THE HONG KONG INSTITUTION OF ENGINEERS
CONSOLIDATED MODEL TRAINING GUIDE
FOR FORMAL TRAINING SCHEME TO ASSOCIATE MEMBERSHIP
MECHANICAL ENGINEERING

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref. (Associate Members)	Length of Time (weeks)
	1. Introduction			**1**
	1.1 Information about the Company			
Location 1	***Description 1***			
	1.1.1 Own Organisation			
	a) Discuss the size, history and internal culture of the trainee's own organisation.	*CCO(AM) 1.2(a)*	11	
	b) Discuss an overview of the relationship between the trainee's own organisation, government departments and other organisations.	*CCO(AM) 1.2(b)*	11	
	c) Discuss the structure and functions of different units within the trainee's own organisation.	*CCO(AM) 1.2(c)*	11	
	d) Demonstrate the awareness to follow operational procedures and practices as required by the trainee's own organization.	*Sch A CCO*	11	
	e) Discuss the objectives, requirements and processes that support the quality assurance system within the trainee's own organisation.	*CCO(AM) 1.7(b)*	11	
	f) Apply the quality assurance system according to the policy of the trainee's own organisation.	*CCO(AM) 1.7(b)*	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 organization.	*Sch A CCO*	11	
	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.	*CCO(AM) 1.3(d)*	11	
	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.	*CCO(AM) 1.6(a)*	11	
	d) Demonstrate a commitment to participate in the local organisations or community services for general personal development.	*CCO(AM) 1.6(b)*	11	
	1.2 Information about the HKIE			
Location 2	***Description 2***			
	a) Discuss an overview of the HKIE organisation as well as its history and role in society.	*CCO(AM) 1.1(a)*	11	
	b) Demonstrate a commitment to participate in relevant activities organised by the HKIE.	*CCO(AM) 1.1(b)*	11	

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	2. Professionalism			**Contin-uous**
	2.1 Conduct and Responsibilities			
Location 3	***Description 3***			
	a) Discuss the social and ethical responsibilities expected in the society.	*CCO(AM) 1.3(a), (c)*	8	
	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.	*CCO(AM) 1.3(b)*	8	
	c) Explain the ethical standards and responsibilities required by the HKIE.	*CCO(AM) 1.3(c)*	8	
	d) Demonstrate the awareness to follow the codes of practice required by the industry.	*CCO(AM) 1.3(c)*	8	
	e) Demonstrate the awareness to uphold the dignity, standing and reputation of the engineering profession.	*New CCO*	8	
	f) Demonstrate the awareness to protect the interests of the community including the environment, welfare, health and safety in conducting engineering activities.	*New CCO*	8	
	2.2 Occupational Safety and Health			
Location 4	***Description 4***			
	a) Demonstrate an understanding of the statutory health and safety requirements.	*CCO(AM) 1.4(a)*	9	
	b) Demonstrate an understanding of the responsibilities for the health and safety of the employers, employees and general public when engaging in engineering activities.	*CCO(AM) 1.4(b)*	9	
	c) Plan the operation of safety management system in accordance with the industry standards and regulatory requirements.	*CCO(AM) 1.4(c)*	7	
	2.3 Environment			
Location 5	***Description 5***			
	a) Demonstrate an understanding of the relevant statutory environmental requirements related to the trainee's discipline.	*CCO(AM) 1.5(a)*	9	
	b) Demonstrate the awareness of the inter-relationship of technology with the environment in the work place.	*CCO(AM) 1.5(b)(i)*	9	
	c) Demonstrate the awareness of the impact of technology on the environment in society.	*CCO(AM) 1.5(b)(ii)*	9	
	3. Mechanical Engineering Practice, Design and Projects			**57**
	3.1 Workshop Training – Mechanical Engineering Fundamentals			8
Location 6	***Description 6***			
	3.1.1 Common Engineering Metallic and Non-metallic Materials			
	a) Propose the types of common engineering metallic and non-metallic materials.	*CO(AM) 1.1*	1	
	b) Assess the properties of common engineering metallic and non-metallic materials.	*CO(AM) 1.1*	1	
	c) Critique the specifications of common engineering metallic and non-metallic materials.	*CO(AM) 1.1*	1	

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	d) Appraise appropriate areas of usage of common engineering metallic and non-metallic materials.	*CO(AM) 1.1*	1	
	e) Appraise appropriate special treatment process (e.g. heat) of common engineering metallic and non-metallic materials.	*CO(AM) 1.1*	1	
	f) Appraise appropriate surface coatings or finishing process of common engineering metallic and non-metallic materials.	*CO(AM) 1.1*	1	
	3.1.2 Materials Shaping			
	3.1.2.1 Traditional Methods			
	a) Select the appropriate operational parameters for the traditional shaping operations including turning, milling, grinding, fitting and drilling.	*CO(AM) 1.2*	1	
	b) Evaluate the reliability factors of traditional materials shaping methods.	*CO(AM) 1.2*	1	
	c) Plan the quality assurance or accuracy checking procedure for products manufactured by the traditional material shaping methods.	*CO(AM) 1.2*	1	
	d) Develop machinery accuracy checking procedures.	*CO(AM) 1.2*	1	
	3.1.2.2 Computer Aided Methods (CNC)			
	a) Select the appropriate operational parameters for the computer aided methods including turning centres, machining centres, jig borers, jib grinders and milling machines.	*CO(AM) 1.2*	1	
	b) Evaluate the reliability factors of computer aided materials shaping methods.	*CO(AM) 1.2*	1	
	c) Plan the quality assurance or accuracy checking procedure for products manufactured by the computer aided materials shaping methods.	*CO(AM) 1.2*	1	
	d) Develop machinery accuracy checking procedures.	*CO(AM) 1.2*	1	
	3.1.3 Materials Forming Processing (Manual and Computer Aided)			
	a) Evaluate the applications and limitations of materials forming related processing equipment (e.g. EDM).	*CO(AM) 1.3*	1	
	b) Evaluate the sheet metal forming processes.	*CO(AM) 1.3*	1	
	c) Evaluate the mould and die forming processes.	*CO(AM) 1.3*	1	
	d) Evaluate the extrusion forming processes.	*CO(AM) 1.3*	1	

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Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref. (Associate Members)	Length of Time (weeks)
	3.1.4 Materials Joining			
	a) Appraise the various types of material joining methods including welding (hand and auto), brazing, soldering and mechanical fastening (rivets, nuts and bolts).	*CO(AM) 1.4*	1	
	b) Evaluate the applications and limitations of different materials joining process.	*CO(AM) 1.4*	1	
	3.1.5 Machinery Reliability			
	a) Appraise the principles and procedures of planned maintenance.	*CO(AM) 1.5*	1	
	b) Evaluate the applications and limitations of different lubricants.	*CO(AM) 1.5*	1	
	c) Appraise the benefits of condition based monitoring and the application of various monitoring methods.	*CO(AM) 1.5*	1	
	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.	*CO(AM) 2.1*	4	
	b) Assess the requirements of different stages of design.	*CO(AM) 2.1*	2	
	c) Propose appropriate software packages in the engineering design process.	*CO(AM) 2.1*	3	
	d) Produce clear design specifications, with reference to the industry standards, that may be understood and interpreted without significant elaboration.	*CO(AM) 2.1*	3	
	e) Plan the information retrieval process.	*CO(AM) 2.1*	4	
	f) Evaluate the design with different perspectives.	*CO(AM) 2.1*	3	
	3.2.2 Design Aspects (at least 4 of the followings)			
	a) Select the appropriate types of various systems and required equipment for engineering design work.	*CO(AM) 2.2 & CO(AM) 2.3*	5	
	b) Anaylze the areas of applications and limitations of various systems and required equipment for engineering design work.	*CO(AM) 2.2 & CO(AM) 2.3*	5	
	c) Evaluate the energy efficiency of the engineering design work.	*CO(AM) 2.2 & CO(AM) 2.3*	5	
	d) Derive the initial and running cost estimates for various designs.	*CO(AM) 2.2 & CO(AM) 2.3*	5	
	e) Evaluate the cost effectiveness of each design.	*CO(AM) 2.2 & CO(AM) 2.3*	5	
	f) Analyze the customer requirements, spatial requirements and buildability of an engineering design with consideration of compliance with statutory requirements.	*CO(AM) 2.2 & CO(AM) 2.3*	12	
	g) Carry out the utilities planning process of the engineering design work.	*CO(AM) 2.2 & CO(AM) 2.3*	6	
	h) Examine the maintainability of the engineering design.	*CO(AM) 2.2 & CO(AM) 2.3*	4	

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Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref. (Associate Members)	Length of Time (weeks)
	3.3 Manufacture or construction or installations of plant			8
Location 8	***Description 8***			
	a) Carry out the procedures of manufacture, or construction or installation of plants, including all associated mechanical and electrical equipment.	*CO(AM) 3.2*	6	
	b) Carry out the preparation works of manufacture, or construction installation, testing and commissioning of an engineering project.	*CO(AM) 3.2*	6	
	3.4 Operational Reliability: Processing Plant Machinery and equipment, Operation procedures, Maintenance			29
Location 9	***Description 9***			
	3.4.1 Industrial Automation			
	a) Select the appropriate units in designing the automatic control systems.	*CO(AM) 3.1*	5	
	b) Apply Computer Integrated Manufacturing / Control to achieve operational reliability.	*CO(AM) 3.1*	5	
	3.4.2 Installation, Testing and Commissioning			
	a) Carry out the procedures of installation, testing and commissioning of an engineering project.	*CO(AM) 3.2*	6	
	b) Carry out the preparation works of installation, testing and commissioning of an engineering project.	*CO(AM) 3.2*	6	
	c) Carry out the testing process on the operational reliability.	*CO(AM) 3.2*	6	
	d) Examine the principle of determining equipment guarantees, and the procedures for handling defects.	*CO(AM) 3.2*	5	
	3.4.3 Instrumentation			
	a) Select appropriate instruments with considerations such as range, accuracy and cost benefit.	*CO(AM) 3.3*	5	
	b) Plan the use of instruments for performance monitoring.	*CO(AM) 3.3*	5	
	c) Carry out the calibration procedures of instruments.	*CO(AM) 3.3*	5	
	3.4.4 Quality Procedures			
	a) Discuss the Quality Management System.	*CO(AM) 3.4*	6	
	b) Comply the quality assurance procedures with widely adopted international engineering standards.	*CO(AM) 3.4*	6	
	c) Carry out the quality control and quality assurance procedures.	*CO(AM) 3.4*	6	
	3.4.5 Maintenance			
	a) Carry out the planning and implementation of maintenance programmes including but not limited to preventive maintenance, breakdown maintenance and emergency response planning.	*CO(AM) 3.5*	6	
	b) Evaluate the applications and limitations of different types of maintenance system to select the appropriate maintenance strategy.	*CO(AM) 3.5*	5	
	c) Apply computer aided maintenance management system to fulfil the requirements of the maintenance strategy.	*CO(AM) 3.5*	5	

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Compe-tence Ref. (Associate Members)	Length of Time (weeks)
	d) Apply appropriate diagnostic techniques to analyse maintenance problems.	*CO(AM) 3.5*	5	
	3.4.6 Operation			
	a) Carry out operational procedures of an engineering process for safety in operation and maintenance.	*CO(AM) 3.6*	6	
	b) Examine the organisational structure of the operation team such as the roles and responsibilities of team members.	*CO(AM) 3.6*	5	
	c) Evaluate the adequacy of safety measures during the operation and maintenance of an engineering process.	*CO(AM) 3.6*	5	
	d) Analyze the risk in the engineering process.	*CO(AM) 3.6*	5	
	4. Engineering Administration and Management Techniques			**20**
	4.1 Leadership and Management			4
Location 10	***Description 10***			
	a) Discuss the various leadership qualities required of a leader including accountability, conflict management and resources management etc.	*CCO(AM) 1.12(a)*	6	
	b) Explain the importance of accountability and responsibility required by a leader for making decisions on engineering activities.	*CCO(AM) 1.12(a)*	6	
	c) Apply various management skills in engineering projects.	*CCO(AM) 1.12(b)*	6	
	d) Distinguish the relationship between good leadership and good management skills.	*CCO(AM) 1.12(c)*	6	
	e) Demonstrate an understanding of the importance of teamwork, partnering and supervision skills in engineering projects.	*CCO(AM) 1.12(d)*	6	
	4.2 Technical and Commercial Leadership			16
Location 11	***Description 11***			
	4.2.1 Interpretation, preparation and communication of requirements. Specifications and drawings			
	a) Analyze the client requirements.	*CO(AM) 4.1*	6	
	b) Examine specifications according to the client requirements.	*CO(AM) 4.1*	6	
	c) Produce engineering drawings.	*CO(AM) 4.1*	6	
	4.2.2 Materials / equipment procurement procedures; tendering procedures, tender appraisal and contract administration			
	a) Carry out the procurement process such as tender, evaluation, contract award and administration.	*CO(AM) 4.2*	6	
	4.2.3 Estimating labour, materials, installation and transportation costs			
	a) Examine the cost estimates of the engineering project including labour resources, materials, installation process and transport costs.	*CO(AM) 4.4*	6	
	4.2.4 Project work, scheduling or management			
	a) Implement the project plan and identify the critical path(s).	*CO(AM) 4.3*	6	
	b) Execute the project budget activities.	*CO(AM) 4.3*	6	

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	c) Carry out project work scheduling process.	*CO(AM) 4.5*	6	
	d) Carry out project work supervision process.	*CO(AM) 4.6*	6	
	4.2.5 Reports & Presentations			
	a) Produce well-structured, clear and concise reports and operation manuals.	*CO(AM) 4.7*	10	
	b) Apply presentation technique in a professional manner.	*CO(AM) 4.7*	10	
	5. Technology in specialized areas			**10**
	5.1 In-depth Experience			
Location 12	***Description 12***			
	a) Appraise the technology applications to the design, installation, testing, commission, maintenance and improvement works of one of the below engineering areas: ▪ Mechanical plant ▪ Pumping system ▪ Air conditioning and ventilation system ▪ Control system ▪ Others as appropriate	*CO(AM) 5.1*	2	
	6. Objective Training			**16**
Location 13	***Description 13***			
	This section covers training in any activities related to mechanical 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.			
	7. Other Common Core Outcomes for Continuous Development			**Contin-uous**
	7.1 Development of Personal Qualities			
Location 14	***Description 14***			
	a) Identify appropriate innovative approach and/or tools for professional development.	*CCO(AM) 1.10(a)*	11	
	b) Demonstrate interpersonal skills for professional development.	*CCO(AM) 1.10(b)*	10	
	c) Demonstrate negotiating skills required for various engineering activities.	*CCO(AM) 1.11(d)*	10	
	d) Demonstrate sound time management skills for professional development.	*New CCO*	11	
	e) Demonstrate a commitment to continuous development and enhancement.	*New CCO*	11	
	7.2 Communication			
Location 15	***Description 15***			
	a) Communicate ideas orally in an accurate and clear manner under various situations (including presentations and meetings).	*CCO(AM) 1.11(a), (c)*	10	

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	b) Formulate an oral presentation of complicated data and information in an effective and persuasive manner.	*CCO(AM) 1.11(a)*	10	
	c) Produce grammatically correct, clear and concise documents (including memos, letters, instructions, reports and resumes) which meet the business objectives.	*CCO(AM) 1.11(b)*	10	
	d) Evaluate the needs of the intended readers to design appropriate technical contents for communication.	*CCO(AM) 1.11(b)*	10	
	7.3 Human Resources Management			
Location 16	***Description 16***			
	a) Demonstrate the awareness of the duties and employment criteria for different job positions in an engineering project.	*CCO(AM) 1.8(a)*	6	
	b) Demonstrate an understanding of the relevant legal requirements and regulatory issues of labour employment and management.	*CCO(AM) 1.8(b)*	6	
	c) Identify the appropriate staff training and development programmes in the organisation.	*CCO(AM) 1.8(c)*	6	
	7.4 Business Operations			
Location 17	***Description 17***			
	a) Recognise the importance of intellectual property to business operations.	*New CCO*	11	
	b) Describe the legal requirements in Hong Kong relevant to intellectual property rights.	*New CCO*	11	
	c) Identify appropriate tools and method to measure and improve the productivity of business operations.	*CCO(AM) 1.7(a)*	11	
	d) Identify appropriate information technology applications to manage business information and to facilitate business operations.	*CCO(AM) 1.7(d)*	11	
	e) Recognise the importance of research and development towards business operations.	*CCO(AM) 1.7(e)*	11	
	f) Demonstrate the awareness of financial considerations in operation business.	*CCO(AM) 1.7(c)*	11	
	g) Recognise the importance of business development in business operations.	*New CCO*	11	

N.B.

1. The training period must not be less than 104 weeks (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 M4 Routes to Membership.
4. During the training, each trainee is required to maintain Training Log Book, Record of Continuing Professional Development and Record of Training Outcomes.