

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

Location where Training will be done	Training Outcomes	Previous Reference	HKIE Competence Ref.	Length of Time (weeks)
	<b>1. Introduction</b>			<b>1</b>
	1.1 Information about the Company			
<b><i>Location 1</i></b>	<b><i>Description 1</i></b>			
	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	

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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			
<b>Location 2</b>	<b>Description 2</b>			
	<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>	
	<b>2. Engineer as a Profession</b>			<b>Continuous</b>
	2.1 Professionalism			
<b>Location 3</b>	<b>Description 3</b>			
	<p>a) Discuss the social and ethical responsibilities of engineers in society.</p>	<p><i>CCO 1.2</i></p>	<p>8</p>	

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	<p>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.</p> <p>c) Explain the ethical standards and responsibilities of professional engineers as required by the HKIE.</p> <p>d) Demonstrate the awareness to follow the codes of practice of professional engineers.</p> <p>e) Demonstrate the awareness to uphold the dignity, standing and reputation of the engineering profession.</p> <p>f) Demonstrate the awareness to protect the interests of the community including the environment, welfare, health and safety in conducting engineering activities.</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><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			
<b>Location 4</b>	<b>Description 4</b>			
	<p>a) Demonstrate an understanding of the statutory health and safety requirements.</p> <p>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.</p> <p>c) Apply the safety management system in accordance with the industry standards and regulatory requirements.</p>	<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			
<b>Location 5</b>	<b>Description 5</b>			
	<p>a) Demonstrate an understanding of the relevant statutory environmental requirements related to the trainee’s discipline.</p>	<p><i>CCO 1.6</i></p>	<p>9</p>	

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	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	
	<b>3. Fire Engineering Practice, and Projects Specifications</b>			<b>57</b>
	3.1 Basic Engineering Practice			4
<b>Location 6</b>	<b>Description 6</b>			
	3.1.1 Fire Engineering Practice			
	a) Comprehend the functions and use of machineries, hand tools, power tools, measuring equipment and testing instruments.	<i>New CO</i>	1	
	b) Examine the commercial and industrial application of electricity.	<i>New CO</i>	1	
	c) Appraise the operation of electrical components such as generators, switchgears, transformers, cables, protection and control equipment, etc.	<i>New CO</i>	1	
	d) Appreciate the selection of appropriate electrical components and/or installations such as emergency generators, switchgears, protection and control equipment, LV Switchboard etc.	<i>New CO</i>	1	
	e) Appraise appropriate areas of usage of common engineering metallic and non-metallic materials.	<i>New CO</i>	1	
	f) Appraise and examine HVAC principles including pressure testing, different types of fan working principle, air leakage testing, applications and limitations of different materials joining process.	<i>New CO</i>	1	

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	<p>g) Appraise and examine pipework connection and jointing method, pressure and hydraulic testing processes that are relevant to fire safety installations utilising water and gaseous extinguishant.</p> <p>h) Appraise and examine the components and operation of manual and automatic fire alarm installations and different types of fire suppression equipment such as sprinklers, FH/HR.</p> <p>i) Comprehend the fire extinguishing principles of portable fire extinguishing equipment.</p>	<p><i>New CO</i></p> <p><i>New CO</i></p> <p><i>New CO</i></p>	<p>1</p> <p>1</p> <p>1</p>	
	3.2 Fire Engineering Fundamentals			4
<b>Location 7</b>	<b>Description 7</b>			
	<p>3.2.1 Properties of Combustion</p> <p>a) Explain the various properties of combustion due to different kinds of fuels, flame types, heat transfer, ignition, fast burning fire, deflagration and detonation, hazardous combustion production and traveling smoke etc.</p> <p>3.2.2 Behaviour of Building Elements Under the Action of Fire</p> <p>a) Demonstrate knowledge of the behavior of different types of building elements in fires.</p> <p>b) Formulate fire resistance protection for various types of building elements and usages.</p> <p>c) Apply appropriate standards of fire safety.</p> <p>d) Apply results of the fire tests of materials.</p>	<p><i>CO 1.1</i></p> <p><i>CO 1.2</i></p> <p><i>CO 1.2</i></p> <p><i>CO 1.2</i></p> <p><i>CO 1.2</i></p>	<p>1</p> <p>1</p> <p>3</p> <p>2</p> <p>3</p>	

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	e) Appraise the fire resistance treatment process.	<i>CO 1.2</i>	1	
	3.2.3 Fire Detection and Suppression Systems			
	a) Demonstrate an understanding of the strength and limits of different types of fire detection and suppression systems.	<i>CO 1.3</i>	1	
	b) Develop applications of fire detection and suppression systems.	<i>CO 1.3</i>	4	
	c) Comply with the relevant standards for fire detection and suppression systems installation.	<i>CO 1.3</i>	2	
	d) Evaluate standards of performance rating of fire detection and suppression systems.	<i>CO 1.3</i>	4	
	e) Examine specifications of fire detection and suppression systems.	<i>CO 1.3</i>	4	
	3.2.4 Materials of the Smoke Extraction System			
	a) Differentiate the types of fans and ductings in the smoke extraction system.	<i>CO 1.4</i>	1	
	b) Select the materials and insulating materials to be used in the smoke extraction system.	<i>CO 1.4</i>	12	
	c) Assess joints and connection of the smoke extraction system.	<i>CO 1.4</i>	4	
	d) Examine the specifications of the smoke extraction system.	<i>CO 1.4</i>	4	
	3.2.5 Foot Traffic Flows and Their Characteristics			
	a) Demonstrate an understanding of the significance of synchronous movement and nonsynchronous movement in evacuation.	<i>CO 1.5</i>	1	
	b) Evaluate different forms of traffic movement speed.	<i>CO 1.5</i>	3	

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	c) Analyse flow traffic along a path and on an escalator.	<i>CO 1.5</i>	3	
	3.2.6 Properties of Consumer Items			
	a) Evaluate different types of fire properties of consumer items including clothing and upholstery etc.	<i>CO 1.6</i>	3	
	b) Evaluate the effects of fire retardants.	<i>CO 1.6</i>	3	
	c) Assess the distribution of fire loads.	<i>CO 1.6</i>	3	
	3.3 Fire Services Installation and Equipment Operational Reliability			12
<b>Location 8</b>	<b>Description 8</b>			
	3.3.1 System Interface			
	a) Evaluate systems compatibility with different types of installations including automatic interfacing with other building services installation.	<i>CO 3.1</i>	4	
	b) Design an audio, visual and voice emergency notification system.	<i>CO 3.1</i>	4	
	c) Develop fire egress signage and lighting.	<i>CO 3.1</i>	4	
	3.3.2 Instrumentation			
	a) Select appropriate instruments with considerations such as range and accuracy.	<i>CO 3.3</i>	5	
	b) Select instruments for performance monitoring.	<i>CO 3.3</i>	5	
	c) Compile the calibration procedures of instruments.	<i>CO 3.3</i>	1	
	3.3.3 Maintenance			
	a) Develop the planning and implementation of maintenance.	<i>CO 3.4</i>	4	

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	<ul style="list-style-type: none"> <li>b) Examine different types of maintenance systems and programmes such as systematic maintenance system, preventive maintenance and emergency repair etc.</li> <li>c) Apply appropriate diagnostic techniques to analyse maintenance problems.</li> </ul>	<i>CO 3.4</i>	3	
		<i>CO 3.4</i>	5	
	3.4 Fire Safety Standards and Risk Management			4
<b>Location 9</b>	<b>Description 9</b>			
	3.4.1 Design Aspect <ul style="list-style-type: none"> <li>a) Analyse the compatibility of different types of occupancies.</li> <li>b) Assess human physiology, psychology and response in emergencies.</li> <li>c) Carry out fire load estimation.</li> <li>d) Carry out life, fire risk and offsite risk assessments.</li> <li>e) Compile the design with relevant legislations.</li> </ul>	<i>CO 2.5</i>	4	
		<i>CO 2.5</i>	4	
		<i>CO 2.5</i>	5	
		<i>CO 2.5</i>	7	
		<i>CO 2.5</i>	2	
	3.5 Fire Engineering Design			21
<b>Location 10</b>	<b>Description 10</b>			
	3.5.1 Acquire skills in engineering design <ul style="list-style-type: none"> <li>a) Demonstrate a mastery of relevant engineering tools including 2D / 3D CAD drawings, Building Information Modelling (BIM), word and data processing, spreadsheet, presentation software etc.</li> <li>b) Apply accepted drawing practices, conventions and standards, legends, symbols and abbreviations.</li> </ul>	<i>New CO</i>	4	
		<i>New CO</i>	4	

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	<p>c) Differentiate the division of responsibilities between related professionals including architects, surveyors, structural / civil, building services and electrical engineers.</p> <p>3.5.2 Fire Safety Design</p> <p>a) Assess the requirements of different stages of design (on buildings, industrial processes, transport activities, cities and communities).</p> <p>b) Appraise the requirements of different types and scale of design (on buildings, industrial processes, transport activities, cities and communities).</p> <p>c) Apply appropriate computer software in the fire safety design process.</p> <p>d) Apply design specifications.</p> <p>e) Appraise relevant fire safety standards.</p> <p>f) Appraise the design verification process.</p> <p>3.5.3 Fire Simulation / Modeling</p> <p>a) Apply various models in fire tests and / or simulation such as zone model, field model and evacuation model etc.</p> <p>b) Assess the simulation / test / modeling results with different perspectives.</p>	<p><i>New CO</i></p> <p><i>CO 2.1</i></p> <p><i>CO 2.1</i></p> <p><i>CO 2.1</i></p> <p><i>CO 2.1</i></p> <p><i>CO 2.1</i></p> <p><i>CO 2.1</i></p> <p><i>CO 2.2</i></p> <p><i>CO 2.2</i></p>	<p>5</p> <p>4</p> <p>4</p> <p>1</p> <p>4</p> <p>2</p> <p>1</p> <p>1</p> <p>12</p>	

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	<p>3.5.4 Active Fire Protection</p> <p>a) Develop the following systems such as fire detection and alarm systems, gas detection and alarm systems, fire extinguishing and suppression systems, portable equipment, supervisory and control system, smoke and gas control and management system etc.</p> <p>b) Comply the active fire protection design with relevant codes and standards.</p> <p>c) Produce clear specifications of an active fire protection design.</p> <p>3.5.5 Passive Fire Protection</p> <p>a) Develop the following systems such as compartmentation and fire separation, fire resistance rating, fire escape egress and fire rescue access.</p> <p>b) Comply the passive fire protection design with relevant codes and standards.</p> <p>c) Produce clear specifications of a passive fire protection design.</p>	<p>CO 2.3</p> <p>CO 2.3</p> <p>CO 2.3</p> <p>CO 2.2</p> <p>CO 2.2</p> <p>CO 2.2</p>	<p>4</p> <p>2</p> <p>4</p> <p>4</p> <p>2</p> <p>4</p>	
	3.6 Site Engineering Practices			6
<b>Location 11</b>	<b>Description 11</b>			
	<p>3.6.1 System Testing and Commissioning</p> <p>a) Develop the procedures of testing and commissioning of an engineering project.</p> <p>b) Plan the preparation works of testing and commissioning of an engineering project.</p> <p>c) Assess the testing process.</p>	<p>CO 3.2</p> <p>CO 3.2</p> <p>CO 3.2</p>	<p>4</p> <p>4</p> <p>1</p>	

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	3.7 Fire Management			6
<b>Location 12</b>	<b>Description 12</b>			
	3.7.1 Fire Fighting Operation			
	a) Identify fire fighting equipment.	<i>CO 4.1</i>	1	
	b) Describe appliances operation.	<i>CO 4.1</i>	1	
	c) Describe command, control and communication.	<i>CO 4.1</i>	1	
	d) Describe fire-ground strategies and tactics.	<i>CO 4.1</i>	1	
	3.7.2 Fire Investigation			
	a) Develop the procedures to preserve the fire scene.	<i>CO 4.2</i>	5	
	b) Recognise fire ignition, growth and spread.	<i>CO 4.2</i>	5	
	c) Identify the point of origin and source of ignition.	<i>CO 4.2</i>	5	
	d) Support appropriate authorities in carrying out forensic investigations.	<i>CO 4.2</i>	5	
	3.7.3 Fire Safety Management			
	a) Appraise evacuation routes and rescue access.	<i>CO 4.3</i>	1	
	b) Appraise the function and purpose of a fire drill.	<i>CO 4.3</i>	1	
	c) Appraise the requirements of a fire safety audit.	<i>CO 4.3</i>	1	
	d) Compile fire safety strategy and emergency action plans.	<i>CO 4.3</i>	1	
	<b>4. Administration, Management, Technical and Supporting Functions</b>			<b>20</b>
	4.1 Interpretation or preparation and communication of requirements and specifications and drawings.			4
<b>Location 13</b>	<b>Description 13</b>			
	a) Analyse client and / or project requirements.	<i>CO 5.1</i>	6	
	b) Compile specifications according to the client and / or project requirements.	<i>CO 5.1</i>	6	
	c) Develop engineering drawings.	<i>CO 5.1</i>	6	

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	4.2 Knowledge on relevant statutory submission procedures, regulations and other organisations relating to fire engineering disciplines.			2
<b>Location 14</b>	<b>Description 14</b>			
	a) Interpret fire safety related Ordinances, regulations, codes and standards.	<i>New CO</i>	6	
	b) Describe the procedures and methodologies in obtaining comments and approvals from various authorities.	<i>New CO</i>	6	
	c) Manage pre-inspection testing and commissioning of systems and installations.	<i>New CO</i>	6	
	d) Co-ordinate with authorities and other trades in supporting statutory inspections and acceptance tests.	<i>New CO</i>	6	
	4.3 Tendering procedures, tenders appraisal and contract administration			
<b>Location 15</b>	<b>Description 15</b>			
	a) Support the procurement process such as tender and / or contract appraisal and administration.	<i>CO 5.2</i>	6	
	b) Support provision of response to tender queries, interviews and variations.	<i>CO 5.2</i>	6	
	4.4 Project work scheduling and management OR management information service.			10
<b>Location 16</b>	<b>Description 16</b>			
	a) Integrate fire engineering into project planning, programming and management information services.	<i>CO 5.3</i>	6	
	b) Formulate the fire engineering budget such as labour resources, materials, installation processes and transport costs etc.	<i>CO 5.3</i>	6	
	c) Derive the cost estimates of the engineering project including labour resources, materials, installation processes and transport costs.	<i>CO 5.4</i>	6	

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	d) Formulate project work scheduling and management plan by adopting appropriate management information system.	<i>CO 5.5</i>	6	
	4.5 Communication skills in verbal and written Chinese and English.			
<b>Location 17</b>	<b>Description 17</b>			
	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	
	4.6 Preparation of reports, operation and maintenance manuals etc.			4
<b>Location 18</b>	<b>Description 18</b>			
	a) 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	
	b) Evaluate the needs of the intended readers to design appropriate technical contents for communication.	<i>CCO 1.7</i>	10	
	c) Produce well-structured, clear and concise reports.	<i>CO 5.6</i>	10	
	<b>5. Objective Training</b>			<b>26</b>
	<i>This section allows the trainee to put to use, under supervision, a wide range of the knowledge and experience gained in academic studies and in the course of the activities outlined. He/she should be given responsibilities and commensurate authority to render a useful and productive service. Special courses dealing with the particular technologies having a bearing future work may be necessary during training; computer applications should also be included, where appropriate. All Training Outcomes, if not yet achieved in earlier parts of training, should be completed here.</i>			

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	<b>6. Other Common Core Outcomes for Continuous Development</b>			<b>Continuous</b>
	6.1 Leadership Qualities			
<b>Location 19</b>	<b>Description 19</b>			
	a) Discuss the various leadership qualities required of a leader including accountability, conflict management and resources management etc.	<i>CCO 1.9</i>	6	
	b) Explain the importance of accountability and responsibility required by a leader for making decisions on engineering activities.	<i>CCO 1.9</i>	6	
	c) Apply various management skills in engineering projects.	<i>CCO 1.9</i>	6	
	d) Distinguish the relationship between good leadership and good management skills.	<i>CCO 1.9</i>	6	
	e) Demonstrate an understanding of the importance of teamwork and partnering skills in engineering projects.	<i>CCO 1.9</i>	6	
	6.2 Conducting technical presentation, sales and contract negotiation.			
<b>Location 20</b>	<b>Description 20</b>			
	a) Demonstrate negotiating skills required for various engineering activities.	<i>CCO 1.4</i>	10	
	6.3 Knowledge of general administration including financial management, human resources, social awareness, marketing technique etc.			
<b>Location 21</b>	<b>Description 21</b>			
	6.3.1 Human Resources Management			
	a) Demonstrate the awareness of the duties and employment criteria for different job positions in an engineering project.	<i>CCO 1.8</i>	6	
	b) Demonstrate an understanding of the relevant legal requirements and regulatory issues of labour employment and management.	<i>CCO 1.8</i>	6	

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	<p>c) Discuss the appropriate staff training and development programmes in the organisation.</p> <p>6.3.2 Business Operations</p> <p>a) Recognise the importance of intellectual property to business operations.</p> <p>b) Describe the legal requirements in Hong Kong relevant to intellectual property rights.</p> <p>c) Identify appropriate tools and method to measure and improve the productivity of business operations.</p> <p>d) Identify appropriate information technology applications to manage business information and to facilitate business operations.</p> <p>e) Recognise the importance of research and development towards business operations.</p> <p>f) Demonstrate the awareness of financial considerations in operating business.</p> <p>g) Recognise the importance of business development in business operations.</p>	<p><i>CCO 1.8</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>CCO 1.11</i></p>	<p>6</p> <p>11</p> <p>11</p> <p>11</p> <p>11</p> <p>11</p> <p>11</p> <p>11</p>	
	6.4 Development of Personal Qualities			
<b>Location 22</b>	<b>Description 22</b>			
	<p>a) Identify appropriate innovative approach and/or tools for professional development.</p> <p>b) Demonstrate interpersonal skills for professional development.</p> <p>c) Demonstrate sound time management skills for professional development.</p> <p>d) Demonstrate a commitment to continuous development and enhancement.</p>	<p><i>CCO 1.4</i></p> <p><i>CCO 1.4</i></p> <p><i>CCO 1.4</i></p> <p><i>CCO 1.4</i></p>	<p>11</p> <p>10</p> <p>11</p> <p>11</p>	

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

**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 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 experience to the trainees to enable them to appreciate the skills, knowledge and workmanship required to resolve practical fire safety engineering challenges. It is expected that the workshop training should cover basic engineering practices in using different types of hand tools and various testing instruments, basic industrial health and safety training, the appropriate use of different types of personal protective equipment, and basic skills related to fire engineering. The training centre should provide the necessary and suitable tools, equipment and facilities to conduct, but not limited to, at least 80% of the following training elements:

- (i) Bench work
- (ii) Various basic skills in machining and metal work
- (iii) Lighting design
- (iv) Heat ventilation and air conditioning work (system installation)
- (v) Different types of control circuits, power cable jointing and termination
- (vi) Use of different test equipment and instrument
- (vii) Hand, power, machine and computer-aided tools
- (viii) Fire service pipework cutting and jointing method
- (ix) Manual and automatic fire alarm system installation
- (x) Conduit, MCB, LMCP, LV switchboard installation
- (xi) Extra low voltage system installation
- (xii) Portable extinguishing equipment operation principles