

**THE HONG KONG INSTITUTION OF ENGINEERS**  
**SCHEME “A” GRADUATE TRAINING**  
**CONSOLIDATED MODEL TRAINING GUIDE**  
**BIOMEDICAL 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 <ul style="list-style-type: none"> <li>a) Discuss the size, history and internal culture of the trainee’s own organisation.</li> <li>b) Discuss an overview of the relationship between the trainee’s own organisation, government departments and other organisations.</li> <li>c) Discuss the structure and functions of different units within the trainee’s own organisation.</li> <li>d) Demonstrate the awareness to follow operational procedures and practices as required by the trainee’s own organisation.</li> <li>e) Discuss the objectives, requirements and processes that support the quality assurance system within the trainee’s own organisation.</li> <li>f) Apply the quality assurance system according to the policy of the trainee’s own organisation.</li> </ul>	CCO 1.10  CCO 1.10  CCO 1.10  CCO 1.10  CCO 1.10	11          11	
	1.1.2 Training Programme, Prospects and Career Development <ul style="list-style-type: none"> <li>a) Discuss an overview of the internal communication systems, training system and career development pathway within the trainee’s own organisation.</li> </ul>	CCO 1.10	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) Comprehend the role of Biomedical Engineers in the healthcare system of Hong Kong such as public / private hospitals, clinics, equipment suppliers / manufacturers, service providers or consultants.</p>	<p><i>CO 1.1</i></p>	<p>1</p>	

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	<ul style="list-style-type: none"> <li>b) Comprehend international standards of biomedical engineering and medical devices commonly used in Hong Kong and local legislations.</li> <li>c) Discuss the social and ethical responsibilities of engineers in society.</li> <li>d) 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.</li> <li>e) Explain the ethical standards and responsibilities of professional engineers as required by HKIE.</li> <li>f) Demonstrate the awareness to follow the codes of practice of professional engineers.</li> <li>g) Demonstrate the awareness to uphold the dignity, standing and reputation of the engineering profession.</li> <li>h) Demonstrate the awareness to protect the interests of the community including the environment, welfare, health and safety in conducting engineering activities.</li> </ul>	<p><i>CO 1.4</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><i>CCO 1.2</i></p> <p><i>CCO 1.2</i></p>	<p>2</p> <p>8</p> <p>8</p> <p>8</p> <p>8</p> <p>8</p> <p>8</p>	
	<b>2.2 Occupational Safety and Health</b>			
<b>Location 4</b>	<b>Description 4</b>			
	<ul style="list-style-type: none"> <li>a) Demonstrate an understanding of the statutory health and safety requirements.</li> <li>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.</li> <li>c) Apply the safety management system in accordance with the industry standards and regulatory requirements.</li> </ul>	<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>	

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	2.3 Environment			
<b>Location 5</b>	<b>Description 5</b>			
	a) Demonstrate an understanding of the relevant statutory environmental requirements related to the trainee’s discipline.	<i>CCO 1.6</i>	9	
	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. Biomedical Engineering in Practice</b>			<b>32</b>
	3.1 Workshop Practice or Factory Practice			4
<b>Location 6</b>	<b>Description 6</b>			
	a) Comprehend basic instrumentation (electrical, mechanical, chemical aspects etc.).	<i>CO 1.2</i>	1	
	b) Comprehend basic theories of biomedical equipment (devices) and their applications.	<i>CO 1.2</i>	1	
	c) Use biomedical engineering tools and testing equipment.	<i>CO 1.2</i>	6	
	d) Demonstrate the awareness of hazards and safety issues (e.g. electrical hazards, mechanical hazards, biohazards etc.).	<i>CO 1.2</i>	9	
	e) Demonstrate the awareness to conduct engineering activities to widely recognised biomedical ethical standard (e.g. investigations involving animal or human subjects).	<i>CO 1.2</i>	8	
	f) Apply 2D and 3D CAD modelling skills effectively to compose engineering drawings complied with engineering standard.	<i>New CO</i>	4	
	g) Use of additive manufacturing and the basic manipulations skills in handling medical data for BME product development.	<i>New CO</i>	3	

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	h) Demonstrate the awareness of uses of advanced technologies (e.g. Artificial Intelligence (AI) and robotics and Extended Reality (xR) in BME applications.	<i>New CO</i>	1	
	3.2 Clinical and Laboratory Environment Practice			8
<b>Location 7</b>	<b>Description 7</b>			
	a) Comprehend clinical and laboratory environment and use of biomedical equipment in these areas.	<i>CO 1.3</i>	1	
	b) Comprehend relevant regulations, standards, code of practice, guidelines etc.	<i>CO 1.4</i>	1	
	3.3 Biomedical Engineering Problems, Solutions and Designs			20
<b>Location 8</b>	<b>Description 8</b>			
	a) Carry out an active part, probably in a supporting role, in researching, assembling and assessing basic data.	<i>CO 2.1</i>	3	
	b) Carry out thinking / analytical process to define biomedical engineering (BME) work problem.	<i>CO 2.1</i>	4	
	c) Produce clear and concise Quarterly Reports on the involvement and experience of the BME work problem.	<i>CO 2.1</i>	10	
	d) Carry out a supporting role to evaluate alternative solutions from technical and financial perspectives for the BME work problem.	<i>CO 2.2</i>	1	
	e) Comprehend through working and practicing the design concepts of the projects on which you work, and the effect of any other external constraints on the design principles.	<i>CO 2.2</i>	1	
	f) Produce clear and concise record in Quarterly Reports detailing the appreciation of the factors involved in the choice of the adopted solutions of the BME work problem.	<i>CO 2.2</i>	10	

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	g) Comprehend the International Standards, Risk Management theories etc., of the adopted solutions for the BME work problem.	<i>CO 2.3</i>	1	
	h) Comprehend the Hong Kong Codes of Practice (COP) and Technical Memoranda (TM) etc. of the adopted solutions for the BME work problem.	<i>CO 2.3</i>	2	
	i) Produce clear and concise Quarterly Reports with reference to your appreciation of the application and limitations of standards, COP, TM, etc., of the adopted solutions for the BME work problem.	<i>CO 2.3</i>	10	
	j) Carry out a supporting role to analyse the user requirements, product and/or service specifications.	<i>CO 2.4</i>	3	
	k) Carry out a supporting role to prepare clear and concise specification document.	<i>CO 2.4</i>	10	
	l) Combine all the relevant data and analytical work for the identified BME work problem and its alternative solutions appropriate to your sector of the industry.	<i>CO 2.5</i>	6	
	m) (1) Produce a preferred solution with justification for assessment by the supervisor showing how this work contributes to the solution of the problem and (2) identification of the major factors on which the solution depends for accuracy or completeness including safety, quality and ease for testing and maintenance.	<i>CO 2.5</i>	5	
	n) Exercise professional engineering judgement to produce a solution.	<i>CO 2.5</i>	12	
	o) Design engineering solutions for the identified BME problem.	<i>CO 2.6</i>	4	
	p) Develop the processes to implement the engineering solutions.	<i>CO 2.6</i>	4	

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	<p>q) Carry out information processing method and technique involved in product and/or service design, experimental work and the laboratory testing and proving of equipment against user requirement.</p> <p>r) Produce clear and concise documentation on the solution containing diagrams, sketches, charts, etc.</p> <p>s) Produce clear and concise computer aided design documentation where appropriate.</p> <p>t) Carry out in a supporting role to prepare costing solutions by taking off quantities and building up cost estimates.</p> <p>u) Comprehend the knowledge of products or services provided by organisation.</p>	<i>CO 2.7</i>	4	
		<i>CO 2.8</i>	10	
		<i>CO 2.8</i>	10	
		<i>CO 2.9</i>	6	
		<i>CO 2.10</i>	3	
	<b>4. Production Engineering</b>			<b>16</b>
	4.1 BME Design and Production			8
<b>Location 9</b>	<b>Description 9</b>			
	a) Carry out in a supporting role the design and production process.	<i>CO 3.1.1</i>	4	
	b) Differentiate the duties and responsibilities of all parties of the project team.	<i>CO 3.1.2</i>	6	
	c) Apply procedure to keep record for the issue and/or receipt, registration and filing of work instructions and/or drawings and amendments.	<i>CO 3.1.3</i>	6	
	d) Carry out accurate daily recording of events and instructions.	<i>CO 3.1.4</i>	6	
	e) Compile engineering drawings.	<i>CO 3.1.5</i>	6	
	f) Execute work instructions.	<i>CO 3.1.5</i>	6	

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	4.2 Safety Standards, Quality Control and Risk Management			8
<b>Location 10</b>	<b>Description 10</b>			
	a) Apply production methods, planning, quality assurance and control methods, progress methods and the associated documentation from the procurement of raw materials and/or the components of a system through production or site assembly to testing of final product, the component parts of a system and/or the complete system.	<i>CO 3.2.1</i>	6	
	b) Carry out works of installation, commissioning, operation and maintenance.	<i>CO 3.3.1</i>	6	
	c) Examine the information contained in a test report.	<i>CO 3.3.2</i>	5	
	d) Apply work test procedures for major plants and/or products.	<i>CO 3.3.2</i>	6	
	e) Apply procedures in handling, assembling and installation of equipment and plants on site, with emphasis on control of workmanship and safety.	<i>CO 3.3.3</i>	6	
	f) Analyse the potential risks of handling, assembling and installation of equipment and plants on site.	<i>CO 3.3.3</i>	7	
	g) Evaluate the potential safety impacts from handling, assembling and installation of equipment and plants on site.	<i>CO 3.3.3</i>	9	
	<b>5. Biomedical Engineering Administration, Management and Supporting Functions</b>			<b>28</b>
	5.1 Project Management in BME			14
<b>Location 11</b>	<b>Description 11</b>			
	a) Formulate planning and scheduling of the resources and activities involved in a project.	<i>CO 4.1.1</i>	6	
	b) Assess the project progress against the schedule and make necessary amendment.	<i>CO 4.1.2</i>	3	

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	5.2 Material and Service Procurement in BME			6
<b>Location 12</b>	<b>Description 12</b>			
	a) Formulate the material or service procurement requirements, with standards, technical and commercial terms as appropriate.	<i>CO 4.2.1</i>	5	
	b) Appraise procurement considerations and procedures for materials, products and services.	<i>CO 4.2.2</i>	5	
	c) Assess the quality of material and service.	<i>CO 4.2.3</i>	9	
	5.3 Product Liability, Servicing and Safety Case related to BME			4
<b>Location 13</b>	<b>Description 13</b>			
	a) Comprehend legal liability, local and foreign legislations in relation to the product or service involved.	<i>CO 4.3.1</i>	1	
	b) Carry out in a supporting role to manage spare parts and service support, maintenance arrangement and product life.	<i>CO 4.3.2</i>	5	
	c) Carry out in a supporting role for defect monitoring, documentation and feedback to product design and production engineering.	<i>CO 4.3.3</i>	5	
	d) Carry out in a supporting role for safety case investigation, follow-up action and recalls.	<i>CO 4.3.4</i>	9	
	5.4 Management and Commercial Activities in BME			4
<b>Location 14</b>	<b>Description 14</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	

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	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	
	<b>6. Objective Training – Project on Engineering Design / Production Engineering / Consultancy / Quality Control</b>			<b>27</b>
	<i>This section allows trainees to put to use, under supervision, a wide range of the knowledge and experience gained in academic studies and in the course of the training programme. The trainee should be given responsibilities and commensurate authority to render a useful and productive service. All Training Outcomes, if not yet achieved in earlier parts of training, should be completed here.</i>			
	<b>7. Other Common Core Outcomes for Continuous Development</b>			<b>Continuous</b>
	7.1 Development of Personal Qualities			
<b>Location 15</b>	<b>Description 15</b>			
	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 skills for professional development.	<i>CCO 1.4</i>	11	
	e) Demonstrate a commitment to continuous development and enhancement.	<i>CCO 1.4</i>	11	
	7.2 Communication			
<b>Location 16</b>	<b>Description 16</b>			
	a) Communicate ideas orally in an accurate and clear manner under various situations (including presentations and meetings).	<i>CCO 1.7</i>	10	

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	<ul style="list-style-type: none"> <li>b) Formulate an oral presentation of complicated data and information in an effective and persuasive manner.</li> <li>c) Produce grammatically correct, clear and concise documents (including memos, letters, instructions, reports, resumes and technical papers) which meet the business objectives.</li> <li>d) Evaluate the needs of the intended readers to design appropriate technical contents for communication.</li> </ul>	<i>CCO 1.7</i>	10	
		<i>CCO 1.7</i>	10	
		<i>CCO 1.7</i>	10	
	7.3 Human Resources Management			
<b>Location 17</b>	<b>Description 17</b>			
	<ul style="list-style-type: none"> <li>a) Demonstrate the awareness of the duties and employment criteria for different job positions in an engineering project.</li> <li>b) Demonstrate an understanding of the relevant legal requirements and regulatory issues of labour employment and management.</li> <li>c) Discuss the appropriate staff training and development programmes in the organisation.</li> </ul>	<i>CCO 1.8</i>	6	
		<i>CCO 1.8</i>	6	
		<i>CCO 1.8</i>	6	
	7.4 Business Operations			
<b>Location 18</b>	<b>Description 18</b>			
	<ul style="list-style-type: none"> <li>a) Recognise the importance of intellectual property to business operations.</li> <li>b) Describe the legal requirements in Hong Kong relevant to intellectual property rights.</li> <li>c) Identify appropriate tools and method to measure and improve the productivity of business operations.</li> <li>d) Identify appropriate information technology applications to manage business information and to facilitate business operations.</li> </ul>	<i>CCO 1.11</i>	11	
		<i>CCO 1.11</i>	11	
		<i>CCO 1.11</i>	11	
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	e) Recognise the importance of research and development towards business operations.	<i>CCO</i> <i>1.11</i>	11	
	f) Demonstrate the awareness of financial considerations in operation business.	<i>CCO</i> <i>1.11</i>	11	
	g) Recognise the importance of business development in business operations.	<i>CCO</i> <i>1.11</i>	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 M3 Routes to Membership.
4. During the training, each trainee is required maintain to a Graduate Training Log Book, Record of Continuing Professional Development and Record of Training Outcomes.