation resistance, high voltage capacity, dielectric strength, etc. ◆ Follow the regulations and safety guidelines for the industry to ensure that power network equipment inspection, testing and commissioning is implemented safely and the power generation or transmission and distribution network is safe to use <p>6.3 Professionalism in inspecting, testing and commissioning power generation or transmission and distribution network equipment</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master the operation of the Safety Rules (Electrical) in order to inspect, test and commission power generation or transmission and distribution network equipment; and (ii) Capable to implement inspection, testing and commissioning tasks for the specified generation installations or transmission and distribution network installations according to different inspection, testing and commissioning techniques and the performance requirements on operation, repair and maintenance, etc. for various levels of generation installations or transmission and distribution network.
8. Remarks	

1. Title	Coordinate the inspection, testing and commissioning project of power generation or transmission and distribution network
2. Code	EMELIT503A
3. Range	Applicable to power generation or transmission and distribution network equipment inspection, testing and commissioning. Coordinate various types of resources including various levels of frontline engineering personnel, tools, materials, instruments, information and data on design indicators, etc., and judge, arrange, monitor and facilitate the inspection, testing and commissioning project of power generation or various levels of transmission and distribution network and associated installations until it completes.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand power generation or transmission and distribution network equipment engineering project design performance requirements, work progress and resources allocation</p> <ul style="list-style-type: none"> ◆ Understand power generation or transmission and distribution network equipment project schedules and actual progress, design performance requirements, allocation of various levels of frontline engineering personnel, operational capital, and various kinds of tools, instruments and materials, information and data on testing indicators, etc. <p>6.2 Coordinate various types of resources to perform power generation or transmission and distribution network equipment inspection, testing and commissioning</p> <ul style="list-style-type: none"> ◆ Plan in advance and coordinate according to project schedules and actual progress various types of resources including: allocation of various levels of frontline engineering personnel, operational capital, and various kinds of tools, instruments and materials, information and data on testing indicators, etc. ◆ Coordinate, arrange and monitor various kinds of equipment inspection, testing and commissioning issues and communicate with clients or contractors to ensure that engineering project is implemented smoothly ◆ Facilitate the implementation of inspection, testing and commissioning project of various levels of power generation and transmission and distribution network and associated installations until it completes ◆ Regarding a series of different technical, professional or management functions, coordinate various types of resources and facilitate the inspection, testing and commissioning work until it completes

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to coordinate various types of resources and facilitate power generation or transmission and distribution network equipment inspection, testing and commissioning.
8. Remarks	

1. Title	Select and use advanced and specialized skills to support engineering management for inspection, test and commissioning of electrical installations
2. Code	EMELIT504A
3. Range	Applicable to electrical inspection, test and commissioning work. Select and use a series of advanced and specialized technical skills to support and enhance electrical equipment inspection, test and commissioning work efficiency and quality.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced and specialized technical skills in electrical engineering</p> <ul style="list-style-type: none"> ◆ Understand a series of advanced and specialized technical skills in electrical inspection, test and commissioning for electrical projects such as using advanced instruments and equipment, advanced inspection and testing methods and skills, systematic inspection, testing and commissioning procedures, reports and relevant logistics management, selecting innovative instruments and tools, using advanced technologies to perform electrical engineering inspection, testing and commissioning, etc. ◆ Understand the uses and strengths and weaknesses of technologies commonly used for inspection, testing and commissioning <p>6.2 Select and use advanced and specialized skills to support electrical equipment inspection, test and commissioning</p> <ul style="list-style-type: none"> ◆ Analyze, re-organize and assess interlocking relationship of inspection, test and commissioning procedures for every equipment in various types of engineering projects, use advanced and specialized skills to formulate and submit inspection, test and commissioning plans, improvement measures, etc. ◆ Select and use advanced and specialized skills to support established practices in inspection, test and commissioning for electrical projects including using advanced instruments and equipment, advanced inspection and testing methods and skills, systematic inspection, testing and commissioning procedures, reports and relevant logistics management to enhance work efficiency and quality, selecting innovative instruments and tools, using advanced technologies to perform electrical engineering inspection, testing and commissioning, etc.

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master uses, and strengths and weaknesses of general inspection, test and commissioning technologies; and (ii) Capable to select and use advanced and specialized skills to enhance current electrical inspection, test and commissioning performance and quality.
8. Remarks	

1. Title	Master the performance requirements for power generation or transmission and distribution network to perform operation, repair and maintenance
2. Code	EMELOR502A
3. Range	Applicable to operation, repair and maintenance of power generation or transmission and distribution network equipment. Master the performance specification requirements for the operation, repair and maintenance techniques for installations of various levels of power generation or transmission and distribution network, and organize and perform inspection, testing and commissioning.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master power generation or transmission and distribution system performance requirements, manufacturer's technical specification requirements on operation, repair and maintenance and the operation of the Safety Rules (Electrical)</p> <ul style="list-style-type: none"> ◆ Master engineering performance requirements for generation or transmission and distribution network, including contract's general specifications, contract's particular specifications, relevant international standards, project schedules, details and implementation of work procedures, engineering quotation checklist, tender drawings, etc. ◆ Master the operation of the Safety Rules (Electrical) including operation, repair and maintenance, etc. ◆ Master manufacturer's technical specifications for operation, repair and maintenance of power generation or transmission and distribution network equipment ◆ Master a series of operational performance requirements on operation, repair and maintenance of power generation installations and transmission and distribution network equipment <p>6.2 Implement operation, repair and maintenance tasks for power generation or transmission and distribution network equipment in order to improve power system performance</p> <ul style="list-style-type: none"> ◆ Follow the engineering specification requirements and the operation of the Safety Rules (Electrical) to implement transmission and distribution network operation, repair and maintenance, including: <ul style="list-style-type: none"> • Selecting materials, tools and instruments that meet the technical requirements on operation, repair and maintenance of power facilities and devices, such as spare parts, hand tools, lifting appliances, insulation impedance tester and high voltage capacity tester • Considering the characteristics and constraints of the work site to use tools that meet the technical requirements on operation, repair and maintenance

	<ul style="list-style-type: none"> • Using appropriate computer control system software and hardware control and protection circuit to assist in performing operation, repair and maintenance • Implementing the arrangement of operation, repair and maintenance of power generation or transmission and distribution network equipment • Completing approved record documents on operation, repair and maintenance and assessing test results • Implementing emergency procedures and contingency measures <ul style="list-style-type: none"> ◆ Follow manufacturer’s technical specification requirements on operation, repair and maintenance to implement operation, repair and maintenance for installations of various levels of power generation or transmission and distribution network ◆ Follow the performance requirements on operation, repair and maintenance to implement operation, repair and maintenance of various levels of generation installations and transmission and distribution network equipment, including active power and non-active power control, voltage regulation control, stability, synchronous speed control, etc., and the application of repair and maintenance such as preventive maintenance management concept, mean time failure rate, repair and maintenance spare parts management, etc. ◆ Compare different system performance information according to relevant standards, re-formulate operation, repair and maintenance plans in order to perform improvements for operation, repair and maintenance <p>6.3 Professionalism in the operation, repair and maintenance of power generation or transmission and distribution network equipment</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that power network equipment operation, repair and maintenance is implemented safely and the power generation or transmission and distribution network is safe to use
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7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master the operation of the Safety Rules (Electrical) in order to perform repair and maintenance for power generation or transmission and distribution network equipment; (ii) Capable to follow manufacturer’s technical specifications for operation, repair and maintenance to understand the key points of the operation, repair and maintenance of installations of various levels of power generation or transmission and distribution network and (iii) Capable to formulate suitable improvement plans on operation, repair and maintenance according to different power system performance information and relevant standards.
8. Remarks	

1. Title	Formulate after-sales service logistics system
2. Code	EMELOR503A
3. Range	Applicable to operation, repair and maintenance management related to electrical projects. Formulate after-sales service logistics system to support and follow up repair and maintenance service.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the scope of logistic service system and resources allocation of the organization</p> <ul style="list-style-type: none"> ◆ Understand the scope and details of logistic service system ◆ Understand the resources allocated by the organization to the logistic service system <p>6.2 Formulate logistic service system and procedures</p> <ul style="list-style-type: none"> ◆ Formulate logistic service system and procedures ◆ Implement logistic service system in order to promptly support and follow up repair and maintenance service to meet client's requirements
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to formulate logistic service system and procedures for electrical projects to support and follow up repair and maintenance service.
8. Remarks	

1. Title	Use various fault finding methods for electrical installations
2. Code	EMELOR504A
3. Range	Applicable to daily operation, repair and maintenance of electrical installations. Master the operation and fault conditions of various kinds of power generation, transmission and distribution installations at worksites; lead and instruct staff of all levels to use various types of fault finding methods to solve the problems.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the operation and fault conditions of power generation, transmission and distribution installations and equipment</p> <ul style="list-style-type: none"> ◆ Understand the operating principles and fault conditions such as generators and high voltage switch control circuit failure, mechanical faults in high voltage switches and overhead cables, short circuit, cable fault, air leak in SF6 insulated high voltage switch, etc. in various types of power generation, transmission and distribution network installations and equipment <p>6.2 Lead and instruct staff of all levels to use various types of appropriate methods to find faults</p> <ul style="list-style-type: none"> ◆ Lead and instruct staff of all levels to use various types of appropriate instruments such as multi-meter, insulation resistance tester, pressure tester, injection test instruments, active detector, gas tester, etc. to find faults ◆ Use various types of appropriate methods such as insulation resistance tester, continuity test, withstand test, injection test, etc. to find faults <p>6.3 Professionalism in repairing and maintaining power generation, transmission and distribution network equipment</p> <ul style="list-style-type: none"> ◆ Follow the regulations and safety guidelines for the industry to ensure that the repair and maintenance of power generation, transmission and distribution network equipment can be performed safely, and the power generation, transmission and distribution network equipment can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the operation and fault conditions of various types of power generation, transmission and distribution network installations and equipment;</p> <p>(ii) Capable to use various types of appropriate instruments to find faults; and</p> <p>(iii) Capable to lead and instruct staff of all levels to use various types of appropriate methods to find faults.</p>
8. Remarks	

1. Title	Coordinate the operation, repair and maintenance project of power generation or transmission and distribution network
2. Code	EMELOR505A
3. Range	Applicable to power generation or transmission and distribution network equipment operation, repair and maintenance. Coordinate various types of resources, arrange, monitor and facilitate the operation, repair and maintenance project of power generation or various levels of transmission and distribution network and associated installations until it completes.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand power generation or transmission and distribution network equipment engineering project design performance requirements, work progress and resources allocation</p> <ul style="list-style-type: none"> ◆ Understand power generation or transmission and distribution network equipment project schedules and actual progress, design performance requirements, allocation of various levels of frontline engineering personnel, operational capital, and various kinds of hand tools, instruments and spare part materials, information and data on operational performance indicators, etc. <p>6.2 Coordinate various types of resources to perform power generation or transmission and distribution network equipment operation, repair and maintenance</p> <ul style="list-style-type: none"> ◆ Plan in advance and coordinate according to project schedules and actual progress various types of resources including: allocation of various levels of frontline engineering personnel, operational capital, and various kinds of hand tools, instruments and spare part materials, information and data on operational performance indicators, etc. ◆ Coordinate, arrange and monitor various kinds of equipment operation, repair and maintenance issues and communicate with clients or contractors to ensure that engineering project is implemented smoothly ◆ Facilitate the implementation of operation, repair and maintenance project of various levels of power generation and transmission and distribution network and associated installations until it completes ◆ Regarding a series of different technical, professional or management functions, coordinate various types of resources and facilitate the operation, repair and maintenance work until it completes

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to coordinate various types of resources and facilitate power generation or transmission and distribution network equipment operation, repair and maintenance according to assessment requirements.
8. Remarks	

1. Title	Select and use advanced and specialized skills to support engineering management for operation, repair and maintenance of electrical intallations
2. Code	EMELOR506A
3. Range	Applicable to electrical operation, repair and maintenance work. Select and use a series of advanced and specialized technical skills to support and enhance electrical equipment operation, repair and maintenance work efficiency and quality.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced and specialized technical skills in electrical engineering</p> <ul style="list-style-type: none"> ◆ Understand a series of advanced and specialized technical skills in electrical operation, repair and maintenance such as integrated management for emergency repair and preventive maintenance, cost management, material procurement management, quality management, human resources management, logistics management, process flow management, etc. ◆ Understand the uses and strengths and weaknesses of a series of technologies commonly used for inspection, testing and commissioning <p>6.2 Select and use advanced and specialized skills to support electrical equipment operation, repair and maintenance</p> <ul style="list-style-type: none"> ◆ Analyze, re-organize and assess interlocking relationship of operation, repair and maintenance procedures for every equipment in various types of engineering projects, make suitable judgement, use advanced and specialized skills to formulate operation, repair and maintenance plans, improvement measures, etc. ◆ Select and use advanced and specialized skills to support established practices in operation, repair and maintenance for electrical projects including integrated management for emergency repair and preventive maintenance, cost management, material procurement management, quality management, human resources management, logistics management, process flow management, etc. to enhance operation, repair and maintenance efficiency and quality
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master uses and strengths and weaknesses of general operation, repair and maintenance management skills; and</p> <p>(ii) Capable to select and use general operation, repair and maintenance management skills and advanced technologies to enhance current electrical operation, repair and maintenance performance and quality.</p>
8. Remarks	

1. Title	Formulate project procedures and schedule
2. Code	EMCUPM501A
3. Range	Formulate project procedures and schedule for electrical and mechanical services according to the specifications, scope and targets of the project.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principles and techniques of electrical and mechanical project management</p> <ul style="list-style-type: none"> ◆ Understand the principles and techniques of electrical and mechanical engineering project management, including the formulation of project procedures, schedule, contingency plan and review mechanism <p>6.2 Formulate procedures, schedule, contingency plans and review mechanism for electrical and mechanical projects</p> <ul style="list-style-type: none"> ◆ Draft project procedures <ul style="list-style-type: none"> • Confirm the project specifications, scope and targets according to the contract and related information • Analyze the work breakdown structure and organisational breakdown structure • Pay attention to safety, health and environmental protection ordinances and codes, the protection of intellectual property and quality management system of the organization when drafting project procedures ◆ Formulate project schedule <ul style="list-style-type: none"> • Apply project management techniques to formulate project schedule according to the contract and related information as well as project procedures drafted and the following arrangements: <ul style="list-style-type: none"> ▸ Critical path and flow chart ▸ Arrangements of equipment, materials and parts ▸ Arrangements of human resources ◆ Formulate contingency mechanism and review mechanisms <ul style="list-style-type: none"> • Conduct risk assessment for the projects and formulate contingency mechanism ◆ Formulate review mechanism for the project to ensure that targets of the project be achieved
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to formulate project procedures and schedules for electrical and mechanical projects according to the project specifications and targets; and</p> <p>(ii) Capable to formulate effective review check points and review mechanism for the projects.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of operation management.

1. Title	Implement project management for projects of power generation, transmission and distribution network
2. Code	EMELPM501A
3. Range	Analyze and assess information such as all the terms of client's tender, contract details, project schedules, etc.; implement project management for electricity generation or various levels of transmission and distribution network and associated installations.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand contract requirements for electricity generation, transmission and distribution network</p> <ul style="list-style-type: none"> ◆ Understand contract requirements for electricity generation, transmission and distribution network, including: contract's general specifications, contract's particular specifications, relevant international standards, project schedules, work process arrangement, project quotation list, tender drawings, etc. <p>6.2 Implement project management for electricity generation, transmission and distribution network</p> <ul style="list-style-type: none"> ◆ Implement project management for electricity generation, transmission and distribution network according to contract requirements, including: <ul style="list-style-type: none"> • Organizing and arranging the design, installation, testing and commissioning of various levels of electricity generation and transmission and distribution network; perform project management to monitor and ensure that the electricity generation, transmission and distribution systems meet the design performance requirements • Implementing engineering project plan and flow chart • Completing recognized project management document records and assessing project management problems and results • Implementing financial and project insurance arrangements • Implementing logistic arrangements and material procurement • Implementing the deployment, coordination, training and recruitment of human resources • Implementing emergency procedures and contingency measures, etc. ◆ Ensure that the works related to electricity generation, transmission and distribution network equipment meet the statutory and professional requirements so that the electricity systems can be used safely

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to implement project management for electricity generation, transmission and distribution network according to the contract requirements for electricity generation equipment or transmission and distribution network.
8. Remarks	

1. Title	Follow the tender bidding strategy of the organization to make engineering project quotations
2. Code	EMELPM502A
3. Range	Applicable to project management of electrical works. Master tender bidding strategy of the organization to make engineering project quotations.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand main details of client's tender, tender bidding strategy and materials of the market</p> <ul style="list-style-type: none"> ◆ Understand the main details of client's tender and tender bidding strategy, including: strengths and weaknesses of the organization in this tender project, omissions and errors in tender specifications , competitors' strengths and weaknesses, etc. ◆ Master general relevant information such as the market prices of materials and equipment, human resources market supply situation, internal return analysis, etc. in the absence of complete information; analyze and consolidate individual risk analysis results <p>6.2 Analyze potential risks faced by the project and follow the tender bidding strategy of the organization to make engineering project quotations</p> <ul style="list-style-type: none"> ◆ Analyze and consolidate data of individual risks faced by the project according to materials and situations of the market ◆ Follow tender bidding strategy of the organization to make engineering project quotations according to the consolidated risk analysis results for the tender specifications
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the details of client's tender specifications;</p> <p>(ii) Capable to master the risks faced by the project; and</p> <p>(iii) Capable to follow the tender bidding strategy of the organization and risk analysis results to make engineering project quotations.</p>
8. Remarks	

1. Title	Justify the costing of engineering project according to procurement specifications
2. Code	EMELPM503A
3. Range	Applicable to project management of electrical works. Analyze the contract requirements of power generation, transmission and distribution network projects, and use various costing techniques of engineering project to justify the project costs.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand electricity generation, transmission and distribution network works contract requirements</p> <ul style="list-style-type: none"> ◆ Understand electricity generation, transmission and distribution network works contract requirements including: material procurement specifications documents, engineering service contract's general specifications, contract's particular specifications, relevant international standards, project schedules, work process details and implementation, project quotation list, tender drawings, etc. <p>6.2 Use various costing techniques of engineering project to justify the project costs</p> <ul style="list-style-type: none"> ◆ Use the following costing techniques of engineering project to justify the project costs according to contract requirements: <ul style="list-style-type: none"> • Analyzing market prices of similar engineering services • Analyzing market prices of similar materials, electrical installations and facilities • Prices of other companies' tender returns • Market price trend and supply and demand for work materials and wages • Size of the companies that have submitted tenders and the number of bids for other engineering projects they have already been awarded • Trends of interest rate and foreign exchange rates, etc.
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to master various costing techniques of engineering project to justify the project costs according to the contract requirements for electricity generation equipment or transmission and distribution network.
8. Remarks	

1. Title	Analyze professional skills needed by the project and implement human resources management for the project
2. Code	EMELPM506A
3. Range	Applicable to project management of electrical works. Analyze the market situation for human resources supply and implement human resources management for the project.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand human resources management knowledge</p> <ul style="list-style-type: none"> ◆ Understand the concept of human resources management for the project ◆ Understand the existing professional skills needed by electrical works <p>6.2 Implement human resources management for the project</p> <ul style="list-style-type: none"> ◆ Analyze information on professionals needed by the project, including: number of relevant professionals needed, market supply situation for the professionals needed, prices to be paid for retaining or recruiting them, etc. ◆ Follow corporate operation management strategy to implement human resources management for the project. Scope of strategy includes: recruitment strategy, staff retaining strategy, internal training mechanism and strategy, etc.
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master the professional skills needed by the project; and (ii) Capable to follow corporate operation management strategy to implement human resources management for the project.
8. Remarks	

1. Title	Master the design performance requirements of power generation, transmission and distribution network and perform project management
2. Code	EMELPM507A
3. Range	Applicable to project management of electrical works. Analyze, organize and assess the design performance requirements and data for different electricity systems in the engineering project; and perform project management for the design, installation, testing and commissioning of various levels of electricity generation, transmission and distribution network.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand electricity generation, transmission and distribution network design performance requirements</p> <ul style="list-style-type: none"> ◆ Understand the design performance requirements and data for various types of electricity generation, transmission and distribution network of the engineering project, including: equipment's nominal data (size dimensions, electric current, voltage, frequency, power factor, etc.), conductor resistance, conductor insulation resistance, cylinder pressure, SF6 gas purity, full load stability and temperature rise, starting current, voltage leakage values, etc. <p>6.2 Perform project management according to electricity generation, transmission and distribution network design performance requirements</p> <ul style="list-style-type: none"> ◆ Implement the design, installation, testing and commissioning of various levels of electricity generation, transmission and distribution network and perform project management according to electricity generation, transmission and distribution network performance design requirements or data in order to monitor and ensure that the design performance requirements for electricity generation, transmission and distribution systems are met ◆ Ensure that the works of electricity generation, transmission and distribution network equipment meet the statutory and professional requirements so that the electricity systems can be used safely
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the design performance requirements for electricity generation, transmission and distribution network; and</p> <p>(ii) Capable to monitor and ensure that the design performance requirements for electricity generation, transmission and distribution systems are met.</p>
8. Remarks	

1. Title	Plan the allocation of project resources
2. Code	EMELPM508A
3. Range	Applicable to project management of electrical works. Plan the allocation of technical staff, materials, tools, instruments and project resources.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Analyze the allocation of corporate resources</p> <ul style="list-style-type: none"> ◆ Analyze the allocation of corporate resources including the number of technical and non-technical staff, materials, tools, instruments, etc. <p>6.2 Plan and timely allocate project resources</p> <ul style="list-style-type: none"> ◆ Plan in advance the resources, such as the number of technical and non-technical staff, materials, tools , instruments , etc. needed by the project according to project schedule and actual progress ◆ Timely allocate project resources to ensure that the project is implemented smoothly according to the project schedule
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to plan and timely allocate project resources.
8. Remarks	

1. Title	Coordinate the project management of electricity generation, transmission and distribution network
2. Code	EMELPM509A
3. Range	Applicable to project management of electrical works. Coordinate various types of resources; arrange, monitor and facilitate the project management works for various levels of electricity generation and transmission and distribution network and associated installations °
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand resource allocation procedures of the organization</p> <ul style="list-style-type: none"> ◆ Understand resource allocation procedures of the organization. Items of resources include the number of technical and non-technical staff, materials, tools, instruments, etc. <p>6.2 Coordinate various types of resources and perform project management for electricity generation, transmission and distribution network</p> <ul style="list-style-type: none"> ◆ Coordinate various types of resources; arrange, monitor and facilitate the project management works for various levels of electricity generation and transmission and distribution network and associated installations according to the project resources planning, project schedule and actual progress ◆ Resources needed by the project include the number of technical and non-technical staff, materials, tools , instruments , etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to coordinate various types of resources and facilitate the project management works for electricity generation, transmission and distribution network.</p>
8. Remarks	

1. Title	Use advanced and specialized techniques to support electrical engineering project management
2. Code	EMELPM510A
3. Range	Applicable to project management of electrical works. Use advanced and specialized techniques to support or enhance electrical engineering project management efficiency and quality.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced and specialized techniques relevant to electrical works</p> <ul style="list-style-type: none"> ◆ Understand advanced and specialized project management techniques relevant to electrical works such as project cost management, project procurement management, project quality management, project human resources management, project risk management, project process flow management, etc. ◆ Understand the uses and strengths and weaknesses of common project management techniques <p>6.2 Use advanced and specialized techniques to support electrical engineering project management</p> <ul style="list-style-type: none"> ◆ Analyze, re-organize and assess every work process and the interlocking relationship of the work processes of different engineering project, make suitable judgement and use advanced and specialized skills to formulate project management solutions or improvement measures, etc. ◆ Use advanced and specialized skills to support electrical engineering project management operations including: project cost management, project procurement management, project quality management, project human resources management, project risk management, project process flow management, etc. to support or enhance existing electrical project management efficiency and quality
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to use advanced and specialized skills to enhance electrical engineering project management efficiency and quality.
8. Remarks	

1. Title	Formulate operation management plans for power generation, transmission and distribution network projects
2. Code	EMELOM501A
3. Range	Applicable to electricity generation, transmission and distribution network project operation management. Master information such as all the terms of client's tenders, contract details, project schedules, etc.; formulate operation management plans for electricity generation or various levels of transmission and distribution network and associated installations
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand contract requirements for electricity generation, transmission and distribution network projects</p> <ul style="list-style-type: none"> ◆ Understand contract requirements for power generation, transmission and distribution networks including: contract's general specifications, contract's particular specifications, relevant international standards, project schedules, work process arrangement, project quotation list, tender drawings, etc. <p>6.2 Formulate operation management plans for power generation, transmission and distribution network projects according to contract requirements</p> <ul style="list-style-type: none"> ◆ Implement project management for power generation, transmission and distribution network according to contract requirements, including: <ul style="list-style-type: none"> • Organizing, arranging and operating all the resources including cash flow and human resources for operation management of different projects so as to monitor and ensure that the electricity generation, transmission and distribution projects can be implemented smoothly • Implementing project operation plan • Completing recognized operation management document records and assessing operation management problems and results • Arranging financial and project insurance arrangements • Monitoring and implementing logistic arrangements and material procurement • Allocation, coordination, training and recruitment of human resources • Implementing emergency procedures and contingency measures, etc. ◆ Ensure that the works related to power generation, transmission and distribution network equipment meet the statutory and professional requirements so that the electricity systems can be used safely

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to formulate operation management plans for power generation, transmission and distribution network projects according to the contract requirements.
8. Remarks	

1. Title	Formulate operation management plans and correct substandard works
2. Code	EMELOM502A
3. Range	Applicable to the operation management of electrical works. Capable to implement quality management to correct works that are below standard or breaching the rules, and formulate operation management plans.
4. Level	5
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand criteria for substandard works</p> <ul style="list-style-type: none"> ◆ Understand criteria for works that are below standard or breaching the rules for electrical works <p>6.2 Correct substandard works and formulate operation management plans</p> <ul style="list-style-type: none"> ◆ Investigate and review works that are below standard or breaching the rules for electrical works, including thoroughly investigating the personnel who are breaching the rules; identify procedures that are below standard or breaching the rules and their causes, locations, happening time, etc. ◆ Implement quality management, and correct works that are below standard or breaching the rules for electrical works ◆ Conduct thorough investigations for all works that are far below standard or breaching the rules, and critically analyze and review the information obtained in order to improve the existing operation management system ◆ Formulate effective operation management improvement plans to correct the inadequacy and errors in the existing operation management system
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master various situations of work that are below standard or breaching the rules for electrical works; and</p> <p>(ii) Capable to formulate effective operation management improvement plans to correct the inadequacy and errors in the existing operation management system.</p>
8. Remarks	

1. Title	Formulate financial management for individual engineering projects
2. Code	EMELOM504A
3. Range	Applicable to the operation management of electrical works. Analyze the operation management of the organization and formulate a financial management plan for individual engineering projects.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the situation of the internal operation management of the organization</p> <ul style="list-style-type: none"> ◆ Understand the situation of the operation management of every engineering project of the organization, including the life cycle of every project, manpower peak demand, capital peak demand, cash flow status, status of the delivery of materials, status of profits and liabilities, etc. <p>6.2 Formulate a financial management plan for individual engineering projects</p> <ul style="list-style-type: none"> ◆ Analyze and review the overall situation of the operation management of the organization ◆ Master the life cycle of operation, cash flow, materials delivery schedule, expenditure items, etc. of every engineering project; formulate a financial management plan for every engineering project, including loan interest analysis, internal rate of return, cash flow, foreign exchange risk hedging, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the overall situation of the operation management of the organization; and</p> <p>(ii) Capable to master the operation management of individual engineering projects of the organization and formulate a financial management plan for them.</p>
8. Remarks	

1. Title	Use advanced and specialized techniques to support the operation management of integrated electrical works
2. Code	EMELOM509A
3. Range	Applicable to operation management of electrical works. Use advanced and specialized techniques to support or enhance electrical works operation management efficiency and quality.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced and specialized techniques relevant to electrical works</p> <ul style="list-style-type: none"> ◆ Understand advanced and specialized operation management techniques relevant to electrical works such as cost management, procurement management, quality management, human resources management, risk management, enterprise operation continuity management, information management, SME operation management, logistic support operation management, process flow operation management, etc. ◆ Master the uses and strengths and weaknesses of common operation management techniques <p>6.2 Use advanced and specialized techniques to support the operation management of electrical equipment</p> <ul style="list-style-type: none"> ◆ Analyze, re-organize and assess every work process and the interlocking relationship of the work processes of different engineering project, make suitable judgement and use advanced and specialized skills to formulate operation management solutions or improvement measures, etc. ◆ Use advanced and specialized skills to support electrical works operation management operations including: cost management, procurement management, quality management, human resources management, risk management, enterprise operation continuity management, information management, SME operation management, logistic support operation management, process flow management, etc. to support or enhance existing electrical works operation management efficiency and quality
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to use advanced and specialized skills to enhance electrical works operation management efficiency and quality.
8. Remarks	

1. Title	Implement risk management for electrical and mechanical services	
2. Code	EMCUSH502A	
3. Range	Apply risk assessment and management techniques to formulate and implement risk management plans.	
4. Level	5	
5. Credit	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about different kinds of electrical and mechanical engineering risks and their management methods</p> <ul style="list-style-type: none"> ◆ Understand different kinds of electrical and mechanical engineering risks such as: <ul style="list-style-type: none"> • Different kinds of potential hazards and risks caused by them • Risk analysis modes such as HAZOP(Hazard and Operability Studies) 、QRA(Quality Risk Assessment) 、FMEA(Failure Modes and Effects Analysis) and FTA(Fault Tree Analysis), etc. • Other risk related factors such as occupational safety and health, management systems, Factories and Industrial Undertakings Ordinance, etc. • Risk control and risk management plans <p>6.2 Implement risk management for electrical and mechanical services</p> <ul style="list-style-type: none"> ◆ Identify potential hazards and their kinds (e.g. chemical hazards, electrical hazards, etc.), the chance of happening and the consequences ◆ Conduct risk assessment and analysis <ul style="list-style-type: none"> • Conduct risk assessment for the working procedure, work type, machinery and organization according to the chance of happening and the consequences of the hazard • Analyze the price for the accident and the advantages of safe operation • Consider comprehensively the aspects of occupational safety and health as well as environmental protection when conducting risk assessment 	

	<ul style="list-style-type: none"> ◆ Control and management risks <ul style="list-style-type: none"> • Formulate risk control levels based on risk assessment data • Formulate the risk control and management plan according to risk control levels and by taking into consideration of the OHSAS18000 Occupational Health and Safety Assessment Series and Factories and Industrial Undertakings Ordinance and regulations ◆ Implement risk management for electrical and mechanical services according to the risk control and management plan
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to identify hazards and assess risks according to the activities and nature of the electrical and mechanical services; and (ii) Capable to devise a risk control and management plan according to the hazards identified, risk assessment and other considerations.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.</p>

1. Title	Formulate occupational safety and health management system
2. Code	EMCUSH504A
3. Range	Master the knowledge of occupational safety and health so as to formulate a basic occupational safety and health management system.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of occupational safety and health</p> <ul style="list-style-type: none"> ◆ Understand the operation of the occupational safety and health management system, including: <ul style="list-style-type: none"> • Goals of the management system • Monitoring mechanism • Training methods • Contingency measures • Review measures <p>6.2 Formulation of basic occupational safety and health management system</p> <ul style="list-style-type: none"> ◆ Formulate occupational safety and health management system according to the requirements of the occupational safety and health ordinances as well as the operation of the company. The tasks include: <ul style="list-style-type: none"> • Setting goals for the management system • Organizing management committee and setting its terms of reference • Establishing management system mechanism • Designing monitoring mechanism • Formulating training plans • Establishing work site contingency measures • Formulating review measures
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective and basic occupational safety and health management system according to the requirements of the occupational safety and health ordinances as well as the operation of the company.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of occupational safety management.

1. Title	Formulate occupational safety and health and environmental protection schemes
2. Code	EMCUSH505A
3. Range	Analyze areas that have to be enhanced regarding staff's awareness of occupational safety and health and environmental protection, and to formulate schemes to enhance staff's awareness of occupational safety and health and environmental protection.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Occupational safety and health and environmental protection scheme</p> <ul style="list-style-type: none"> ◆ Understand the importance of occupational safety and health and environmental protection to staff; and draft a scheme relevant to occupational safety and health and environmental protection including the following: <ul style="list-style-type: none"> • Scheme targets • schedule • Effectiveness review • Manpower arrangement • Budget, etc. <p>6.2 Formulation of occupational safety and health and environmental protection scheme</p> <ul style="list-style-type: none"> ◆ Identify the difference between the company's targets and staff awareness of occupational safety and health and environmental protection <ul style="list-style-type: none"> • Collect opinions of staff on occupational safety and health and environmental protection management • Set the company's targets on occupational safety and health and environmental protection management • Identify the difference between the company's targets and staff awareness of occupational safety and health and environmental protection management ◆ Formulate plans to enhance staff's awareness of occupational safety and health and environmental protection management <ul style="list-style-type: none"> • Analyze company's occupational safety and health and environmental protection management culture, and draft proposals for the enhancement scheme such as training courses, seminars and quiz competitions, etc. • Collect staff's opinions on safety, health and environmental improvement • Collect staff's opinions on the enhancement scheme • Use other organizations' successful experience in organizing activities to enhance staff's awareness of occupational safety and health and environmental protection

	<ul style="list-style-type: none"> • Formulate a scheme to enhance staff’s awareness of occupational safety, health environmental protection, including the formulation of scheme targets, implementation methods and schedule, expected performance, budget, measuring methods, etc. • Manpower arrangement for the implementation of the scheme ◆ Review the effectiveness of the scheme <ul style="list-style-type: none"> • Ensure good communication during the implementation of the scheme • Measure and review the effectiveness of the scheme after implementation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate and implement schemes to enhance staff’s awareness of occupational safety and health and environmental protection; and to review their effectiveness.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.</p>

1. Title	Perform risk assessment for electrical and mechanical work
2. Code	EMCUSH506A
3. Range	Apply the knowledge and skills of risk assessment with the understanding of the electrical and mechanical work to perform risk assessment. The competency of this unit is applicable to safety management of the electrical and mechanical services.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Engineering work and environment</p> <ul style="list-style-type: none"> ◆ Understand the engineering work and environment according to engineering working guidelines and on-site observation ◆ Understand the potential risks and hazards according to the accident reports <p>6.2 Perform risk assessment</p> <ul style="list-style-type: none"> ◆ Apply risk assessment skills to perform risk assessment for electrical and mechanical procedures, such as HAZOP (Hazard and Operability), FTA (Fault Tree Analysis), fault-finding analysis, status analysis, and the use of tools under different circumstances and handling of dangerous goods and scope of application ◆ Compile risk assessment reports for engineering procedures, including <ul style="list-style-type: none"> • Hazards and their identification • Risk assessment methods • Calculation and assessment of risks • Methods to reduce or eliminate risks • Conclusions and recommendations
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to perform effectively risk assessment and to write proposals for electrical and mechanical work and environment, and come up with conclusions and recommendations.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of using basic risk assessment methods.

1. Title	Formulate environmental protection management system	
2. Code	EMCUSH507A	
3. Range	Master the legal requirements on environmental protection so as to formulate a basic environmental protection management system.	
4. Level	5	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of environmental protection</p> <ul style="list-style-type: none"> ◆ Understand the legal requirements on environmental protection, including the areas of emissions, waste water, noise, solid waste, chemical waste, etc. ◆ Understand the operation of a basic environmental protection management system, including: <ul style="list-style-type: none"> • Goals of the management system • Monitoring mechanism • Contingency measures • Review measures • ISO 14001, etc. <p>6.2 Formulation of basic environmental protection management system</p> <ul style="list-style-type: none"> ◆ Formulate a basic environmental protection management system according to the legal requirements on environmental protection, including the following: <ul style="list-style-type: none"> • Goals of the management system • Management system mechanism • Monitoring mechanism • Contingency measures • Review measures 	
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective basic environmental protection management system for the electrical and mechanical services according to the legal requirements on environmental protection, and review its effectiveness.</p>	
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of environmental protection.	

1. Title	Implement occupational safety and health and environmental protection courses and training programmes
2. Code	EMCUSH508A
3. Range	Implement occupational safety and health and environmental protection courses and training programmes, and enhance safety awareness of staff.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Contents of general occupational safety and health and environmental protection courses and training</p> <ul style="list-style-type: none"> ◆ Understand the objectives and contents of general occupational safety and health and environmental protection courses and training ◆ Understand the characteristics and needs of training targets <p>6.2 Implementation of general occupational safety and health and environmental protection courses and training</p> <ul style="list-style-type: none"> ◆ Investigate the needs of training targets within the organization <ul style="list-style-type: none"> • Use different methods to help investigate the needs of training targets within the organization for occupational safety and health and environmental protection training, such as questionnaire, staff appraisal report, company policy, etc. ◆ Implement occupational safety and health and environmental protection courses and training projects <ul style="list-style-type: none"> • Make relevant arrangements for enrolment and admission procedures, venue and duration for the course, teaching materials and aids, etc ◆ Enhance staff's safety awareness <ul style="list-style-type: none"> • Encourage the staff to participate actively in occupational safety and health and environmental protection courses and training programmes through continuous staff training, merit assessment, performance incentives, extracurricular activities

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to use different methods to investigate and analyze effectively the needs of training targets on occupational safety and health and environmental protection within the organization; (ii) Capable to organize training courses and programmes, and implement relevant activities effectively according to the internal needs of the organization; and (iii) Capable to formulate and implement encouragement measures to enhance staff's safety awareness.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of occupational safety management.</p>

1. Title	Formulate and implement quality management courses and training programmes
2. Code	EMCUQM503A
3. Range	Formulate and implement quality management courses and training programmes by targeting the weaknesses in electrical and mechanical engineering quality management so as to enhance the staff's awareness of quality management.
4. Level	5
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Electrical and mechanical engineering quality management concept and culture</p> <ul style="list-style-type: none"> ◆ Understand the electrical and mechanical engineering quality management concept and culture, including the 'Plan-Do-Check-Act' Quality Management Cycle <p>6.2 Formulate and implement quality management courses and training programmes</p> <ul style="list-style-type: none"> ◆ Formulate and implement quality management courses and training programmes by targeting the weaknesses in electrical and mechanical engineering quality management such as the basic quality management in various procedures, including installation, checking, debugging, commissioning and repair, etc. ◆ Formulate the basic course on 'Plan-Do-Check-Act' Quality Management Cycle ◆ Formulate basic level quality management courses or training programmes ◆ Implement quality management courses or training programmes to enhance the staff's awareness of quality management, including: <ul style="list-style-type: none"> • Basic requirements and application of ISO 9000 quality management and quality assurance standards • Promoting quality management culture • Urging the staff to constantly review and improve the engineering process performance ◆ Review and improve the quality management courses regularly to enhance the effectiveness of staff training
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate and implement quality management courses and training programmes effectively by targeting the weaknesses in electrical and mechanical engineering quality management, and review and improve the quality management courses effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Formulate and analyze quality assurance reports
2. Code	EMCUQM504A
3. Range	With regard to quality management of electrical and mechanical services, analyze information generated from quality monitoring points of each engineering procedure, quality issues and problems, and formulate quality assurance reports.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Format and key points of quality assurance report on electrical and mechanical services ♦ Understand the format and key points of quality assurance report on electrical and mechanical services</p> <p>6.2 Formulate and analyze quality assurance reports ♦ Base on records of the major monitoring points of each service procedure and all quality related issues, such as quality level for each action, non-compliance with regulations, errors, defects, deviation, excesses or shortfalls and other causes, etc., to quantify quality management issues and problems so as to provide sufficient data or information to produce the quality assurance reports</p> <ul style="list-style-type: none"> • Analyze all quality management issues and problems, formulate quality assurance reports and report to the management
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to effectively monitor each service procedure, quantify quality management issues and problems, analyze data and information, and formulate quality assurance reports.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Formulate schemes to enhance staff's awareness of quality management
2. Code	EMCUQM505A
3. Range	Analyze what areas in quality management of electrical and mechanical services that the staff should improve, and formulate schemes to enhance staff's awareness of quality management.
4. Level	5
5. Credit	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Culture and targets of organization in quality management</p> <ul style="list-style-type: none"> ◆ Understand the culture and targets of the organization in quality management <p>6.2 Plan to enhance staff's awareness of quality management and review the effectiveness of the scheme</p> <ul style="list-style-type: none"> ◆ Collect staff's understanding and opinions on quality management ◆ Identify the deviation between targets of the organization and staff's performance on quality management ◆ Analyze the quality management culture of the organization, and draft forms of enhancement measures, such as training courses, quiz competitions and seminars, etc. ◆ Collect staff's opinions on the enhancement scheme ◆ Implement Quality Circle activities ◆ Formulate suitable schemes to enhance staff's awareness of quality management, including the formulation of schemes' targets, implementation methods and schedule, expected performance, budget and means for measuring the effectiveness, etc. ◆ Measure and review the effectiveness of the scheme after implementation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to analyze the quality management culture of the organization, draft a proposal to enhance staff's awareness of quality management, and review the effectiveness of the enhancement scheme after implementation.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses a fair basis of quality management.

1. Title	Implement quality management training courses
2. Code	EMCUQM506A
3. Range	Master knowledge and skills in quality management of electrical and mechanical services to implement quality management courses.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Quality management system</p> <ul style="list-style-type: none"> ◆ Understand quality management system, such as: <ul style="list-style-type: none"> • ISO 9000 • Total quality management • Quality circle • Business Process Re-engineering <p>6.2 Implement quality management courses</p> <ul style="list-style-type: none"> ◆ Set targets for the courses <ul style="list-style-type: none"> • Identify staff's training needs and formulate a training plan accordingly • Set targets for each course according to the training plan ◆ Apply the knowledge of quality management system and the pre-set quality standard and system of the organization when formulating courses, including: <ul style="list-style-type: none"> • Working procedure system • Working instruction system • Document control system ◆ Set the teaching mode of the quality management courses, including: <ul style="list-style-type: none"> • Lesson mode • Interactive mode • Workshop mode • Assessment mode ◆ Review the effectiveness of courses <ul style="list-style-type: none"> • Use questionnaires to collect opinions of the staff concerned • Check with the department-in-charge the progress of the staff concerned after receiving the training
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply the knowledge of quality management system and the quality management policy of the organization to formulate effective quality management courses, and review the courses effectively after implementation.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses a fair basis of quality management.

1. Title	Implement quality management standards of International Organization for Standardization (ISO)
2. Code	EMCUQM507A
3. Range	Apply ISO quality management standards in quality management work of electrical and mechanical services.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 ISO quality management standards ♦ Understand ISO 9000 Quality Management and Quality Assurance Standard Series, including the quality assurance system and management mechanism</p> <p>6.2 Implement ISO quality management standards ♦ Implement ISO 9000 Quality Management and Quality Assurance Standard Series, including:</p> <ul style="list-style-type: none"> • Quality management responsibilities of staff at different levels • Quality assurance system • Inspection mechanism • Document and information management mechanism • Procurement management mechanism • Work process audit mechanism • Improper works control and correction system • Quality record control system • Internal quality audit system
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement effectively ISO 9000 Quality Management and Quality Assurance Standard Series and review its effectiveness.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Master market situation of power generation, transmission and distribution network and formulate marketing plans
2. Code	EMELMS501A
3. Range	Applicable to marketing and sales of electrical works. Master the market situation of different levels of electricity generation, transmission and distribution network and associated installations, perform analysis and formulate marketing plans to enhance the market share and profits of the electrical installations or engineering services to be sold.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the market sales situation of electricity generation, transmission and distribution equipment</p> <ul style="list-style-type: none"> ◆ Understand the market sales situation of electricity generation, transmission and distribution equipment, such as the following: <ul style="list-style-type: none"> • Markets: the local market, Mainland market, each target overseas market, etc. • Market situations: Development potential of each target overseas market, marketing structure, current market leader, market life cycle, etc. <p>6.2 Formulate marketing plans according to the market sales situation of electricity generation, transmission and distribution equipment</p> <ul style="list-style-type: none"> ◆ Formulate effective and comprehensive marketing plans according to the market sales situation of electricity generation, transmission and distribution equipment: <ul style="list-style-type: none"> • Take care of the needs of various types of clients of different target markets in order to expand the market and attract new clients • Use “Relationship Marketing” to strengthen client’s loyalty to the electrical installations or engineering services provided • Formulate marketing portfolio • Master marketing and sales tools and formulate budgets according to the financial situation of the organization • Master the functions of exhibitions and formulate the exhibition strategy for overseas markets • Assess marketing results • Master the results and information of the marketing plans, and to develop future marketing strategy • Manage the comprehensive marketing plans to ensure they are in harmony and conduct assessment

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master market situation ; and (ii) Capable to formulate different marketing plans.
8. Remarks	

1. Title	Implement marketing and sales courses and training programmes
2. Code	EMELMS502A
3. Range	Applicable to the marketing and sales of electrical works. Implement marketing and sales courses and training programmes and encourage and enhance safety awareness of staff.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the measures and results of promoting marketing and sales courses and training programmes</p> <ul style="list-style-type: none"> ◆ Understand the measures and results of marketing and sales courses and training programmes, including: making use of the influence of corporate policy, leaflets, email, internet, product website, continuous staff training, merit assessment, performance incentives, extracurricular activities, etc. <p>6.2 Implement marketing and sales courses and training programmes</p> <ul style="list-style-type: none"> ◆ Formulate measures to promote training programmes to encourage staff to actively participate in marketing and sales courses and training programmes to enhance staff awareness of marketing and sales ◆ Implement marketing and sales courses and training programmes of the company, including arranging the following: venue, course scheduling, publicity, student recruitment, instructors of the course, etc.
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to implement marketing and sales courses and training programmes of the company.
8. Remarks	

1. Title	Formulate human resources strategy to enhance the quality of marketing staff
2. Code	EMELMS503A
3. Range	Applicable to the operation management of electrical works. Master marketing and sales technical human resources market supply situation in order to formulate marketing and sales human resources strategy and plans.
4. Level	5
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the market supply of marketing and sales technical human resources</p> <ul style="list-style-type: none"> ◆ Understand marketing and sales technical human resources market supply situation including: <ul style="list-style-type: none"> • Relevant human resources statistics • Market demand for relevant human resources • Price paid to retain competent staff ◆ Understand the quality of the marketing and sales staff of the company, including: <ul style="list-style-type: none"> • Sales staff's marketing knowledge • Sales staff's knowledge of engineering products or services • Sales staff's communication skills • Sales staff's interpersonal skills <p>6.2 Formulate human resources strategy and plans to enhance marketing staff quality</p> <ul style="list-style-type: none"> ◆ Follow corporate operational strategy to formulate marketing human resources strategy and plans to enhance marketing staff quality, including: <ul style="list-style-type: none"> • Manpower supply and demand of relevant markets • Assessing organization's demand for the number of marketing staff and team quality • Formulating the goals and plans of marketing manpower training • Formulating marketing manpower recruitment strategy and plans • Effectively managing the staff attrition problem
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master the manpower market supply situation and the quality of the marketing and sales staff of the organization; and</p> <p>(ii) Capable to formulate human resources strategy and plans to enhance the quality of marketing staff.</p>
8. Remarks	

1. Title	Use advanced and specialized techniques to support the marketing and sales management of integrated electrical works
2. Code	EMELMS504A
3. Range	Applicable to marketing and sales of electrical works. Use advanced and specialized techniques to support or enhance the marketing and sales efficiency and quality of electrical works.
4. Level	5
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced and specialized techniques for electrical works</p> <ul style="list-style-type: none"> ◆ Understand advanced and specialized quality management skills for electrical works such as: market positioning strategy, market development strategy, market capture strategy, marketing measures, etc. ◆ Understand the uses and strengths and weaknesses of common marketing and sales techniques <p>6.2 Use advanced and specialized techniques to support the marketing and sales management of electrical works as a whole</p> <ul style="list-style-type: none"> ◆ Use appropriate advanced and specialized techniques to formulate marketing and sales management solutions and improvement measures ◆ Use advanced and specialized techniques to support current marketing and sales management operations for electrical works including: market positioning strategy, market development strategy, market capture strategy, marketing measures, etc.
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: <ul style="list-style-type: none"> (i) Capable to the uses and strengths and weaknesses of master general marketing and sales techniques; and (ii) Capable to use advanced and specialized techniques to improve the current electrical equipment marketing and sales performance and quality.
8. Remarks	

**Competencies for Practitioners of
the Electrical Engineering Branch
in the Electrical & Mechanical Services
Industry**

Competency Level 6

1. Title	Use highly specialized technical skills to explore the conditions of existing power supply system for economic despatch and further improvement
2. Code	EMELDE601A
3. Range	Applicable to electrical work. Use highly specialized technical or scholastic skills to precisely analyze, critically review and consolidate evidence for the problems of power supply network to find out the most optimum operating points and areas that can be further improved in the existing system.
4. Level	6
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance effectiveness Requirements</u></p> <p>6.1 Understand the performance effectiveness and weaknesses of the existing power supply system</p> <ul style="list-style-type: none"> ◆ Understand the internal and external factors affecting the performance of the existing power supply system ◆ Understand the causes and effects of the internal and external factors ◆ Understand the weaknesses of the existing power supply system <p>6.2 Master highly specialized technical skills to find out the potential problems of the existing power supply system</p> <ul style="list-style-type: none"> ◆ Review the weaknesses of the existing power supply system, put forward items for study to improve the system performance ◆ Use highly specialized technical or scholastic skills across the area of power supply system design and application to precisely analyze, critically review and consolidate evidence for the potential problems in the power supply network to find out the best performance effectiveness and areas that can be improved in the existing system ◆ Use highly specialized technical skills to conduct an in-depth and thorough research in the structure, functions and management mechanism of the existing power supply system <p>6.3 Professionalism in using highly specialized technical skills to improve the effectiveness and safety performance of the existing power supply system</p> <ul style="list-style-type: none"> ◆ Use highly specialized technical skills to ensure that the existing power supply system is safe to use ◆ Follow the strict legal and professional requirements to improve the effectiveness and safety performance of the existing power supply system
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to master highly specialized technical skills to find out the weaknesses and potential problems of the existing power supply system put forward items for study to improve the system performance.
8. Remarks	

1. Title	Implement design project of large-scale power network
2. Code	EMELDE602A
3. Range	Applicable to the design management of large-scale electrical projects. Master all the terms and conditions in client's tender specifications, contract specifications, drawings, etc., and implement management of the design project of large-scale power network.
4. Level	6
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand all the requirements of client's tender specifications</p> <ul style="list-style-type: none"> ◆ Understand and master all the terms and conditions in tender specifications or contract specifications ◆ Critically analyze, consolidate and judge client's requirements for large-scale power network design, installation, testing, commissioning, quality management, etc. <p>6.2 Implement management of the design project of large-scale power network and associated installations</p> <ul style="list-style-type: none"> ◆ Implement design project management for large-scale power network and associated installations, formulate design management plan including manpower organizational chart, design specifications, project schedules, power network schematic diagrams, protection system schematic diagrams, the design project data and information filing management, etc. to achieve the greatest design cost-effectiveness ◆ Use assessment skills such as systems thinking problem analysis and decision-making techniques, skills to analyze potential problems, etc. to investigate the design project implemented <p>6.3 Professionalism in implementing large-scale power network design project</p> <ul style="list-style-type: none"> ◆ Use highly specialized technical skills to ensure that the design project of large-scale power network and associated installations is safe and reliable to use ◆ Follow the strict legal and professional requirements to improve the effectiveness and safety performance of the existing design project of the large-scale power network and associated installations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to critically analyze, consolidate and judge client's requirements for large-scale power network; and</p> <p>(ii) Capable to implement management of the design project of large-scale power network and associated installations.</p>
8. Remarks	

1. Title	Lead and supervise the design project
2. Code	EMELDE603A
3. Range	Applicable to the design management of large-scale electrical works. Master the design project requirements for large-scale power supply system and associated installations; formulate project schedules; lead and supervise the whole design project.
4. Level	6
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points and processes of large-scale power supply system design management</p> <ul style="list-style-type: none"> ◆ Understand the key points, implementation skills and supervision process of large-scale power supply system design management <p>6.2 Lead the design management of large-scale engineering projects to achieve the performance indicators designed for the system</p> <ul style="list-style-type: none"> ◆ Lead the management of the design project of large-scale electrical installations, including resources analysis, organizing design project management and supervision teams, formulating design management and supervision plans, formulating project monitoring system, etc. ◆ Master design management of large-scale projects; facilitate, coordinate and supervise the design project according to project schedule to achieve the performance indicators designed for the system <p>6.3 Professionalism in using highly specialized skills in managing design projects</p> <ul style="list-style-type: none"> ◆ Follow strict legal and professional requirements to lead and supervise the design project to achieve the effectiveness and safe performance indicators designed
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to lead the design management for large-scale power supply installations project; and (ii) Capable to facilitate, coordinate and supervise the design project until it completes in order to achieve the performance indicators designed for the system.
8. Remarks	

1. Title	Conform to regulations of different places that have impact on electricity projects to perform power supply network design works
2. Code	EMELDE604A
3. Range	Applicable to electrical work. Master the details of regulations of different places that have impact on electricity projects, and conform to those regulations when performing power supply network design works.
4. Level	6
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand legal requirements of different places that have impact on electricity projects</p> <ul style="list-style-type: none"> ◆ Understand regulations of different places that have impact on power facilities projects, such as electricity regulations, electricity supplier's power of operation, electrical equipment method and standards, rules for installation, environmental protection requirements, etc. ◆ Assess the legal requirements and their impact on power supply network design works <p>6.2 Conform to regulations of different places that have impact on electricity projects to implement the design of large-scale power network</p> <ul style="list-style-type: none"> ◆ Conform to regulations of different places that have impact on electricity projects to implement the design of large-scale power network ◆ Base on legal requirements of different places to review and improve the functions, business operation and performance of the power supply system
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to conform to regulations of different places that have impact on electricity projects to implement the design of large-scale power network.
8. Remarks	

1. Title	Lead the design renovation of large-scale power supply system installations
2. Code	EMELDE606A
3. Range	Applicable to large-scale electrical engineering design. Lead the design renovation of large-scale power supply systems and associated installations.
4. Level	6
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand advanced technologies and performance indicators for large-scale power supply system installations</p> <ul style="list-style-type: none"> ◆ Understand advanced technologies and performance indicators for large-scale power supply system installations such as power supply systems stability, automation, intelligent protection system, high voltage DC transmission, etc. <p>6.2 Lead the design renovation of large-scale power supply systems and associated installations</p> <ul style="list-style-type: none"> ◆ Master innovative design ideas for large-scale power supply systems and associated installations to enhance or renovate the power supply performance of the existing power supply system such as the stability, automation, intelligent protection system, and high voltage DC transmission of large-scale power supply system ◆ Lead and organise design renovation team and set the goal for power supply system performance ◆ Lead the design renovation work and monitor the results at each stage <p>6.3 Professionalism in leading the design renovation of large-scale power supply systems and associated installations</p> <ul style="list-style-type: none"> ◆ Follow the strict legal and professional requirements to renovate the effectiveness and safety performance of the existing large-scale power network and associated installation design
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master advanced technologies and innovative design ideas for large-scale power supply system installations; and</p> <p>(ii) Capable to lead and organize design renovation team.</p>
8. Remarks	

1. Title	Use engineering software to identify areas that need to be improved in the power supply network
2. Code	EMELDE607A
3. Range	Applicable to electrical work. Use various types of engineering application software to identify power supply network weaknesses or inadequacy to enhance power supply network reliability and stability for achieving system design effectiveness.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the characteristics of power supply network performance</p> <ul style="list-style-type: none"> ◆ Understand the characteristics and data of power supply network performance <p>6.2 Use various types of engineering application software to identify power supply network inadequacy</p> <ul style="list-style-type: none"> ◆ Use various types of engineering application software to repeatedly simulate and actually test the blind spots and constraints in the power supply network performance; to identify power supply network weaknesses or inadequacy such as potential overload sections, protection blind spots, unstable points, etc. to achieve the purpose of improving the power supply network system design ◆ Use engineering application software to enhance the work efficiency of power supply network design, installation, inspection, testing and commissioning, operation, repair and maintenance, project management, operation management, quality management, marketing and sales, occupational health, safety and environmental protection, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use various types of engineering application software to identify the inadequacy of power supply network; and</p> <p>(ii) Capable to use engineering application software to enhance the work efficiency in specified areas of power supply network.</p>
8. Remarks	

1. Title	Consolidate and calculate power supply network data
2. Code	EMELDE608A
3. Range	Applicable to electrical work. Critically assess and consolidate different power supply network or equipment data and do the calculations at different stages of the engineering project to assess the power supply network equipment performance.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the methods of obtaining the performance data for various types of power network</p> <ul style="list-style-type: none"> ◆ Understand the methods of obtaining the performance data and calculation techniques for various types of power network <p>6.2 Consolidate and calculate power supply network data</p> <ul style="list-style-type: none"> ◆ Critically assess and consolidate different power supply network or equipment data and do the calculations at different stages of the engineering project to assess the power supply network equipment performance ◆ Assess power supply network equipment performance data to enhance the work efficiency of power supply network design, installation, inspection, testing and commissioning, operation, repair and maintenance, project management, operation management, quality management, marketing and sales, occupational health, safety and environmental protection, etc.
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to assess performance data for various types of power supply network equipment; and (ii) Capable to use system performance data to enhance the work efficiency in specified areas of power supply network.
8. Remarks	

1. Title	Implement engineering project management for large-scale power network
2. Code	EMELIN601A
3. Range	Applicable to the engineering management of large-scale electrical projects. Master all the terms and conditions in client's tender specifications, drawings, etc., and implement management of the installation project of large-scale power network.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand all the client's requirements</p> <ul style="list-style-type: none"> ◆ Analyze, consolidate and judge client's requirements for large-scale power network design and installation in order to master all the terms and conditions in tender specifications <p>6.2 Implement engineering project management for large-scale power network and associated installations</p> <ul style="list-style-type: none"> ◆ Implement engineering project management for large-scale power network and associated installations, formulate engineering management plan including manpower organizational chart, project schedules, logistic management, management of items not complying to the rules, installation project filing management, work site management and reporting mechanism, etc. to achieve the greatest installation cost-effectiveness <p>6.3 Professionalism in implementing engineering project management for large-scale power network</p> <ul style="list-style-type: none"> ◆ Ensure that the installation project of large-scale power network and associated installations is safe and reliable to use ◆ Follow the strict legal and professional requirements to implement the installation project of large-scale power network and associated installations in order to achieve the effectiveness and safety performance indicators designed
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master all the contract requirements for the installation project of large-scale power network and associated installations; and</p> <p>(ii) Capable to implement engineering project management for large-scale power network and associated installations.</p>
8. Remarks	

1. Title	Lead and supervise the installation project
2. Code	EMELIN602A
3. Range	Applicable to the installation management of large-scale electrical works. Master the installation project requirements for large-scale power supply system and associated installations; formulate project schedules; lead and supervise the whole installation project.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points and processes of large-scale power supply system installation management project</p> <ul style="list-style-type: none"> ◆ Understand the key points, implementation skills and supervision process of large-scale power supply system installation management project <p>6.2 Lead the installation management for large-scale engineering project to achieve the performance indicators designed for the system</p> <ul style="list-style-type: none"> ◆ Lead the management of the installation project of large-scale electrical installations, including organizing installation project management and supervision teams, formulating installation management and supervision plans, formulating project monitoring system, etc. ◆ Facilitate, coordinate and supervise every management detail for the installation project according to project schedule to achieve the performance indicators designed for the system <p>6.3 Professionalism in leading and supervising large-scale installation projects</p> <ul style="list-style-type: none"> ◆ Follow strict legal and professional requirements to implement the installation of large-scale power network and associated installations to achieve the effectiveness and safe performance indicators designed
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to lead the installation management for large-scale power supply installations project; and</p> <p>(ii) Capable to facilitate, coordinate and supervise the installation project in order to achieve the effectiveness and safe performance indicators designed.</p>
8. Remarks	

1. Title	Inspect, test and commission large-scale power network
2. Code	EMELIT601A
3. Range	Applicable to the inspection, testing and commissioning of large-scale power network projects. Master all the terms and conditions in client's tender specifications, drawings, etc., and implement management of the inspection, testing and commissioning project of large-scale power network.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand all the client's requirements</p> <ul style="list-style-type: none"> ◆ Analyze, consolidate and judge client's requirements for large-scale power network design, inspection, testing and commissioning in order to master all the terms and conditions in tender specifications <p>6.2 Implement inspection, testing and commissioning of large-scale power network and associated installations</p> <ul style="list-style-type: none"> ◆ Implement inspection, testing and commissioning of large-scale power network and installations, formulate inspection, testing and commissioning plan including manpower organizational chart, specifications and criteria for inspection, testing and commissioning, project schedules, protection schematic diagrams, the design project data and information filing management, etc. to achieve the greatest design cost-effectiveness <p>6.3 Professionalism in inspecting, testing and commissioning large-scale power network</p> <ul style="list-style-type: none"> ◆ Ensure that the inspection, testing and commissioning project of large-scale power network and installations is safe and reliable to use ◆ Follow the strict legal and professional requirements to implement inspection, testing and commissioning for large-scale power network and installations in order to achieve the effectiveness and safety performance indicators designed
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master all the contract requirements for large-scale power network; and (ii) Capable to implement inspection, testing and commissioning management for the project of large-scale power network and installations.
8. Remarks	

1. Title	Lead and supervise the inspection, testing and commissioning project
2. Code	EMELIT602A
3. Range	Applicable to the inspection, testing and commissioning of electrical works. Master the inspection, testing and commissioning project requirements, formulate project schedules, and lead and supervise the inspection, testing and commissioning for the whole project of large-scale power supply system.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points and processes of large-scale power supply system inspection, testing and commissioning</p> <ul style="list-style-type: none"> ◆ Understand the key points, implementation skills and supervision process of large-scale power supply system inspection, testing and commissioning <p>6.2 Lead the inspection, testing and commissioning for large-scale engineering project to achieve the performance indicators designed for the system</p> <ul style="list-style-type: none"> ◆ Lead the inspection, testing and commissioning of large-scale electrical installations, including organizing inspection, testing and commissioning management teams, formulating project schedule, formulating inspection, testing and commissioning management plan, formulating commissioning monitoring system, commissioning guidelines and failure follow-up mechanism, etc. ◆ Master inspection, testing and commissioning management of large-scale projects; facilitate, coordinate and supervise the inspection, testing and commissioning of every engineering item of the large-scale project according to project schedule to achieve the performance indicators designed for the system <p>6.3 Professionalism in inspecting, testing and commissioning large-scale power supply systems</p> <ul style="list-style-type: none"> ◆ Follow strict legal and professional requirements to implement inspection, testing and commissioning of large-scale power network and associated installations to achieve the effectiveness and safe performance indicators designed
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to lead the inspection, testing and commissioning management for large-scale power supply installations project; and</p> <p>(ii) Capable to facilitate, coordinate and supervise inspection, testing and commissioning of large-scale power supply installations project in order to achieve the effectiveness and safe performance indicators designed.</p>
8. Remarks	

1. Title	Formulate strategy of operation, repair and maintenance management for large-scale power network
2. Code	EMELOR601A
3. Range	Applicable to large-scale electrical project operation, repair and maintenance management. Master all the terms and conditions in client's tender specifications, drawings, etc., and formulate strategy of operation, repair and maintenance management for large-scale power network and associated installations.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand client's requirements and market environment information</p> <ul style="list-style-type: none"> ◆ Analyze, consolidate and judge client's requirements on operation, repair and maintenance of large-scale power network, all the terms in tender specifications for operation, repair and maintenance of large-scale power network, so as to master client's requirements and market environment information including market standard, relevant regulations, etc. <p>6.2 Formulate strategy of operation, repair and maintenance management for large-scale power network</p> <ul style="list-style-type: none"> ◆ Base on client's requirements and market environment information to formulate strategy of operation, repair and maintenance management for large-scale power network including using efficient and maintenance-free power network equipment strategy, operation, repair and maintenance staff training strategy, corporate strategy for outsourcing the large-scale power network operation, repair and maintenance management, etc. to achieve the greatest cost-effectiveness <p>6.3 Professionalism in formulating strategy of operation, repair and maintenance management for large-scale power network</p> <ul style="list-style-type: none"> ◆ Follow the strict legal and professional requirements to implement operation, repair and maintenance management of large-scale power network and associated installations in order to achieve the designed effectiveness and safety performance indicators
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master client's requirements on large-scale power network operation, repair and maintenance; and</p> <p>(ii) Capable to formulate strategy of operation, repair and maintenance management for large-scale power network.</p>
8. Remarks	

1. Title	Lead and supervise the operation, repair and maintenance project
2. Code	EMELOR602A
3. Range	Applicable to the operation, repair and maintenance management of electrical works. Master the operation, repair and maintenance project requirements, formulate project schedules, and lead and supervise the operation, repair and maintenance for the whole project of large-scale power supply system and associated installations.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points and processes of large-scale power supply system operation, repair and maintenance</p> <ul style="list-style-type: none"> ◆ Understand the key points, implementation skills and supervision process of large-scale power supply system operation, repair and maintenance <p>6.2 Lead the operation, repair and maintenance management of large-scale engineering project</p> <ul style="list-style-type: none"> ◆ Lead the operation, repair and maintenance management of large-scale electrical installations project, including organizing operation, repair and maintenance management teams, formulating operation, repair and maintenance management plan, formulating project monitoring system, checklist on materials and equipment related to operation, repair and maintenance, logistic management system for materials and equipment, etc. ◆ Master operation, repair and maintenance management of large-scale projects; facilitate, coordinate and supervise the operation, repair and maintenance of every engineering item of the project according to project schedule until it completes <p>6.3 Professionalism in operating, repairing and maintaining large-scale engineering project</p> <ul style="list-style-type: none"> ◆ Follow strict legal and professional requirements to implement operation, repair and maintenance management for large-scale power network and associated installations to achieve the effectiveness and safe performance indicators designed
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to lead the operation, repair and maintenance management for large-scale power supply installations project; and</p> <p>(ii) Capable to facilitate, coordinate and supervise operation, repair and maintenance management of large-scale power supply installations project in order to achieve the effectiveness and safe performance indicators designed.</p>
8. Remarks	

1. Title	Apply project management skills and professional knowledge to handle unfulfilled or unperformed contracts effectively
2. Code	EMCUPM601A
3. Range	Use professional knowledge to analyze the reasons and impact of non-fulfillment or non-performance of project contracts, as far as electrical and mechanical project management is concerned, and apply project management knowledge and skills to handle these contracts effectively.
4. Level	6
5. Credit	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Reasons for non-fulfillment or non-performance of contract</p> <ul style="list-style-type: none"> ◆ Use professional knowledge and knowledge of engineering environment to analyze the reasons of non-fulfilment or non-performance of project contracts by considering the following factors: <ul style="list-style-type: none"> • Technical concerns • Cost effectiveness • Change in project environment • Political, social and legal concerns • Contractor-related concerns <p>6.2 Handle unfulfilled or unperformed project contracts</p> <ul style="list-style-type: none"> ◆ Consider all solutions according to the above concerns, and calculate the costs and price for each solution ◆ Identify the most beneficiary solution to both sides and draft details of the solution ◆ Base on the drafted solution to negotiate with the contractor in order to come up with a solution accepted by both sides ◆ Know which part of the contract is unfulfilled or unperformed, and arrange to call for tender for that part again ◆ Be capable to provide sufficient and clear information should legal actions are required to solve the contract issues
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply project management skills and professional knowledge to handle unfulfilled or unperformed project contracts, draft solutions effectively and calculate costs and prices for the solutions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of engineering business management.

1. Title	Formulate marketing and bidding strategies for electrical installations
2. Code	EMELPM601A
3. Range	Applicable to project management and marketing of large-scale electrical works. Master all the terms and conditions, contract details, drawings, etc. in client's tender specifications; consolidate and compare with competitors the electrical equipment or services to be sold by the company in order to formulate marketing and tender bidding strategy.
4. Level	6
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand all the details in client's tender specifications and the market situation</p> <ul style="list-style-type: none"> ◆ Understand all the terms and conditions, contract details, drawings, etc. in client's tender specifications ◆ Understand different market situations such as futures prices of materials in the market, delivery time, trends of interest rate and foreign exchange rates, etc. information <p>6.2 Formulate marketing and tender bidding strategy</p> <ul style="list-style-type: none"> ◆ Build up communication channels for different walks of life and obtain first-hand or second-hand information and conduct analysis. Communication channels include: internal market research unit of the organization, business marketing consultant, personal human network, etc. ◆ Analyze, judge, consolidate and compare with competitors the electrical equipment or services to be sold by the organization ◆ Formulate marketing and bidding strategies for electrical installations ◆ Make timely modifications to the marketing and bidding strategies for electrical installations formulated by the organization in order to enhance the profitability of the organization
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to collect information and implement effective communication, find suitable targets and obtain first-hand or second-hand information; and</p> <p>(ii) Capable to master the tender specifications, market situation information and the competitiveness of the products of the organization and formulate marketing and bidding strategies for electrical installations.</p>
8. Remarks	

1. Title	Implement project management for large-scale power networks
2. Code	EMELPM602A
3. Range	Applicable to project management of large-scale electrical works. Master all the terms and conditions, contract details, drawings, etc. in client's tender specifications to lead the project management of large-scale power network and associated installations.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand all client's requirements</p> <ul style="list-style-type: none"> ◆ Analyze, consolidate, expand and judge client's various requirements for large-scale power network on design, installation, testing and commissioning, occupational safety, health and environmental protection , operation, repair and maintenance, quality management, etc., and master all the terms and conditions of tender specifications or contract details <p>6.2 Lead the project management of large-scale power network and associated installations</p> <ul style="list-style-type: none"> ◆ Lead the project management of large-scale power network and associated installations , formulate project management plans for the design, installation, inspection, testing and commissioning, operation, repair and maintenance of large-scale power network including: project cost management, project procurement management, project quality management, project human resources management, project risk management, etc. to maximize cost-effectiveness of the project <p>6.3 Professionalism in implementing large-scale power network project management</p> <ul style="list-style-type: none"> ◆ Ensure that the large-scale power network system and associated installations are safe to use ◆ Follow strict legal and professional requirements to implement the project management of large-scale power network and associated installations to achieve the effectiveness designed and safe performance indicators
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master all the client's requirements for large-scale power network; and</p> <p>(ii) Capable to implement the project management of large-scale power network and associated installations.</p>
8. Remarks	

1. Title	Formulate material procurement specifications and strategy
2. Code	EMELPM603A
3. Range	Applicable to project management of electrical works. Master all the terms and conditions, contract details, drawings, etc. in client's tender specifications to formulate project material procurement specifications documents, contract details and delivery schedule; and master information on materials to be procured or services out-sourced, such as market prices, futures prices, delivery time, etc.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand all client's requirements on procurement of materials and equipment</p> <ul style="list-style-type: none"> ◆ Analyze, consolidate and judge all the specifications conditions, contract details, drawings, etc. in client's tender specifications for the procurement of materials and equipment <p>6.2 Formulate material procurement specifications and strategy</p> <ul style="list-style-type: none"> ◆ Master information on materials to be procured or services out-sourced, such as market prices, futures prices, delivery time, etc. ◆ Formulate materials and equipment procurement specifications documents, contract details and delivery schedule ◆ Master market prices and information on suppliers and formulate materials and equipment procurement strategies such as: procurement negotiation strategy , logistic support strategy, risk management strategy, etc. to maximize cost-effectiveness ◆ Make timely modifications to the electrical installation material procurement strategy formulated by the organization in order to enhance the profitability of the organization
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master client's various requirements for the procurement of materials and equipment; and</p> <p>(ii) Capable to consolidate different, inconsistent and incomplete data to formulate project material procurement specifications and strategy.</p>
8. Remarks	

1. Title	Formulate tender bidding strategy and risk management plan
2. Code	EMELPM604A
3. Range	Applicable to project management of electrical works. Analyze the cash flow of the organization, market supply situation for relevant human resources, business regulations requirements, etc. and formulate individual tender bidding strategies and risk management plans.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the business operation and conditions for tender bidding of the organization</p> <ul style="list-style-type: none"> ◆ Follow client’s tender requirements, specifications conditions, details of business regulations requirements, etc. and master the business operation and conditions for tender bidding of the organization, including cash flow analysis, market supply situation for relevant human resources , business regulations requirements, etc. <p>6.2 Formulate individual tender bidding strategies and risk management plan</p> <ul style="list-style-type: none"> ◆ Master relevant information such as the market prices of materials and equipment, human resources market supply situation, internal return analysis, etc. and formulate individual engineering project risk management plans ◆ Formulate individual tender bidding strategies according to the consolidated risk analysis results for individual tender specifications to ensure winning the tenders by taking bearable risk ◆ Make timely modifications to the electrical installation project tender bidding strategy formulated by the organization
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master client’s tender requirements, details of business regulations requirements, etc.;</p> <p>(ii) Capable to formulate tender bidding strategy according to the consolidated risk analysis results for individual tender specifications; and</p> <p>(iii) Capable to formulate individual engineering project risk management plans according to the business operation and conditions for tender bidding of the organization.</p>
8. Remarks	

1. Title	Lead and supervise project management of large-scale electrical works
2. Code	EMELPM605A
3. Range	Applicable to project management of large-scale electrical works. Master project management requirements for large-scale electricity supply systems and associated installations; formulate project schedules; lead and supervise major work processes of large-scale engineering projects.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points and processes of large-scale electricity supply system project management</p> <ul style="list-style-type: none"> ◆ Understand the key points and processes of large-scale electricity supply system project management and implement technical and supervision processes <p>6.2 Lead project management of large-scale engineering projects</p> <ul style="list-style-type: none"> ◆ Master the requirements for the project management of large-scale electricity supply systems and associated installations, and formulate project schedule ◆ Lead the implementation of project management of large-scale electrical installations, including: organizing project management teams, formulating project management plans and schedules, formulating project monitoring system, formulating checklists for delivery of materials and equipment and schedules, logistic management system for materials and equipment, project commissioning mechanism upon completion, etc. ◆ Master project management of large-scale projects; facilitate, coordinate and supervise project management in every issue of the project according to project schedule to achieve the performance indicators designed for the system <p>6.3 Professionalism in leading project management of large-scale engineering projects</p> <ul style="list-style-type: none"> ◆ Ensure that large-scale power network system and associated installations are safe to use ◆ Follow strict legal and professional requirements to implement project management of large-scale power network and associated installations to achieve the effectiveness and safe performance indicators designed
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to lead project management of large-scale electricity supply system and associated installation works; and</p> <p>(ii) Capable to facilitate, coordinate and supervise project management of large-scale electricity supply system and associated installation works to achieve the effectiveness and safe performance indicators designed.</p>
8. Remarks	

1. Title	Master tender specifications and follow tender bidding strategy to charge additional engineering fees
2. Code	EMELPM606A
3. Range	Applicable to project management of electrical works. Master details of tender specifications and the prices of different levels of electrical equipment or services to be sold; follow corporate tender bidding strategy to charge additional engineering fees for documents on additional project items or alterations omitted by the client.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand apparent or potential omissions and loopholes in the tender specifications and the tender bidding strategy for the project</p> <ul style="list-style-type: none"> ◆ Understand apparent or potential omissions and loopholes in the tender specifications ◆ Understand the key points for target returns set by the tender bidding strategy <p>6.2 Manage the operation of individual engineering projects in order to maximize the return</p> <ul style="list-style-type: none"> ◆ Follow project operation strategy and master apparent or potential omissions and loopholes in the tender specifications , opportunities and work progress in order to maximize the return ◆ Obtain and enlarge the number of additional works and assess the charged amount in figures ◆ Master the charged amount in figures for work delays ◆ Master the charged amount in figures for work damages and situations resulted ◆ Master additional administrative works, etc. ◆ Follow professional project management requirements to build up the project management file system ◆ Use project management file system to record documents for charging additional engineering fees, including: client's works orders, log book, additional works record (relevant contract specifications and incidents)and quotations, work delay record (relevant contract specifications and incidents) and quotations, work damage record (relevant contract specifications and incidents) and quotations, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use apparent or potential omissions and loopholes in the tender specifications in order to follow the tender bidding strategy for the project;</p> <p>(ii) Capable to master the status of project operation in order to maximize the return; and</p> <p>(iii) Capable to build up project management file system to properly prepare document records for charging additional engineering fees.</p>
8. Remarks	

1. Title	Master tender specifications and market competition information and formulate operation management strategy
2. Code	EMELOM601A
3. Range	Applicable to the operation management of electrical works. Master all the terms and conditions, contract details, drawings, etc. of tender specifications from a number of clients, as well as information on electrical equipment or services to be sold by the organization and on competitors in order to formulate different marketing strategies and after-sales service operation management strategies.
4. Level	6
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand details of tender specifications from a number of clients and competitors' information</p> <ul style="list-style-type: none"> ◆ Understand all the terms and conditions of tender specifications, contract details, drawings, etc. from a number of clients ◆ Understand competitors' information such as: different levels of market prices, delivery time, etc. <p>6.2 Formulate appropriate operation management strategy for marketing and after-sales service of electrical installations</p> <ul style="list-style-type: none"> ◆ Consolidate the details of tender specifications from a number of clients to assist in formulating appropriate after-sales service operation management strategy, including the following issues: charging system for specified and non-specified after-sales service items, after-sales service operation management system and the synergy effect, etc. ◆ Master the information such as the strengths and weaknesses, after-sales service, market prices, delivery time, etc. of the electrical equipment sold by the organization and competitors; formulate marketing and after-sales service operation management strategy, including the following issues: tender submission strategy, synergy effect of works operation contracts, after-sales service operation centre and service network, operation issues for target market identification and new market development projects, etc. ◆ Make timely modifications to the operation management strategy for marketing and after-sales service of electrical installations formulated by the organization to enhance the profitability of the organization
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to base on market information to formulate an operation management plan for marketing and after-sales service.
8. Remarks	

1. Title	Master the operation of the organization and allocate resources to match the workflow
2. Code	EMELOM602A
3. Range	Applicable to the operation management of electrical works. Master the operation for all kinds of resources of the organization and allocate properly the resources of technical staff, materials, tools, instruments, etc. to match the operation and process flow of every engineering project.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the operation for all kinds of resources of the organization ♦ Understand the operation for all kinds of resources of the organization including their utilization, update, replenishment and synergy, etc.</p> <p>6.2 Allocate resources to match the workflow ♦ Timely and properly allocate resources of technical staff, materials, tools, instruments, etc. according to the project needs to match the operation and process flow of every engineering project, ensuring that the operation of project is smooth and has synergy effect</p>
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to master the operation for all kinds of resources of the organization; and (ii) Capable to effectively allocate all kinds of resources to make the operation of project smooth.
8. Remarks	

1. Title	Master the holistic business environment and formulate corporate business development strategy of the organization
2. Code	EMELOM603A
3. Range	Applicable to the operation management of electrical works. Critically analyze consolidate, expand and judge the holistic business environment of different areas; and formulate corporate business development strategy of the organization.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the holistic business environment of different areas</p> <ul style="list-style-type: none"> ◆ Understand the holistic business environment of different areas including: market size, market development potential, overall market value, number of competitors in the market, etc. <p>6.2 Formulate corporate business development strategy of the organization</p> <ul style="list-style-type: none"> ◆ Formulate corporate business development strategy of the organization according to the analyses of the business environment of different areas and the strengths and weaknesses of the organization ◆ Make timely modifications to the business development strategy of the organization formulated according to the requirements for professional accountability of decision-making so as to enhance the profitability of the electrical projects
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to formulate corporate business development strategy of the organization according to the holistic business environment of different areas.
8. Remarks	

1. Title	Master the requirements of different tender specifications and formulate an integrated material procurement strategy
2. Code	EMELOM604A
3. Range	Applicable to the operation management of electrical works. Master operation tender contracts for different clients and all the terms and conditions, contract details, drawings, etc. of every contract in order to formulate an integrated material procurement strategy of the organization.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand all the contract requirements of different clients on material procurement, market prices information and materials delivery schedule</p> <ul style="list-style-type: none"> ◆ Understand the specifications conditions, contract details, drawings, etc. for the procurement of materials and equipment listed in client’s tender contracts ◆ Understand market prices, information on suppliers, and information such as different levels of market prices, futures prices, delivery time, etc. for materials or outsourcing services ◆ Understand delivery schedules for materials and equipment of every engineering project <p>6.2 Formulate an integrated material procurement strategy of the organization</p> <ul style="list-style-type: none"> ◆ Formulate an integrated material procurement strategy of the organization, such as procurement negotiation strategy, logistic support strategy, risk management strategy, etc. to maximize the cost-effectiveness of operation management ◆ Make timely modifications to the electrical installation material procurement strategy in order to enhance the profitability of the organization
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master all the contract requirements of different clients on procurement of materials and equipment; and</p> <p>(ii) Capable to formulate an integrated material procurement strategy of the organization according to contract requirements of different clients.</p>
8. Remarks	

1. Title	Decide on and implement different tender bidding strategies
2. Code	EMELOM605A
3. Range	Applicable to the operation management of electrical works. Master risk and return analysis for different tender bidding projects. Decide on and accurately implement different tender bidding strategies for different tender bidding projects.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand risk and return analysis for different tender bidding projects</p> <ul style="list-style-type: none"> ◆ Follow long-term or short-term operation goals of the company to decide on different tender bidding projects according to project risk and return analyses <p>6.2 Decide on and accurately implement different tender bidding strategies for different tender bidding projects</p> <ul style="list-style-type: none"> ◆ Formulate appropriate tender bidding strategies for different tender bidding projects ◆ Implement different tender bidding strategies for different tender bidding projects according to internal operation of the company ◆ Make timely modifications to the tender bidding strategies for electrical installation projects to enhance the profitability of the organization
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to formulate appropriate tender bidding strategies for different tender bidding projects according to project risk and return analyses; and</p> <p>(ii) Capable to implement different tender bidding strategies for different tender bidding projects according to internal operation of the company.</p>
8. Remarks	

1. Title	Lead and supervise operation management of concurrent large-scale electricity supply system projects
2. Code	EMELOM607A
3. Range	Applicable to the operation management of electrical works. Review, analyze, assess, judge, make final decisions, and lead and supervise the processes of operation of a number of large-scale electricity supply systems and associated installations.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand key points and processes of large-scale electricity supply system operation management</p> <ul style="list-style-type: none"> ◆ Understand the key points and processes of large-scale electricity supply system operation management and implement technical and supervision processes <p>6.2 Lead and supervise a number of large-scale operation management projects</p> <ul style="list-style-type: none"> ◆ Review, analyze, assess, judge, make final decisions, and lead and supervise the processes of operation of a number of large-scale electricity supply systems and associated installations ◆ Correct the errors or deviations in the operation of large-scale electrical projects ◆ Follow strict legal and professional requirements to lead and supervise operation management of a number of large-scale electricity supply system projects to ensure that the large-scale power network system and associated installations achieve the effectiveness and profit indicators designed
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to lead and supervise operation management of a number of large-scale electricity supply system projects ; and</p> <p>(ii) Capable to correct the errors or deviations in the operation of large-scale electrical projects.</p>
8. Remarks	

1. Title	Formulate operation strategies and make arrangements for charging additional engineering fees
2. Code	EMELOM608A
3. Range	Applicable to the operation management of electrical works. Master and judge errors, omissions and alterations, etc. of engineering contracts; formulate operation strategies and make arrangements for charging additional engineering fees for client's omissions
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master apparent or potential omissions and loopholes in engineering contracts</p> <ul style="list-style-type: none"> ◆ Master apparent or potential omissions and loopholes in engineering contracts <p>6.2 Follow the long-term or short-term goals of the company to formulate operation strategies and make arrangements for charging additional engineering fees</p> <ul style="list-style-type: none"> ◆ Follow the long-term or short-term goals of the company to formulate operation strategies for different engineering contracts ◆ Make arrangements for charging additional engineering fees client's errors, loopholes and alterations according to project management document file records ◆ Use appropriate negotiation techniques to achieve the purpose of charging additional engineering fees ◆ Make timely modifications to the operation management strategies of electrical installation projects to enhance the profitability of the organization ◆ Make arrangements for charging additional engineering fees for apparent or potential omissions and loopholes in engineering contracts according to the professional operation management requirements to enhance the profitability of the project
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to master apparent or potential omissions and loopholes in engineering contracts and formulate operation strategies ; and</p> <p>(ii) Capable to use appropriate negotiation techniques to achieve the purpose of charging additional engineering fees.</p>
8. Remarks	

1. Title	Formulate overall safety, health and environmental protection policy	
2. Code	EMCUSH601A	
3. Range	Master comprehensive knowledge and techniques of safety, health and environmental protection; review comprehensively the organization's safety, health and environmental protection management system; and formulate a forward-looking, overall safety, health and environmental protection policy and management system.	
4. Level	6	
5. Credit	20	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Overall safety, health and environmental protection policy and management system of the organization</p> <ul style="list-style-type: none"> ◆ Understand the safety, health and environmental protection management system and policy goals of the organization, including: <ul style="list-style-type: none"> • Long-term and short-term goals • Measurement of performance • Management system • Review mechanism <p>6.2 Overall safety, health and environmental protection policy of the organization</p> <ul style="list-style-type: none"> ◆ Formulate long-term and short-term goals for the overall safety, health and environmental protection policy <ul style="list-style-type: none"> • Draw the experience of other organizations that have won safety, health and environmental protection awards, and formulate forward-looking, long-term and short-term goals for the overall safety, health and environmental protection management ◆ Identify the deviations between safety, health and environmental protection management goals and current performance <ul style="list-style-type: none"> • Identify and confirm the deviations between safety, health and environmental protection management goals and current performance of the organizational management system, including the items and operating mode 	

	<ul style="list-style-type: none"> ◆ Formulate and implement safety, health and environmental protection management policy <ul style="list-style-type: none"> • Analyze deviations between safety, health and environmental protection goals and current system performance, staff's awareness of safety, health and environmental protection, and formulate an overall safety, health and environmental protection management policy, including: <ul style="list-style-type: none"> ▸ Safety, health and environmental protection policy ▸ Long-term and short-term goals for safety, health and environmental protection ▸ Resources arrangement for implementation of the safety, health and environmental protection policy and performance review ▸ Operating mode of the management system for the safety, health and environmental protection policy ▸ Measurement of performance of the safety, health and environmental protection management system ▸ Review mechanism ▸ Improvement mechanism ▸ Communication channels
7. Assessment 'Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to identify the deviations between safety, health and environmental protection goals and current performance of the organization according to activities and nature of the organization; and (ii) Capable to formulate a forward-looking safety, health and environmental protection management policy and system according to deviations identified and other factors of consideration, and review its performance and make modifications after implementation.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.</p>

1. Title	Formulate improvement plans for occupational safety and health	
2. Code	EMCUSH602A	
3. Range	Formulate improvement plans for working procedures and mechanical protection and systems that do not comply with the safety and health management standards, and to do so continuously according to views and recommendations generated after the reviews on safety and health policy and management system.	
4. Level	6	
5. Credit	20	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Occupational safety and health policy and management system</p> <ul style="list-style-type: none"> ◆ Understand the occupational safety and health policy and management system of the enterprise, such as: <ul style="list-style-type: none"> • Work safety and health pledge made by the enterprise and its safety policy • Framework for the implementation of the work safety and health pledge • Staff trained with the knowledge of working safely in conditions not hazardous to their health • Internal safety regulations to attain the goal of safety management • Identify dangers and conduct remedial inspection schemes accordingly on a regular basis or as deemed necessary • Identify potential dangers to workers and work out plans to deal with these dangers • Safety committee • Enhance, develop and maintain the awareness of safety and health at work site <p>6.2 Improvement plans for occupational safety and health</p> <ul style="list-style-type: none"> ◆ Formulate improvement plans for working procedures and mechanical protection and systems that do not comply with the safety and health management standards <ul style="list-style-type: none"> • Formulate improvement plans which include the goals, operating modes, training, implementation and monitoring, according to the investigation as well as the safety and health audit results; and formulate improvement plans for system management with respect to the overall system, financial estimates, performance measurement and review, workflow and schedule of implementation 	

	<ul style="list-style-type: none"> ◆ Formulate improvement plans according to views and recommendations generated after the reviews on safety and health policy and management system <ul style="list-style-type: none"> • Identify and confirm items or operating mode of the system that need to be improved according to views and recommendations generated after the reviews on safety and health policy and management system • Formulate an overall management system improvement plan for items or operating mode of the system that need to be improved ◆ Formulate improvement plans for the occupational safety and health management system for benchmarking enhancement <ul style="list-style-type: none"> • Identify and confirm items or operating mode of the system that need to be improved for benchmarking enhancement • Formulate an overall management system improvement plan for items or operating mode of the system that need to be improved ◆ Consult and communicate sufficiently when formulating improvement plans <ul style="list-style-type: none"> • Consult the staff and stakeholders extensively and establish good communication channels with them during the formulation of the improvement plans
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to formulate effective improvement plans for working procedures and mechanical protection and systems that do not comply with the safety and health management standards; and (ii) Capable to formulate effective improvement plans for benchmarking enhancement of the organization.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.</p>

1. Title	Formulate environmental protection improvement plans	
2. Code	EMCUSH603A	
3. Range	Formulate improvement plans for working procedures and mechanical protection that do not comply with the environmental protection management standards, and to do so continuously according to views and recommendations generated after the reviews on environmental protection policy and management system.	
4. Level	6	
5. Credit	20	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Environmental protection policy and management system</p> <ul style="list-style-type: none"> ◆ Understand the environmental protection policy and management system of the organization, including: <ul style="list-style-type: none"> • Policy goals • Operating mode of the management system • Monitoring procedures • Measurement of performance <p>6.2 Environmental protection improvement plans</p> <ul style="list-style-type: none"> ◆ Formulate improvement plans for areas of emissions, waste water, light pollution, noise, solid waste, chemical waste, ecological environment, etc. that do not comply with the environmental protection management standards: <ul style="list-style-type: none"> • Operating mode • Implementation and monitoring • System management • budgeting • Measurement of performance • Review, workflow and schedule for implementation ◆ Formulate improvement plans according to views and recommendations generated after the reviews on environmental protection policy and management system <ul style="list-style-type: none"> • Identify and confirm items or operating mode of the system that need to be improved • Formulate an overall management system improvement plan for items or operating mode of the system that need to be improved ◆ Consult and communicate sufficiently when formulating improvement plans <ul style="list-style-type: none"> • Consult the staff and stakeholders extensively and establish good communication channels with them during the formulation of the improvement plans 	

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to formulate improvement plans for the organization for areas that do not comply with the environmental protection management standards.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of environmental protection.

1. Title	Formulate quality management strategy
2. Code	EMCUQM601A
3. Range	Fully master the knowledge and techniques of quality management as well as business strategy and quality management culture of the organization and be able to formulate a forward-looking quality management strategy applicable to electrical and mechanical workplaces.
4. Level	6
5. Credit	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Quality management goals</p> <ul style="list-style-type: none"> ◆ Understand the concept of excellent quality management awards such as: <ul style="list-style-type: none"> • Deming Prize • Baldrige Quality Award • European Quality Award • Hong Kong Award for Industry <p>6.2 Formulation of quality management strategy</p> <ul style="list-style-type: none"> ◆ Identify the deviations between quality management goals and the current quality management system ◆ Identify the deviations between quality management goals and the performance of current quality management system ◆ Formulate quality management strategy <ul style="list-style-type: none"> • Analyze the deviations between quality management goals and the current quality management system, and quality management culture and quality costs of the organization in order to formulate the quality management strategy including: <ul style="list-style-type: none"> › Quality management policy › Quality management goals › Operating mode of the quality management system under the quality management policy › Measurement of the quality management system performance › Review mechanism › Improvement mechanism › Communication channels
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective quality management strategy according to the deviations between quality management goals and the current quality management system as well as other factors of consideration.</p>
8. Remarks	This unit of competency is suitable for quality management staff enhancement. The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of quality management.

1. Title	Implement total quality management plan
2. Code	EMCUQM602A
3. Range	Master the knowledge and techniques of total quality management as well as business strategy and quality management culture of the organization so as to implement the total quality management plan properly for electrical and mechanical works.
4. Level	6
5. Credit	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Total quality management theory</p> <ul style="list-style-type: none"> ◆ Understand total quality management (TQM) methods and techniques such as: <ul style="list-style-type: none"> • Quality Function Deployment • Business Process Reengineering • Process Improvement • Strategic Outsourcing • Rapid Product Development ◆ Understand the concepts of quality economics, including: <ul style="list-style-type: none"> • Quality costs • Quality costs calculation system of quality economics <p>6.2 Implementation of total quality management</p> <ul style="list-style-type: none"> ◆ Implement total quality management <ul style="list-style-type: none"> • Apply the following TQM methods to assist the implementation of total quality management strategy <ul style="list-style-type: none"> ▸ Quality Function Deployment ▸ Business Process Reengineering ▸ Process Improvement ▸ Strategic Outsourcing ▸ Rapid Product Development ◆ Build up the concept of catering customers' needs in a correct way <ul style="list-style-type: none"> • implement the concept of catering customers' needs in a correct way, including <ul style="list-style-type: none"> ▸ internal and external customers ▸ customers' voices ▸ customers' level of satisfaction ▸ customers' loyalty ▸ the importance of customers to the organization

	<ul style="list-style-type: none"> ◆ Apply the concept of quality economics to analyze quality costs <ul style="list-style-type: none"> • Apply the concept of quality economics to analyze quality costs and implement quality costs system calculated by quality economics, in which the economic value of customers' loyalty is also included ◆ Improve the quality management system continuously through learning and growth <ul style="list-style-type: none"> • Improve the quality management system continuously through quality management learning and upgrade provided by the organization • Improve the quality management system continuously through improvement of management method and employee empowerment
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to use TQM methods to formulate and implement effective quality management plans for the organization; (ii) Capable to apply the concept of quality economics to analyze quality costs for a specific organization; and (iii) Capable to formulate a mechanism to continuously improve the quality management system of the organization.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of quality management.</p>

1. Title	Formulate corporate marketing strategy for electrical installations
2. Code	EMELMS601A
3. Range	Applicable to marketing and sales of electrical works. Master the holistic business environment of different areas; formulate corporate marketing strategy for electrical installations; lead and oversee marketing and sales management of electrical installations.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the holistic business environment of different areas</p> <ul style="list-style-type: none"> ◆ Understand the holistic business environment of different areas, including: market size, market development potential, overall market value, number of competitors, etc. <p>6.2 Formulate corporate marketing strategy for electrical installations</p> <ul style="list-style-type: none"> ◆ Formulate corporate marketing strategy for electrical installations for the organization according to the analyses of the overall business environment of different areas and the strengths and weaknesses of the organization ◆ Lead and oversee the marketing and sales management plan for electrical installations, including: organizing marketing and sales working groups, implementing and monitoring marketing and sales activities, implementing and monitoring market promotion activities, etc. ◆ Make timely modifications to the overall marketing strategy for electrical installations to enhance the profitability of the organization
7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: <ul style="list-style-type: none"> (i) Capable to master the holistic business environment of different areas; (ii) Capable to formulate corporate marketing strategy for electrical installations; and (iii) Capable to lead and monitor marketing and sales management plans for electrical installations.
8. Remarks	

1. Title	Formulate effective marketing and sales courses and training programmes
2. Code	EMELMS602A
3. Range	Applicable to marketing and sales of electrical works. Formulate effective marketing and sales courses and training programmes and facilitate the publicity and promotion of the entire organization.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the requirements of internal training targets of the organization</p> <ul style="list-style-type: none"> ◆ Understand survey methods including: questionnaire survey, staff appraisal report, company policy, etc. to conduct survey on the internal training requirements of the organization ◆ Understand the training requirements of different departments in order to formulate marketing and sales courses and training programmes <p>6.2 Formulate marketing and sales courses and training programmes for the entire organization</p> <ul style="list-style-type: none"> ◆ Consolidate different, inconsistent and incomplete data to survey the requirements of the external competitive environment on staff's marketing and sales knowledge, including legal requirements, different clients, professional bodies, etc. in order to master the requirements of the industry and formulate marketing and sales courses and training programmes for the entire organization ◆ Formulate marketing and sales courses or training programmes according to the internal training requirements of the organization. Courses may include legal requirements, product characteristics and merits, types of market and market segment of client, classification of market, marketing development techniques, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to consolidate different, inconsistent and incomplete data to formulate appropriate survey methods to identify the training requirements; and</p> <p>(ii) Capable to formulate marketing and sales courses or training programmes to meet the training requirements.</p>
8. Remarks	

**Competencies for Practitioners of
the Electrical Engineering Branch
in the Electrical & Mechanical Services
Industry**

Competency Level 7

1. Title	Constantly advance the renovation of power system design
2. Code	EMELDE704A
3. Range	Applicable to electrical engineering design. Constantly advance the renovation of design for various kinds of electrical installations or systems.
4. Level	7
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master various types of creative or breakthrough thinking</p> <ul style="list-style-type: none"> ◆ Master various types of creative or breakthrough thinking <p>6.2 Constantly renovate the design of electrical installations or systems</p> <ul style="list-style-type: none"> ◆ Break through the conventional mindset and analyze from different angles the feasibility of renovating the design of electrical installations or systems ◆ Organize brain-storming sessions to exchange ideas and latest information, and inspire thinking, etc. ◆ Constantly review and advance the renovation of power system design, such as using new technologies to simplify the electrical installations or systems, replacement of communication equipment, etc.
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to break through the conventional mindset and analyze from different angles the feasibility of renovating the design of electrical installations or systems; and</p> <p>(ii) Capable to organize brain-storming sessions to exchange ideas and latest information, and inspire thinking; review and advance the renovation of power system design.</p>
8. Remarks	

1. Title	Establish standards in the engineering research report and lead the research direction
2. Code	EMELDE705A
3. Range	Applicable to electrical work. Publish engineering research report, establish standards for critical discussions and lead the research direction.
4. Level	7
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master the modes of publishing engineering research reports</p> <ul style="list-style-type: none"> ◆ Understand the areas of study in electrical engineering and science ◆ Master the modes of publishing engineering study reports <p>6.2 Publish engineering research reports on specialized areas, establish standards and lead the research direction</p> <ul style="list-style-type: none"> ◆ Publish engineering study reports on specialized areas of study to elaborate the research results in order to contribute to the industry ◆ Establish standards for critical discussions and lead the research direction and constantly advance for improvement
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to publish engineering research reports to elaborate the research results; and</p> <p>(ii) Capable to establish standards for critical discussions and lead the research direction and constantly advance for improvement.</p>
8. Remarks	

1. Title	Consolidate power supply network design data for extensive use
2. Code	EMELDE707A
3. Range	Applicable to electrical engineering design. Assess power supply network design numerical and graphical data so that they can be used extensively.
4. Level	7
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand power supply network design and operating data</p> <ul style="list-style-type: none"> ◆ Understand power supply network design and operating data such as working life of various types of electrical equipment, repair items, average failure rate, work efficiency, noise, etc. <p>6.2 Consolidate power supply network design and operating data and turn them into useful statistical information so that they can be used extensively</p> <ul style="list-style-type: none"> ◆ Collect and consolidate design and operating data for the whole power supply network such as: <ul style="list-style-type: none"> • Investment and operational costs for different levels of power supply network • Performance data for different levels of power supply network equipment, such as their working life, repair items, average failure rate, work efficiency, noise, etc. • Operational costs for the whole power supply network • Load profile mode for different levels of power supply network • Figures of current flow, voltage sag, power flow, etc. for different levels of power supply network ◆ Turn the above-mentioned data into useful statistical information so that they can be used extensively
7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to use statistical skills to consolidate power supply network design and operating data and turn them into useful statistical information so that they can be used extensively.
8. Remarks	

1. Title	Formulate overall operation development direction and strategy	
2. Code	EMCUOM701A	
3. Range	With regard to electrical and mechanical engineering operation management, understand the social conditions, fully master the development trend of the industry as well as the goals and present situation of the organization so as to formulate an overall operation development direction and strategy for the organization; handle very complex / new issues in the absence of complete/consistent data/information, and develop creative response.	
4. Level	7	
5. Credit	20	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of social, electrical and mechanical industry's environment</p> <ul style="list-style-type: none"> ◆ Understand the development trends of society and the electrical and mechanical trade ◆ Understand clearly the influence of legislations, especially ordinances related to safety, health and environmental protection, on the industry ◆ Master social and economic information <p>6.2 Formulate overall operation development direction and strategy</p> <ul style="list-style-type: none"> ◆ Analyze strengths of the organization <ul style="list-style-type: none"> • Use analytical tools to analyze strengths of the organization in operation management, occupational safety and health and environmental protection, quality management, human resources management, financial management, product development management and risk management • Use internal questionnaire survey for analysis and reference • Use the comparison with industrial benchmarking for analysis and reference ◆ Formulate development goals for the organization according to the analysis of the its strengths, the social and industrial environment and trend, and stakeholders' needs ◆ Use operation management techniques to formulate an overall operation development direction and strategy according to development goals, including: <ul style="list-style-type: none"> • Business development strategy • Business operation strategy • Human resources management strategy • Financial strategy • Product development strategy • Risk management strategy • Communication channels 	

	<ul style="list-style-type: none"> ◆ Formulate mechanisms to measure, review and improve the operation development direction and strategy ◆ Lead the organization for a forward-looking development according to the following social and industrial changes <ul style="list-style-type: none"> • Product or service requirements • Technological development • Human resources and all kinds of costs in comparison with competitors or the region
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to formulate an overall operation development direction and strategy according to the situation of an electrical and mechanical organization; (ii) Capable to formulate for the organization mechanisms to measure, review and improve the operation development direction and strategy; and (iii) Capable to lead the organization for a forward-looking development according to social and industrial changes.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of engineering operation management.</p>

1. Title	Decide on, facilitate, coordinate and monitor the entire electrical works project
2. Code	EMELOM701A
3. Range	Analyze, judge, make final decisions for, facilitate, coordinate and monitor a large electrical works project until it completes.
4. Level	7
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Master electrical projects</p> <ul style="list-style-type: none"> ◆ Master the works for electrical projects including organizing inter-departmental working groups to coordinate the implementation of electrical works <p>6.2 Take charge of a large electrical project, and make final decisions for, facilitate, coordinate and monitor the entire electrical project</p> <ul style="list-style-type: none"> ◆ Take charge of an electrical project including: organizing inter-departmental inspection, testing and commissioning project management group, formulating inspection, testing and commissioning project management plans, formulating works progress monitoring system, formulating failure reporting system, etc. ◆ Analyze and assess the impact of every work item, make final decisions and facilitate, coordinate and monitor the project until it completes ◆ Make timely modifications to the management plan for a large project in order to enhance the management effectiveness of the management team
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to coordinate a large electrical project;</p> <p>(ii) Capable to analyze and assess the impact of the electrical project and make final decisions on it;</p> <p style="text-align: center;">and</p> <p>(iii) Capable to facilitate, coordinate and monitor a large engineering project until it completes.</p>
8. Remarks	

Appendix I

Generic Level Descriptors

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
1	<ul style="list-style-type: none"> - Employ recall and demonstrate elementary comprehension in a narrow range of areas with dependency on ideas of others - Exercise basic skills - Receive and pass on information - Use, under supervision or prompting, basic tools and materials. - Apply learnt responses to solve problems - Operate in familiar, personal and/or everyday contexts - Take some account, with prompting, of identified consequences of actions. 	<ul style="list-style-type: none"> - Operate mainly in closely defined and highly structured contexts - Carry out processes that are repetitive and predictable - Undertake the performance of clearly defined tasks - Assume a strictly limited range of roles. 	<ul style="list-style-type: none"> - The ability to perform tasks of routine and repetitive nature given clear direction - Carry out directed activity under close supervision - Rely entirely on external monitoring of output and quality 	<ul style="list-style-type: none"> - Use very simple skills with assistance — for example: - Take some part in discussions about straightforward subjects - Read and identify the main points and ideas from documents about straightforward subjects - Produce and respond to a limited range of simple, written and oral communications, in familiar/routine contexts - Carry out a limited range of simple tasks to process data and access information - Use a limited range of very simple and familiar numerical and pictorial data - Carry out calculations, using whole numbers and simple decimals to given levels of accuracy.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
2	<ul style="list-style-type: none"> - Apply knowledge based on an underpinning comprehension in a selected number of areas - Make comparisons with some valuation and interpret available information - Apply basic tools and materials and use rehearsed stages for solving problems. - Operate in familiar, personal and/or everyday contexts - Take account the identified consequences of actions. 	<ul style="list-style-type: none"> - Choose from a range of procedures performed in a number of contexts, a few of which may be non-routine - Co-ordinate with others to achieve common goals. 	<ul style="list-style-type: none"> - The ability to perform a range of tasks in predictable and structured contexts - Undertake directed activity with a degree of autonomy - Achieve outcomes within time constraints - Accept defined responsibility for quantity and quality of output subject to external quality checking. 	<ul style="list-style-type: none"> - Use skills with some assistance—for example: - Take active part in discussions about identified subjects - Identify the main points and ideas from documents and reproduce them in other contexts - Produce and respond to a specified range of written and oral communications, in familiar/routine contexts - Carry out a defined range of tasks to process data and access information - Use a limited range of familiar numerical and graphical data in everyday contexts - Carry out calculations, using percentages and graphical data to given levels of accuracy.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
3	<ul style="list-style-type: none"> - Apply knowledge and skills in a range of activities, demonstrating comprehension of relevant theories - Access, organize and evaluate information independently and make reasoned judgements in relation to a subject or discipline - Employ a range of responses to well defined, but sometimes unfamiliar or unpredictable, problems - Make generalizations and predictions in familiar contexts. 	<ul style="list-style-type: none"> - Operate in a variety of familiar and some unfamiliar contexts, using a known range of technical or learning skills - Select from a considerable choice of predetermined procedures - Give presentations to an audience 	<ul style="list-style-type: none"> - The ability to perform tasks in a broad range of predictable and structured contexts which may also involve some non-routine activities requiring a degree of individual responsibility - Engage in self-directed activity with guidance/evaluation - Accept responsibility for quantity and quality of output - Accept well defined but limited responsibility for the quantity and quality of the output of others 	<ul style="list-style-type: none"> - Use a wide range of largely routine and well practiced skills — for example: - Produce and respond to detailed and complex written and oral communication in familiar contexts, and use a suitable structure and style when writing extended documents. - Select and use standard applications to obtain, process and combine information - Use a wide range of numerical and graphical data in routine contexts, which may have some non-routine elements.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
4	<ul style="list-style-type: none"> - Develop a rigorous approach to the acquisition of a broad knowledge base, with some specialist knowledge in selected areas - Present and evaluate information, using it to plan and develop investigative strategies - Deal with well defined issues within largely familiar contexts, but extend this to some unfamiliar problems - Employ a range of specialised skills and approaches to generate a range of responses. 	<ul style="list-style-type: none"> - Operate in a range of varied and specific contexts involving some creative and non-routine activities - Exercise appropriate judgement in planning, selecting or presenting information, methods or resources - Carry out routine lines of enquiry, development of investigation into professional level issues and problems. 	<ul style="list-style-type: none"> - The ability to perform skilled tasks requiring some discretion and judgement, and undertake a supervisory role - Undertake self-directed and a some directive activity - Operate within broad general guidelines or functions - Take responsibility for the nature and quantity of own outputs - Meet specified quality standards - Accept some responsibility for the quantity and quality of the output of others. 	<ul style="list-style-type: none"> - Use a wide range of routine skills and some advanced skills associated with the subject/discipline — for example: - Present using a range of techniques to engage the audience in both familiar and some new contexts - Read and synthesize extended information from subject documents; organize information coherently, convey complex ideas in well-structured form - Use a range of IT applications to support and enhance work - Plan approaches to obtaining and using information, choose appropriate methods and data to justify results & choices - Carry out multi-stage calculations.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
5	<ul style="list-style-type: none"> - Generate ideas through the analysis of abstract information and concepts - Command wide ranging, specialized technical, creative and/or conceptual skills - Identify and analyse both routine and abstract professional problems and issues, and formulate evidence-based responses - Analyse, reformat and evaluate a wide range of information - Critically analyse, evaluate and/or synthesize ideas, concepts, information and issues - Draw on a range of sources in making judgments. 	<ul style="list-style-type: none"> - Utilise diagnostic and creative skills in a range of technical, professional or management functions - Exercise appropriate judgement in planning, design, technical and/or supervisory functions related to products, services, operations or processes. 	<ul style="list-style-type: none"> - Perform tasks involving planning, design, and technical skills, and involving some management functions - Accept responsibility and accountability within broad parameters for determining and achieving personal and/or group outcomes - Work under the mentoring of senior qualified practitioners - Deal with ethical issues, seeking guidance of others where appropriate. 	<ul style="list-style-type: none"> - Use a range of routine skills and some advanced and specialized skills in support of established practices in a subject/discipline, for example: - Make formal and informal presentations on standard/mainstream topics in the subject/discipline to a range of audiences - Participate in group discussions about complex subjects; create opportunities for others to contribute - Use a range of IT applications to support and enhance work - Interpret, use and evaluate numerical and graphical data to achieve goals/targets.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
6	<ul style="list-style-type: none"> - Critically review, consolidate, and extend a systematic, coherent body of knowledge - Utilise highly specialised technical research or scholastic skills across an area of study - Critically evaluate new information, concepts and evidence from a range of sources and develop creative responses - Critically review, consolidate and extend knowledge, skills practices and thinking in a subject/discipline - Deal with complex issues and make informed judgements in the absence of complete or consistent data/information. 	<ul style="list-style-type: none"> - Transfer and apply diagnostic and creative skills in a range of situations - Exercise appropriate judgement in complex planning, design, technical and/or management functions related to products, services operations or processes, including resourcing and evaluation - Conduct research, and/or advanced technical or professional activity - Design and apply appropriate research methodologies. 	<ul style="list-style-type: none"> - Apply knowledge and skills in a broad range of professional work activities - Practice significant autonomy in determining and achieving personal and/or group outcomes - Accept accountability in related decision making including use of supervision - Demonstrate leadership and /or make an identifiable contribution to change and development. 	<ul style="list-style-type: none"> - Communicate, using appropriate methods, to a range of audiences including peers, senior colleagues, specialists - Use a wide range of software to support and enhance work; identify refinements to existing software to increase effectiveness or specify new software - Undertake critical evaluations of a wide range of numerical and graphical data, and use calculations at various stages of the work.

Generic Level Descriptors

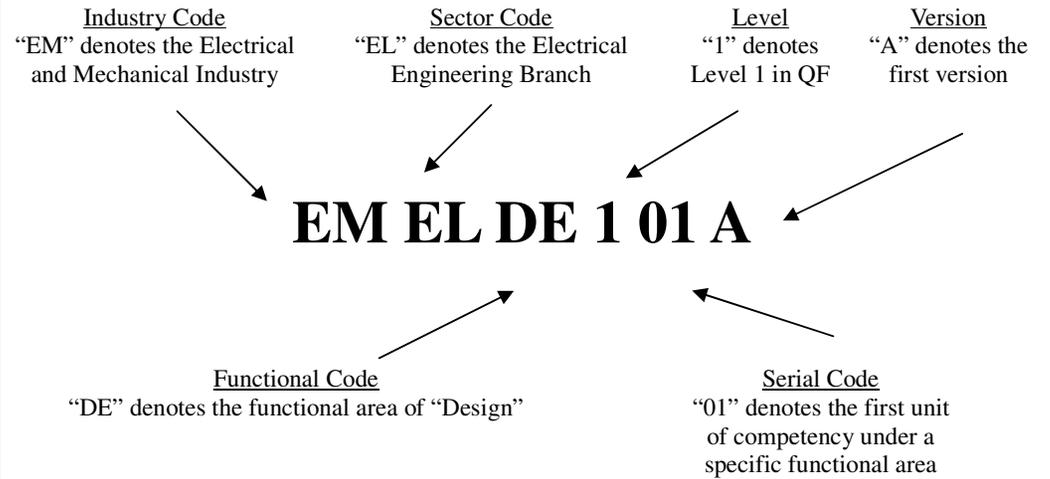
Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
7	<ul style="list-style-type: none"> - Demonstrate and work with a critical overview of a subject or discipline, including an evaluative understanding of principal theories and concepts, and of its broad relationships with other disciplines - Identify, conceptualise and offer original and creative insights into new, complex and abstract ideas and information - Deal with very complex and/or new issues and make informed judgements in the absence of complete or consistent data/information - Make a significant and original contribution to a specialised field of inquiry, or to broader interdisciplinary relationships. 	<ul style="list-style-type: none"> - Demonstrate command of research and methodological issues and engage in critical dialogue - Develop creative and original responses to problems and issues in the context of new circumstances. 	<ul style="list-style-type: none"> - Apply knowledge and skills in a broad range of complex and professional work activities, including new and unforeseen circumstances - Demonstrate leadership and originality in tackling and solving problems - Accept accountability in related decision making - High degree of autonomy, with full responsibility for own work, and significant responsibility for others - Deal with complex ethical and professional issues. 	<ul style="list-style-type: none"> - Strategically use communication skills, adapting context and purpose to a range of audiences - Communicate at the standard of published academic work and/or critical dialogue - Monitor, review and reflect on own work and skill development, and change and adapt in the light of new demands - Use a range of software and specify software requirements to enhance work, anticipating future requirements - Critically evaluate numerical and graphical data, and employ such data extensively.

Appendix II

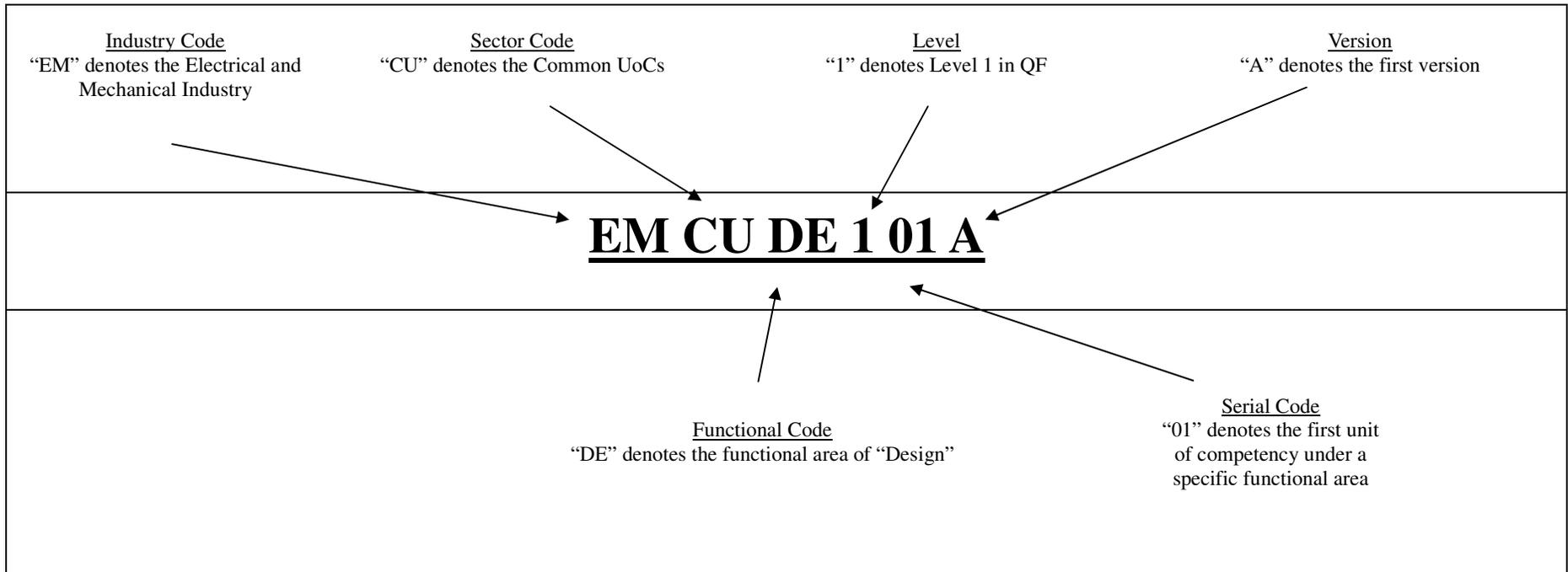
Coding Criteria

Coding Criteria

	Major Functional areas	Codes
(i)	Design	DE
(ii)	Installation	IN
(iii)	Inspection, Testing and Commissioning	IT
(iv)	Operation, Repair and Maintenance	OR
(v)	Project Management	PM
(vi)	Operation Management	OM
(vii)	Safety, Health and Environment	SH
(viii)	Quality Management	QM
(ix)	Marketing and Sales	MS
(x)	Maintenance	*MA



Common UoCs Coding Criteria (The Common UoCs are applicable to other branches)



Remarks: 1) There is not space in the code.
2) The code must be underlined.

Common UoCs Coding Criteria (The Common UoCs are in the individual branch)

Use italic type, for example: *EMELDE101A*