

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	1. Introduction			1
	1.1 Information about the Company			
<i>Location 1</i>	<i>Description 1</i>			
	1.1.1 Own Organisation			
	a) Discuss the size, history and internal culture of the trainee’s own organisation.	<i>CCO</i> <i>1.10</i>	11	
	b) Discuss an overview of the relationship between the trainee’s own organisation, government departments and other organisations.	<i>CCO</i> <i>1.10</i>	11	
	c) Discuss the structure and functions of different units within the trainee’s own organisation.	<i>CCO</i> <i>1.10</i>	11	
	d) Demonstrate the awareness to follow operational procedures and practices as required by the trainee’s own organisation.	<i>CCO</i> <i>1.10</i>	11	
	e) Discuss the objectives, requirements and processes that support the quality assurance system within the trainee’s own organisation.	<i>CCO</i> <i>1.10</i>	11	
	f) Apply the quality assurance system according to the policy of the trainee’s own organisation.	<i>CCO</i> <i>1.10</i>	11	
	1.1.2 Training Programme, Prospects and Career Development			
	a) Discuss an overview of the internal communication systems, training system and career development pathway within the trainee’s own organisation.	<i>CCO</i> <i>1.10</i>	11	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

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	<p>b) Demonstrate a commitment to extend and develop up-to-date technical knowledge through reading relevant engineering publications, participating in seminars or conferences, and information searching.</p> <p>c) Demonstrate a commitment to extend and develop up-to-date knowledge of local, regional and international current affairs through reading relevant engineering publications, participating in seminars or conferences, and information searching.</p> <p>d) Demonstrate a commitment to participate in the local organisations or community services for general personal development.</p>	<p><i>CCO 1.2</i></p> <p><i>CCO 1.3</i></p> <p><i>CCO 1.3</i></p>	<p>11</p> <p>11</p> <p>11</p>	
	1.2 Information about the HKIE			
Location 2	Description 2			
	<p>a) Discuss an overview of the HKIE organisation as well as its history and role in society.</p> <p>b) Demonstrate a commitment to participate in relevant activities organised by the HKIE.</p>	<p><i>CCO 1.1</i></p> <p><i>CCO 1.1</i></p>	<p>11</p> <p>11</p>	
	2. Engineer as a Profession			Continuous
	2.1 Professionalism			
Location 3	Description 3			
	<p>a) Discuss the social and ethical responsibilities of engineers in society.</p>	<p><i>CCO 1.2</i></p>	<p>8</p>	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

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	<ul style="list-style-type: none"> b) Explain the rules and standard requirements of conducting engineering activities to the HKIE, employers, clients, general public and colleagues in accordance with the HKIE Rules of Conduct. c) Explain the ethical standards and responsibilities of professional engineers as required by the HKIE. d) Demonstrate the awareness to follow the codes of practice of professional engineers. e) Demonstrate the awareness to uphold the dignity, standing and reputation of the engineering profession. f) Demonstrate the awareness to protect the interests of the community including the environment, welfare, health and safety in conducting engineering activities. 	<p><i>CCO 1.2</i></p> <p><i>CCO 1.2</i></p> <p><i>CCO 1.2</i></p> <p><i>CCO 1.2</i></p> <p><i>CCO 1.2</i></p>	<p>8</p> <p>8</p> <p>8</p> <p>8</p> <p>8</p>	
	2.2 Occupational Safety and Health			
Location 4	Description 4			
	<ul style="list-style-type: none"> a) Demonstrate an understanding of the statutory health and safety requirements. b) Demonstrate an understanding of the responsibilities of professional engineers for the health and safety of the employers, employees and general public when engaging in engineering activities. c) Apply the safety management system in accordance with the industry standards and regulatory requirements. 	<p><i>CCO 1.5</i></p> <p><i>CCO 1.5</i></p> <p><i>CCO 1.5</i></p>	<p>9</p> <p>9</p> <p>7</p>	
	2.3 Environment			
Location 5	Description 5			
	<ul style="list-style-type: none"> a) Demonstrate an understanding of the relevant statutory environmental requirements related to the trainee’s discipline. 	<p><i>CCO 1.6</i></p>	<p>9</p>	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	b) Evaluate the inter-relationship of technology with the environment in the work place.	<i>CCO 1.6</i>	9	
	c) Demonstrate the awareness of the impact of technology on the environment in society.	<i>CCO 1.6</i>	9	
	3. Electrical Engineering Design, Fundamental and Operational Reliability Applied to Electrical And Associated Systems			52
	3.1 Workshop Training			8
Location 6	Description 6			
	a) Examine the principle of electricity generation, transmission and distribution.	<i>CO 1.1</i>	1	
	b) Examine the development trend of electricity generation, transmission and distribution.	<i>CO 1.1</i>	1	
	c) Examine the commercial and industrial application of electricity.	<i>CO 1.1</i>	1	
	d) Appraise the operation of basic electrical components such as generators, switchgear, transformers, electronic drivers, capacitors / reactors, cables, overhead lines, protection and control equipment etc.	<i>CO 1.4</i>	1	
	e) Select appropriate electrical components for operation such as generators, switchgear, transformers, electronic drivers, capacitors / reactors, cables, overhead lines, protection and control equipment etc.	<i>CO 1.4</i>	5	
	f) Apply electrical components such as generators, switchgear, transformers, electronic drivers, capacitors / reactors, cables, overhead lines, protection and control equipment etc. for the safe and reliable operation of electrical systems.	<i>CO 1.4</i>	1	
	g) Apply modern electronic, communication and computer systems to electrical power systems.	<i>CO 1.5</i>	6	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	h) Evaluate modern electronic, communication and computer systems to electrical power systems.	<i>CO 1.5</i>	3	
	3.2 Engineering Design			12
Location 7	Description 7			
	3.2.1 Design Office Practice			
	a) Design solutions that comply with relevant codes of practice or meet recognised engineering standard of practice in Hong Kong.	<i>CO 2.1</i>	2	
	b) Assess the requirements of different stages of design.	<i>CO 2.1</i>	4	
	c) Analyse load growth, load flow and fault level.	<i>CO 1.2</i>	6	
	d) Assess potential risks from load growth, load flow and fault level.	<i>CO 1.2</i>	7	
	e) Evaluate social, safety and environmental effects from load growth, load flow and fault level.	<i>CO 1.2</i>	9	
	f) Apply H.V. Engineering.	<i>CO 1.3</i>	6	
	g) Assess potential risks from H.V. engineering.	<i>CO 1.3</i>	7	
	h) Evaluate safety and environmental effects from H.V. engineering.	<i>CO 1.3</i>	9	
	i) Assess the social, cultural, health, safety, sustainability and environmental effects at different stages of design.	<i>CO 2.1</i>	9	
	j) Produce well-structured, clear and concise design documents.	<i>CO 2.1</i>	10	
	k) Propose appropriate computer packages, such as Building Information Modeling, in the engineering design process.	<i>CO 2.1</i>	3	
	l) Apply appropriate computer aided design packages.	<i>CO 2.1</i>	6	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	3.2.2 Synthesis a) Select appropriate units or components in the design process. b) Produce design by applying the concept of total design considerations. c) Assess alternative design solutions by considering the technological and non-technological perspectives of the design process.	CO 2.2 CO 2.2 CO 2.2	5 4 12	
	3.3 Manufacturing processes of the company or construction or installations.			10
Location 8	Description 8			
	a) Plan the preparation works of installation, testing and commissioning of an engineering project. b) Support resource scheduling, monitoring and control of safety operation. c) Appraise the organisational structure of the safety operation team such as the roles and responsibilities of team members. d) Comply the operation safety practices and documentations with widely adopted international standards such as ISO 45001 and the required standard and regulatory requirements of Hong Kong. e) Design operation safety practices. f) Comply the quality assurance procedures and documentation with widely adopted international engineering standards such as ISO 9000 etc. g) Plan the quality assurance procedures by employing appropriate approach and methodology. h) Support the quality control and quality assurance activities.	CO 3.1 CO 3.4 CO 3.4 CO 3.4 CO 3.4 CO 3.3 CO 3.3 CO 3.3	6 6 1 2 4 6 6 6	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	3.4 Inspection procedure in accordance with standards and specifications or testing or commissioning.			4
Location 9	Description 9			
	a) Appraise the testing process on the operational reliability.	<i>CO 3.1</i>	6	
	b) Analyse the testing results.	<i>CO 3.1</i>	3	
	c) Select appropriate instruments for performance monitoring.	<i>CO 3.1</i>	5	
	d) Appraise the operating principle and limitations of testing equipment.	<i>CO 3.2</i>	1	
	e) Select appropriate instruments with considerations such as range and accuracy.	<i>CO 3.2</i>	5	
	f) Compile the calibration procedures of instruments.	<i>CO 3.2</i>	6	
	g) Operate the testing equipment.	<i>CO 3.2</i>	6	
	3.5 Operations and operational procedures or maintenance or repairs.			8
Location 10	Description 10			
	a) Appraise different types of asset management system such as ISO 55001 and different asset performance management systems.	<i>CO 3.5</i>	1	
	b) Appraise the procedures, management and supervision of electrical equipment maintenance.	<i>CO 3.5</i>	1	
	c) Assess different types of maintenance systems and programs such as condition monitoring, preventive maintenance, corrective maintenance and post-mortem analysis etc.	<i>CO 3.5</i>	5	
	d) Appraise different condition monitoring techniques.	<i>CO 3.5</i>	1	
	e) Apply computer-aided maintenance management system.	<i>CO 3.5</i>	6	
	f) Apply appropriate diagnostic techniques to analyse maintenance problems.	<i>CO 3.5</i>	5	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	g) Assess the health, safety and environmental effects of operation and maintenance activities.	<i>CO 3.5</i>	9	
	3.6 Project Management including cost management, programme management, quality management and environmental management.			10
Location 11	Description 11			
	a) Apply appropriate supervisory skills, problem-solving, decision-making and project control techniques to manage engineering projects.	<i>CO 4.5</i>	6	
	b) Appraise the importance of project cost and programme management.	<i>CO 4.5</i>	6	
	4. Engineering Administration and Management Aspects			25
	4.1 Interpretation or preparation of requirements and specifications incorporating sketches and drawing, methods of construction and materials to be used.			6
Location 12	Description 12			
	a) Develop design specifications that may be understood and interpreted without significant elaboration.	<i>CO 2.1</i>	4	
	b) Criticise design specifications.	<i>CO 2.1</i>	3	
	4.2 Tendering procedures, tender appraisal and contract administration.			0.5
Location 13	Description 13			
	a) Appraise various concepts of commercial procedures such as purchase requisition, tendering and contracts management etc.	<i>CO 4.2</i>	6	
	b) Comply with the established commercial procedures.	<i>CO 4.2</i>	6	
	c) Carry out tender or purchase requisition evaluation and/or recommendation.	<i>CO 4.2</i>	6	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	4.3 Estimating labour, materials, installation and transport costs and cost control.			4
Location 14	Description 14			
	a) Apply appropriate supervisory skills, problem-solving, decision-making and project control techniques to manage engineering projects.	<i>CO 4.5</i>	6	
	4.4 Project scheduling and work management.			5
Location 15	Description 15			
	a) Appraise the importance of project cost and programme management.	<i>CO 4.5</i>	6	
	b) Apply appropriate risk management for the project activities.	<i>CO 4.5</i>	7	
	4.5 Preparation of reports and manuals for procedures of installation, operation and maintenance, and codes of practice.			5
Location 16	Description 16			
	a) Develop the procedures of installation, testing and commissioning of an engineering project.	<i>CO 3.1</i>	6	
	b) Develop safety operational procedures of an engineering process.	<i>CO 3.4</i>	4	
	4.6 Budgeting system			0.5
Location 17	Description 17			
	a) Apply various finance and accounting concept such as basic accounting, account coding system, budgeting, budget control and stock control etc.	<i>CO 4.1</i>	6	
	b) Analyse various financial reports for expenditure monitoring.	<i>CO 4.1</i>	3	
	4.7 General administration knowledge including financial management, human resources study, social awareness, marketing technique etc.			4
Location 18	Description 18			
	a) Discuss the various leadership qualities required of a leader including accountability, conflict management and resources management etc.	<i>CCO 1.9</i>	6	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	<ul style="list-style-type: none"> b) Explain the importance of accountability and responsibility required by a leader for making decisions on engineering activities. c) Apply various management skills in engineering projects. d) Distinguish the relationship between good leadership and good management skills. e) Demonstrate an understanding of the importance of teamwork and partnering skills in engineering projects. 	<p><i>CCO 1.9</i></p> <p><i>CCO 1.9</i></p> <p><i>CCO 1.9</i></p> <p><i>CCO 1.9</i></p>	<p>6</p> <p>6</p> <p>6</p> <p>6</p>	
	5. Direct Objective Training			26
	<p><i>This section covers any activities related to Electrical Engineering. It should aim to develop skills and knowledge relating to personal qualities, communication, human resources management and business operational sense in addition to the technical, commercial and engineering knowledge acquired by the trainees during earlier parts of their training. Latest developments in the discipline should be included. All Training Outcomes, if not yet achieved in earlier parts of training, should be completed here.</i></p> <p><i>Specific project(s) should be assigned to the trainee according to the work nature of the trainee in this period. The emphasis of the project(s) should be on the applications of the essential knowledge and skills acquired in the previous phases of the training programme. The trainee is expected to report the progress at scheduled intervals.</i></p> <p><i>Regular reviews between the supervisor(s) and the trainee should be arranged so as to ensure the progress to be in line with the project objective(s).</i></p>			

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

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	6. Other Common Core Outcomes for Continuous Development			Continuous
	6.1 Development of Personal Qualities			
Location 19	Description 19			
	a) Identify appropriate innovative approach and/or tools for professional development.	<i>CCO 1.4</i>	11	
	b) Demonstrate interpersonal skills for professional development.	<i>CCO 1.4</i>	10	
	c) Demonstrate negotiating skills required for various engineering activities.	<i>CCO 1.4</i>	10	
	d) Demonstrate sound time management skill for professional development.	<i>CCO 1.4</i>	11	
	e) Demonstrate a commitment to continuous development and enhancement.	<i>CCO 1.4</i>	11	
	6.2 Communication			
Location 20	Description 20			
	a) Communicate ideas orally in an accurate and clear manner under various situations (including presentations and meetings).	<i>CCO 1.7</i>	10	
	b) Formulate an oral presentation of complicated data and information in an effective and persuasive manner.	<i>CCO 1.7</i>	10	
	c) Produce grammatically correct, clear and concise documents (including memos, letters, instructions, reports, resumes and technical papers) which meet the business objectives.	<i>CCO 1.7</i>	10	
	d) Evaluate the needs of the intended readers to design appropriate technical contents for communication.	<i>CCO 1.7</i>	10	
	6.3 Human Resources Management			
Location 21	Description 21			
	a) Demonstrate the awareness of the duties and employment criteria for different job positions in an engineering project.	<i>CCO 1.8</i>	6	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

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	<ul style="list-style-type: none"> b) Demonstrate an understanding of the relevant legal requirements and regulatory issues of labour employment and management. c) Discuss the appropriate staff training and development programmes in the organisation. d) Comprehend human resources policies. e) Apply appropriate skills and methods to motivate sub-ordinates. 	<p><i>CCO 1.8</i></p> <p><i>CCO 1.8</i></p> <p><i>CO 4.3</i></p> <p><i>CO 4.3</i></p>	<p>6</p> <p>6</p> <p>6</p> <p>6</p>	
	6.4 Business Operations			
Location 22	Description 22			
	<ul style="list-style-type: none"> a) Recognise the importance of intellectual property to business operations. b) Describe the legal requirements in Hong Kong relevant to intellectual property rights. c) Identify appropriate tools and method to measure and improve the productivity of business operations. d) Identify appropriate information technology applications to manage business information and to facilitate business operations. e) Recognise the importance of research and development towards business operations. f) Demonstrate the awareness of financial considerations in operating business. g) Recognise the importance of business development in business operations. h) Comprehend the data privacy policy i) Comply with the information management policy. 	<p><i>CCO 1.11</i></p> <p><i>CCO 1.11</i></p> <p><i>CCO 1.11</i></p> <p><i>CCO 1.11</i></p> <p><i>CCO 1.11</i></p> <p><i>CCO 1.11</i></p> <p><i>CCO 1.11</i></p> <p><i>CO 4.4</i></p> <p><i>CO 4.4</i></p>	<p>11</p> <p>11</p> <p>11</p> <p>11</p> <p>11</p> <p>11</p> <p>11</p> <p>1</p> <p>1</p>	

THE HONG KONG INSTITUTION OF ENGINEERS
SCHEME “A” GRADUATE TRAINING
CONSOLIDATED MODEL TRAINING GUIDE
ELECTRICAL ENGINEERING

N.B.

1. The training period must not be less than 24 months.
2. The programme set out is for guidance only but substantial departure should not be made. Employers should endeavour to provide training to their trainees in as many areas as possible as is appropriate to the sector of employment.
3. This guide should be read in conjunction with Section 3 of the M3 Routes to Membership.
4. During the training, each trainee is required to maintain a Graduate Training Log Book, Record of Continuing Professional Development and Record of Training Outcomes.

Additional Note for Workshop Training:

The emphasis of workshop training should be given to provide hands-on experiences to the trainees to enable them to appreciate the skills, knowledge and workmanship required for a quality product. It is expected that the workshop training should cover basic engineering practices in using hand tools and electrical test equipment, basic industrial health and safety trainings, the appropriate use of different types of personal protective equipment, and basic skills related to electrical engineering. The workshop training should include, but not limited to, at least 80% of the following elements:

- Bench work
- Various basic skills in machining and metal work
- Conduit and MCB installation
- Lighting design
- Heat ventilation and air conditioning work
- Different types of control circuits, power cable jointing and termination
- LV switchboard testing
- Computer programming and simulation
- CAD/CAE tools practice
- PCB fabrication
- LAN configuration
- Machine windings and different configuration
- Use of different test equipment and instrument