LEMBAGA TEKNOLOGIS MALAYSIA
MALAYSIA BOARD OF TECHNOLOGISTS

TVET SECTOR

TECHNOLOGY & TECHNICAL ACCREDITATION STANDARD

2nd Edition

TECHNOLOGY & TECHNICAL ACCREDITATION COUNCIL

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Empowering Technology Education

TVET SECTOR

Technology & Technical Accreditation Standard 2nd Edition*

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Tel	+603-8800 6268 / 8380
Fax	+603-8800 8381
Email	ttas@mbot.org.my
Website	https://www.mbot.org.my/
	https://www.ttasmbot.org.my/

LEMBAGA TEKNOLOGIS MALAYSIA
MALAYSIA BOARD OF TECHNOLOGISTS

Technology And Technical Accreditation Secretariat (TTAS)
Malaysia Board Of Technologists (MBOT)
A1-3-1, Ayer@8, Jalan P8G, Precinct 8, 62250, Putrajaya, MALAYSIA

PREFACE
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Siti Hamisah binti Tapsir, FASc.

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Department of Higher Education

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Confederation

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TASK FORCE
TTAC Standard 2nd Edition

Task Force Leader

Prof. Ts. Dr. Mohd Rusllim bin Mohamed

Assoc. Prof. Ts. Dr. Muhammad Fahmi bin Miskon

Assoc. Prof. Ts. Ir. Dr. Tan Lai Wai

Assoc. Prof. Ts. Dr. Zulkefli bin Mansor

Ts. Rama Rao Lachanna

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Noramira binti Zulkepli

Nur Farhana binti Mohd Muhaidin

Anis Syahrina binti Lukman

Aina Aqilah binti Lukman

Muhammad Izzat Hakimi bin Mustaffa

Nurhafiza binti Samsudin

Muhamad Fauzan bin Zainal Abidin

Umi Munirah binti Mohamad Puzi

Nur Izzaty Najihah binti Mohamad Sani

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Prof. Ts. Chm. Dr. Chan Chin Han
Prof. Ts. Dr. Mohamad Yusof bin Maskat
Datuk Ir. Kamarulzaman bin Zainal
Assoc. Prof. Mejar Ts. Dr. Mohd Hazizan bin Mohd Hashim
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Ts. Saiful Bahri bin Hamzah
Tc. Mohd Azrin bin Roselan
Shanmuga Kittappa
Foo Fang Yeow
Kamaruzzaman bin Wahid
Syed Ahmad Faiz bin Syed Kamarulzaman
Suraya binti Mohkilisan
Zainol'Aini binti Mohamed
Abdul Razak bin Ismail
Hajah Farina binti Zulkernain
Sheheide bin Sheh Omar
Fazlan bin Abdullah
Azahani binti Abd Aziz

ACRONYM

MBOT	-	Malaysia Board of Technologists
GT	-	Graduate Technologists
Ts./P.Tech	-	Professional Technologists
QT	-	Qualified Technicians
Tc./C.Tech	-	Certified Technicians
MQA	-	Malaysian Qualifications Agency
TTAC	-	Technology and Technical Accreditation Council
TTAS	-	Technology and Technical Accreditation Secretariat
TVET	-	Technical and Vocational Education and Training
MQF	-	Malaysian Qualifications Framework
AP	-	Accreditation Panel
PEO	-	Programme Educational Objective
PLO	-	Programme Learning Outcomes
CQI	-	Continuous Quality Improvement
SLT	-	Student Learning Time
SRR	-	Self-Review Report
PA	-	Provisional Accreditation
FA	-	Full Accreditation
CA	-	Compliance accreditation

Technologists and Technicians Act 2015 (Act 768)

Technologists and Technicians Act 2015 (Act 768) was passed by the Parliament of Malaysia and gazetted to take effect on 1 Aug 2015. It was instigated by the Tenth Malaysia Plan (10th MP) recommendation, which has identified the need to set up a professional body to register and recognise graduates of skills and technology. In contrast to other professional bodies, Act 768 governs the establishment of Malaysia Board of Technologists (MBOT) to cover both management & executive levels and executor & support groups, especially technical teams from technicians that can be recognised as professionals under Act 768. This recognition of technicians as professionals can subsequently elevate their status.

Introduction to MBOT

As defined by Collins, technology means "methods, systems and devices which result from scientific knowledge that are being used for practical purposes". Meanwhile, Oxford defines technology as "the application of scientific knowledge for practical purposes, especially in industry". In a nutshell, based on both definitions, technologists can be viewed as professionals who practise their knowledge based on the usage of tools and implementation of systems.

MBOT was officially formed in November 2016 as a professional body to award professional recognition to technologists and technicians. This occurred after the Parliament of Malaysia gazetted the Technologists and Technicians Act 2015 (Act 768) in 2015. Therefore, it is essential to recognise the roles and responsibilities of technologists and technicians in Malaysia as the nation is gearing towards the Fourth Industrial Revolution.

Under Section 21(1) and Section 22(1), a technologist is acknowledged as any individual with a bachelor's degree that is recognised by MBOT. Concurrently, technicians are acknowledged as any person with a certificate or relevant qualification recognised by MBOT. Membership registration was opened by MBOT for technologists and technicians with two categories of entry-level, namely Graduate Technologist (GT) for bachelor's degree holders and Qualified Technician (QT) for advanced diploma, diploma, and skill certificate holders.

Technologists and technicians who register with MBOT will have the opportunity to be recognised as Professional Technologists or Certified Technicians in accordance with their expertise. Figure 1.0 illustrates MBOT's continuous pathway for technologists and technicians.

Under Section 19 (Act 768), a Professional Technologist shall be entitled to approve and certify the manner or conduct of technology services to be carried out and he uses the abbreviated title "Ts." or "P.Tech". Conversely, under Section 20 (Act 768), a Certified Technician shall be entitled to approve and certify the manner or conduct of technical services to be carried out and he uses the abbreviated title "Tc." or "C.Tech". Both Ts. and Tc. are entitled to use the stamp as determined by MBOT.

The scope of services for technologists is clarified in Section 16(b), which involves any operations relating to product development, product manufacturing, product testing, product commissioning and product

maintenance. On the other hand, Section 16(a) outlines the scope of services for technicians which include any operations that relate to product testing, product commissioning, and product maintenance.

The functions of MBOT are to:

i. To recognise Professional Technologist and Certified Technician as professionals;
ii. To keep and maintain the Register under section 17;
iii. To provide facilities for the promotion of education and training and to hold or cause to be held, professional development programmes for registered persons to further enhance their knowledge relating to their professions;
iv. To conduct assessments or to cause assessments to be conducted by an institution approved by the Board for the purpose of admission to the profession;
v. To determine and regulate the conduct and ethics of the technologist and technician profession; and
vi. Generally, to carry out all such acts and do all such things as may appear to the Board necessary to carry out the provisions of this Act.

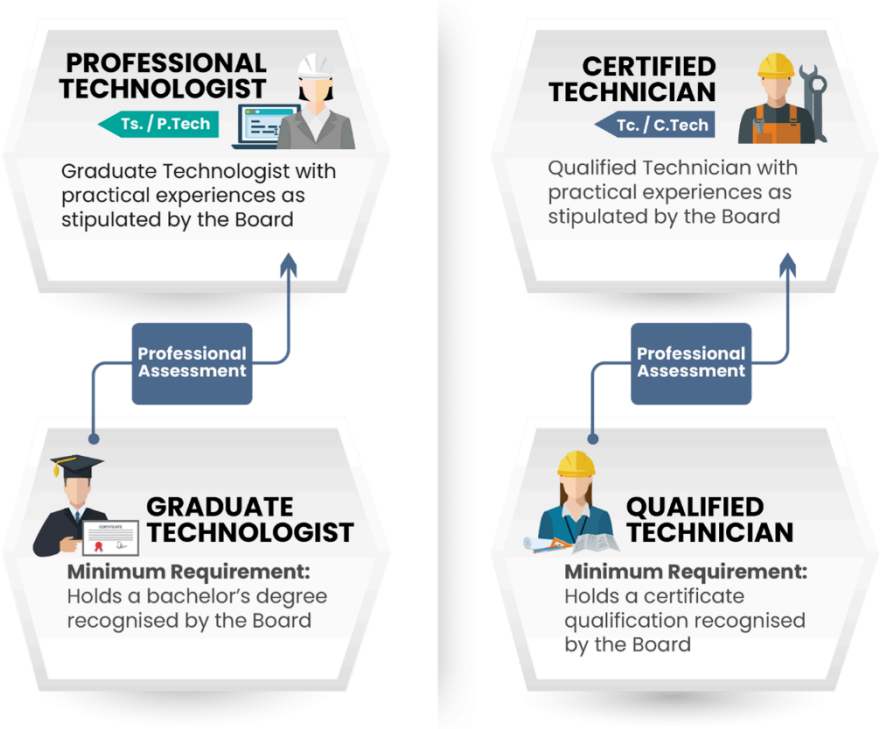

Figure 1.0. MBOT's continuous pathway for technologists and technicians

Technology and Technical Accreditation Council (TTAC)

Section 6 (2) (g) of Act 768 mentions that MBOT is empowered to set up a council to evaluate the quality assurance of academic programmes in the 24 fields of technology under the purview of MBOT. To ensure that the respective academic programmes meet the needs of respective stakeholders, especially industries with respect to labour supply, MBOT has agreed to set up TTAC on 13 October 2016 to evaluate the development and deliveries of academic programmes from Technical and Vocational Education and Training (TVET) provider. Moreover, TTAC acts as a Joint Technical Committee (JTC) between Malaysian Qualifications Agency (MQA) - MBOT to comply with the requirements of professional programmes and professional qualifications stipulated under the Act 679 - MQA Act 2007 Section 50-55.

TTAC members are:

i. Chairman
ii. Representative from MQA
iii. Representative from MBOT
iv. Representative from related Ministry
v. Representative from Learned Society
vi. Representative from Industries
vii. Representatives from Academicians
viii. Any representative to be determined by MBOT

The TTAC term of responsibilities are:

i. Acts as a Joint Technical Committee with MQA in accordance with Section 51 of the Act 679 to coordinate the accreditation process for Technology and Technical programmes.
ii. Approves policies, guidelines and detailed procedures for the accreditation of study programmes.
iii. Recommends accreditation decisions for study programmes.
iv. Approves the appointment of accreditation panel (AP).
v. Recommends policy changes related to the accreditation of study programmes to MBOT.
vi. Advise on matters related to the accreditation of study programmes.

Technology & Technical Accreditation Standard 2nd Edition (TVET Sector) Philosophy

TVET Sector Standard is a guide for TVET provider in offering TVET provider programmes. The standard covers a broad spectrum of academic programmes either fully academically inclined programmes, a mix of academic and practical-oriented programmes or fully practical-oriented programmes. Furthermore, the TVET Sector Standard represents MBOT's aspirations to empower TVET in Malaysia by providing the general guidelines for TVET provider to produce quality and competent workforces locally or internationally. The standard is prepared by considering the nature of future education, such as multidisciplinary-based, organic curriculum and flexible education; therefore, TVET provider has autonomy over designing their programmes to meet stakeholder's expectations.

A quality educational programme should have a proper curriculum structure, learning processes and proven assessment mechanisms to ensure that all intended outcomes and technology/technical services are met. A good quality programme should produce graduates who can uphold their professional dignity and reputation as well as execute their professional skills to the best of their ability with integrity so as to safeguard public interest in matters of safety and health. In an effort to maintain the highest quality of graduates, the system employed by any TVET provider should ensure the implementation of good quality assurance throughout the educational processes. Continuous quality improvement (CQI) should become a part of the culture for programme sustainability and keep up-to-date with real-life technology advancement.

Accreditation Objectives and Benefits

Quality assurance is an open-ended process, whereby all parties involved are accountable. Therefore, it is vital for MBOT to continuously review its quality assurance practices in order to ensure their relevancy, reliability, adaptability and efficiency in respond to the progressively changing higher education environment. Accreditation is a status or an achievement as a result of the quality assessment exercises conducted by MBOT with the objective to ensure that the programmes offered by TVET provider will meet the minimum requirement of technology-based education. Besides, accreditation will ensure that graduates for the accredited programmes comply with attributes required as professionals in the fields. There are two levels of programme accreditations, namely provisional accreditation (PA) and full accreditation (FA).

The main objective of PA is to validate the minimum requirements for TVET provider to conduct a programme in relation to the seven criteria of assessment, particularly the programme curriculum framework. Meanwhile, an accreditation visit may be conducted in order to verify the evidence of planning on how the programme will be conducted and preparedness of the institution concerning academic facilities (lecture hall, laboratory, online system etc.) and other support facilities (library, clinic, sport and recreation, substantial room). This is to ensure that all academic programmes justify the needs and expectation of respective stakeholders.

Meanwhile, the primary purpose of the FA process is to ensure that a programme meets the requirements as stipulated in the standard, which is in line with the accreditation criteria outlined by the MBOT and MQA. This is to comply with expected graduate attributes in accordance with the educational level of Malaysian Qualifications Framework (MQF). FA evaluation is carried out by APs appointed by the TTAC to represent subject matter experts in the respective fields.

All programmes accredited by MBOT will be recognised as a professional programme that can be referred to Malaysian Qualifications Register (MQR), and thus complies with MQF and MBOT requirements. Therefore, upon graduation the graduate can automatically apply to be registered as GT or QT.

Amongst others, the benefits of an accredited academic programme are:

i. The Public Service Department utilises the accreditation status to verify the requirements in public services recruitment.

ii. Accreditation is used by professional bodies such as MBOT to register graduates as graduate members for further assessment and be recognised as professionals (Ts. and Tc.) as specified in Act 768.
iii. Students in the accredited programmes are eligible for loans or funding from various organisations, for example, the National Higher Education Fund (PTPTN) or Majlis Amanah Rakyat (MARA).
iv. Conferment of degree at higher institutions is legitimate and the attainment of credit transfer is permissible although the conclusive decision depends on the corresponding institution.
v. Graduates may gain employment in the public sector. Apart from that, employers in the private sector acknowledge accredited programmes in selecting graduates for recruitment.
vi. Institutions may franchise their accredited programmes to other institutions, subject to definite conditions.

Operation Definition

Technology refers to the use of scientific knowledge in practical ways.

In general, the operational definition for technology are as follows:

i. Cutting-edge machinery or equipment or technique.
ii. Created from the systematic application of scientific and technical knowledge for practical purposes, including but not limited to modernisation, miniaturisation, integration, and computerisation of electronic, hydraulic, pneumatic, laser, mechanical, robotics, nuclear, chemical, telecommunication and other technological applications.
iii. Enhance productivity or way of life in areas, including but not limited to manufacturing, communications, medicine, bioengineering and commerce

Programme criteria for TVET offered by TVET provider are:

i. Structured learning or exercise.
ii. Student's exposure to high technology usage.
iii. Produces highly skilled, competent and competitive graduates.

Different Nature of Academic Programme

The MQF has been benchmarked against the main qualifications framework worldwide, such as those of England, Wales and Northern Ireland, Australia, New Zealand and Europe, as well as the United Nations Educational, Scientific and Cultural Organisation (UNESCO) framework. Therefore, as a professional body established under the Act 768, MBOT accepts it as the basis to acknowledge the approved academic qualifications and levels as indicated in the MQF.

As stated in the MQF, "Qualifications are certificates, diplomas or degrees that are awarded by any competent authority, having affirmed that one has been successful in completing the study at the determined standard and has satisfied the determined level of achievement and can take on a role, duty, or work". Qualifications indicate positive achievement of learning outcomes, not as compensation due to

failure or coincidence". Moreover, MQF has determined the eight levels of education pathways that link qualifications systematically through a minimum student learning time (SLT) and credit hours system as well as the general expectations of learning outcomes.

MBOT acknowledges the interest of TVET provider in introducing a hybrid programme, consisting of a discipline-based and technology elements in its curriculum structure. Based on the above mentioned MQF qualifications and levels, it should be noted that MBOT would uphold the facts of pre-determined national education system. Therefore, there are no differences in qualifications between the programmes that provide pure discipline-based curriculum, hybrid discipline-based and technology curriculum or pure technology-based curriculum. For that reason, all stakeholders should accept that no substandard treatment must be allowed for various implementations in curriculum structure since the qualifications and levels are already pre-determined by the MQF.

MBOT caters different implementations of the curriculum structures meant for the different job scopes. Therefore, a programme should emphasise on the use of advanced machinery, equipment or techniques in structured learning methodology to produce highly skilled and competent graduates of the latest technologies and who are adaptable to new and emerging technologies. The programmes should emphasise fundamental knowledge of science and mathematics for pure discipline-based programmes. As the approach to the programme mainly focuses on theoretical elements, it is expected that students will develop a solid fundamental knowledge of science and mathematics in a way that they would build their expertise in the design and development of products, processes or systems that may enhance the living standards, productivity and quality of life.

Hybrid discipline-based and technology programmes require the application of scientific and fundamental knowledge and methods within the discipline, combined with technical skills to support discipline-based activities. Students are exposed to almost similar courses to those of the pure discipline-based programme. However, a different emphasis will be given to the distribution of theories and technical skills. The approach is typically application-oriented but contains slightly fewer theoretical elements as compared to the pure discipline-based counterparts.

Finally, pure technology-based programmes emphasise on applying scientific knowledge and methods for practical purposes in specified industries. The nature of such a programme is expected to be geared towards product development, product manufacturing, product testing, product commissioning and product maintenance. Students are exposed to the theories and technical skills to perform technology/technical services tasks in related sectors. The theoretical components can either be separated or embedded within specific courses. Typically, this type of programme is application-oriented, emphasising techniques to execute profession-based technology.

1.0 Programme Nomenclature

1.1 Use of the Term 'Technology'

The term 'technology' or 'applied science' shall be used in the programme nomenclature. An exception is given to educational programme with nomenclature that reflect technology itself or has been widely used, for example, 'Computer Science', 'Renewable Energy', 'Cyber Security', 'Material Science', etc.

Programmes utilising the terms 'discipline-based & technology' in the programme nomenclature under the field of MBOT provision may apply to MBOT for the programme accreditation, subject to compliance with the requirements specified by MBOT.

The programmes which are classified within the pure-discipline-based programme or that use terms other than 'technology' in the programme nomenclature, can apply to MBOT for the programme accreditation, subject to compliance with the requirements specified by MBOT.

1.2 Level of Programme

The level of programme refers to the level of an educational programme offered by TVET provider based on MQF.

1.3 Programme Discipline

The programme discipline refers to the general area of educational programmes that reflect locally, internationally or work professions.

1.4 Programme Specialisation (If any)

The programme specialisation refers to the sub-fields of the educational programme.

1.5 General Guideline

i. The title of a particular programme must consider the requirement of professional or employment for the specific title and/or descriptors.
ii. Nomenclature can be based on broad-based or specialisation, depending on the preferences of TVET provider based on the stakeholders' input.
iii. TVET provider's name should not be part of the programme nomenclature.
iv. Programme nomenclature at MQF Level 6 in Malay, it is preferable to use *Sarjana Muda* instead of 'Bachelor' or *Ijazah*.
v. The term *Kepujian* or Honours can only be used for educational programmes at MQF Level 6.
vi. The broad-based programmes with a single major should comprise a minimum of 70% of technology field-based or technology competency-based, as shown in the Table 1.0.

Table 1.0. Examples of programme nomenclature

MBOT Technology Field	Technology Field-based	Technology Competency-based
Information and Computing Technology (IT)	Bachelor of Computer Science	Bachelor of Artificial Intelligence Technology
	Bachelor of Information System	Bachelor of Web Development Technology
	Bachelor of Computer Science (Data Analytics)	Bachelor of Applied Science in Data Analytics
	Diploma in Information Technology	Diploma in Network Technology
	Diploma in Software Engineering	Diploma in Software Testing Technology
	Certificate in Computer Science	Certificate in Network Technology
Manufacturing and Industrial Technology (ME)	Bachelor of Manufacturing Technology	Bachelor of Machining Technology
	Bachelor of Mechatronics Technology	Bachelor of Robotics Technology
	Diploma in Mechanical Technology	Diploma in Metal Fabrication Technology
	Certificate in Mechatronics Technology	Certificate in Welding Technology
Automotive Technology (AT)	Diploma in Automotive Technology	Diploma in Automotive Bodyworks Technology
Electrical and Electronic Technology (EE)	Bachelor of Electrical Technology	Bachelor of Electrical Systems Maintenance Technology
	Diploma in Electronics Technology	Diploma in Autotronics Technology
Food Technology (FT)	Bachelor of Food Science and Technology	Bachelor of Technology in Food Services
	Diploma in Food Technology	Diploma in Food Processing Technology
Chemical Technology (CM)	Bachelor of Chemical Technology	Bachelor of Chemical Technology in Physical Testing

Healthcare and Medical Technology (HM)	Diploma in Biomedical Technology	Diploma in Medical Laboratory Technology
Agro-based Technology (AF)	Bachelor of Applied Science (Agrotechnology)	Bachelor of Technology in Precision Agriculture

1.5.1 Programmes with specialisation should comprise 25%—30% of the specialisation courses and the specialisation fields should be mentioned in bracket. For example, Bachelor of Science in Computer Science (Software Development).

1.5.2 Programmes with double-major disciplines should comprise 50% of each component and should use the term "and" to indicate the double-major discipline. For example; Bachelor of Materials and Manufacturing Technology with Honours.

1.5.3 Programmes with major-minor discipline should comprise 25%—30% of the second discipline and should use the term '"with" to indicate the major-minor discipline. For example; Bachelor of Computer Science with Maritime Informatics (Honours).

1.6 Academic Programme with Collaboration

For collaboration programmes, TVET provider should not use "in collaboration with" or in Malay *dengan kerjasama* in the programme nomenclature. The term should be stated in the academic transcript.

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2.0 CRITERIA 1: PROGRAMME DESIGN AND DELIVERY

2.1 Education Provider Vision and Mission

Programmes applying for accreditation through MBOT shall clearly state the TVET provider's vision and mission. The purpose of having this clear vision and mission is to specify TVET provider's strategies and objectives to position itself in providing the best education and training.

2.2 Programme Educational Objectives (PEOs)

PEOs are broad statements which describes what graduates will ultimately become in their career after graduation. The PEOs are the specific goals of a programme and should align with TVET provider's vision and mission.

Establishing PEOs shall demonstrate the interest of programme stakeholders. Therefore, to ensure the effectiveness of PEOs, TVET provider shall have a clear key performance indicator for each PEO, which is agreed upon through proper consultation with the representative stakeholders.

This is crucial to ensure that the programme can produce technologists or technicians who meet the stakeholders' expectations.

The programmes shall demonstrate a mechanism to monitor and evaluate the PEOs attainment. Attainment of outcomes can be measured through direct or indirect measurements. Direct measurement can be conducted through direct information gathered from graduates, whereas indirect measurement can be conducted through surveys on graduate attainment to stakeholders.

2.3 Programme Relation to TVET provider's Vision and Mission

Programmes which are applying for technology/technical accreditation shall have a statement that illustrates their consistency with the TVET provider's vision and mission. This statement is vital to ensure that the programmes sustainability is in line with TVET provider's strategic move.

2.4 Graduate Attributes

The programmes shall have well-documented graduate attributes to describe the abilities that students should portray upon accomplishment of the programme, which covers knowledge and attitudes that the future technologist/technician will achieve after completing the programme.

The graduate attributes reflect the commonly known Programme Learning Outcomes (PLOs) which become the minimal intended targets of student competencies.

The programmes shall demonstrate mechanisms to monitor and evaluate the PLOs attainment. Attainment of PLOs can be conducted through direct measurement of constructively aligned courses to the outcomes.

Table 2.0 shows the expected generic graduate attributes for students to attain at the end of the programme to become a GT or QT with respect to the latest MQF.

TVET provider shall publish the PLOs to all stakeholders and consider designing the programmes with adequate assessments so that it will be transparent in meeting the stakeholders' expectation. Evidence of stakeholders' involvement shall be provided in generating the PLOs programme.

Table 2.0 Indicates students' generic graduate attributes for GT and QT upon completion of programme.

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Table 2.0. Students' generic graduate attributes upon completion of programme

Domain	Graduate Technologist	Qualified Technician		
	Bachelor's degree	Advanced Diploma	Diploma	Certificate
PLO1 - Knowledge *(Cognitive Domain)*	Applies technology fundamental knowledge to **broadly define** procedures, processes, systems, and methodologies in the field of study.	Possesses relevant technology fundamentals knowledge on **extended well-defined** procedures and practices in the field of study.	Possesses relevant technology fundamentals knowledge on **well-defined** procedures and practices in the field of study.	Possesses technology fundamentals basic knowledge on **routine** procedures and practices in the field of study.
PLO2 - Practical Skills/Modern Tool Usage/ Digital Skills *(Psychomotor Domain)*	Proposes and employs current tools and techniques to resolve **broadly defined / *complex problems**.	Proposes and employs current tools and techniques to resolve **extended well-defined** problems.	Proposes and employs current tools and techniques to resolve **well-defined** problems.	Proposes and employs current tools and techniques to resolve **routine** problems.
PLO3 - Analytical, Critical Thinking, Design Thinking and Scientific Approach / Numeracy Skills *(Cognitive Domain)*	Demonstrates analytical and critical thinking abilities to design and provides a solution for **broadly defined / *complex problems** in the field of study.	Establishes investigative and significant thinking abilities to resolve **extended well-defined** problems in the field of study.	Establishes investigative and significant thinking abilities to resolve **well-defined** problems in the field of study.	Establishes basic investigative and significant thinking abilities to resolve **routine** problems in the field of study.
PLO4 - Communication Skills *(Affective Domain)*	**Communicates effectively** and flexibly in oral and written language for social, academic, and professional purposes.	**Communicates** and explains in detail a wide range of viewpoints for social, academic, and professional purposes.	**Communicates** and explains clearly several viewpoints for social, academic and professional purposes.	**Communicates** and describes simple tasks within familiar areas and the immediate needs.
PLO5 - Social Responsibility in Society and Technologist Community *(Affective Domain)*	Illustrates the understanding of corresponding issues related to the society and subsequent responsibilities to the **broadly defined** technology practices.	Illustrates the understanding of issues related to society and subsequent responsibilities appropriate to the **extended well-defined** technology practices.	Illustrates the understanding of issues related to society and subsequent responsibilities appropriate to the **well-defined** technology practices.	Illustrates the understanding of issues related to society and the subsequent responsibilities appropriate to the **routine** technology practices.

PLO6 - Lifelong Learning and Information Management / Personal Skills *(Affective Domain)*	Acknowledges the requirement of professional establishment and to employ independent continuing learning in **specialist technology.**	Acknowledges the requirement of career establishment and to employ independent continuing learning in **specialised technical knowledge.**	Acknowledges the requirement of career establishment and to employ independent continuing learning in **specialised technical knowledge.**	Acknowledge the requirement of career establishment and to employ continuing learning.
PLO7 - Technopreneurial and Management Skills *(Affective Domain)*	Illustrates consciousness of management and technopreneurial routine in real perspective.	Illustrates consciousness of management and technopreneurial routine in real perspective.	Illustrates consciousness of management and technopreneurial routine in real perspective.	Illustrate a consciousness of management and technopreneurial routine from a real perspective.
PLO8 - Ethics and Professionalism *(Affective Domain)*	Illustrates ethical awareness and professionalism.	Illustrates ethical awareness and professionalism.	Illustrates ethical awareness and professionalism.	Illustrate ethical awareness and professionalism.
PLO9 - Teamwork and Leadership *(Affective Domain)*	Illustrates leadership character, mentoring and works efficiently in **diverse teams.**	Illustrates leadership character and works efficiently in **diverse technical teams.**	Illustrates leadership character and works efficiently in **diverse technical teams.**	Illustrate leadership character and work efficiently in a **technical team.**

* For Bachelor's degree programme in Information and Communication Technology, Cyber Security Technology and Art Design and Creative Multimedia Technology only, the programme shall emphasise **Complex Problem (CP)** and **Complex Activity (CA)** in teaching and learning practices.

1) **Complex Problem** has some or all of the following characteristics:

CP1: Various parameters involving wide-ranging issues.
CP2: Depth of analysis of the problem with no obvious solution.
CP3: In-depth knowledge of the field of study.
CP4: Involves infrequently encountered issues.
CP5: Uncommon requirement beyond standard practice.

2) **Complex Activity** has some or all of the following characteristics:

CA1: diverse resources (people, money, equipment, materials, information, and technologies).
CA2: Considering solutions for different parameters.
CA3: Involves creativity and innovation in providing a solution.

CA4: Sustainable solution.

2.5 Technology / Technical Services

Section 16 of the Act 768 states that the MBOT shall determine the Technology and Technical Services provisions under the MBOT. Table 3.0 outlines the key services that need to be covered within each programme.

It is required for bachelor's degree programmes at MQF Level 6, respectively, denoting the minimum criteria of GT, to address five technology services. Meanwhile, programmes at MQF Level 3, Level 4 and Level 5, which signify the minimum criteria of QT, shall address three technical services. The respective requirement is stipulated in Table 3.0.

Table 3.0. Key services of programme

Technology / Technical Services	
Technologist	**Technician**
1. Development	N/A
2. Manufacturing	N/A
3. Testing	1. Testing
4. Commissioning	2. Commissioning
5. Maintenance	3. Maintenance

The technology and technical services listed in Table 3.0 serve as a guide for TVET provider to provide the best competency and skills training with respect to the specific field of technology and technical services. The services are expected to be included in the curriculum design. However, TVET provider has flexibility to modify the curriculum with strong evidence and justification, particularly regarding technology advances and coverage of the services supported by authorised core industries/agencies. Nevertheless, MBOT reserves the right to advise TVET provider and make changes where appropriate. (Appendix A).

2.6 Programme Development, Design and Delivery

The Programme development shall effectively develop the following processes:

i. Market survey and analysis
   Needs analysis shall be carried out through surveys and data analytics from respective agencies to ensure that the programme meets the stakeholders' demands for programme sustainability.

ii. Engagement with stakeholders
   Evidence of stakeholder's involvement in curriculum design, delivery and assessment are required to ensure that the programme meets the stakeholders' expectations and to continuously improve the key aspects of programme.

iii. Programme design and delivery

TVET programmes seeking accreditation shall establish a clear process in designing, reviewing and evaluating the programme structure. Programme shall ensure that the content and structure are continually kept abreast with the most current technological advances, professional practices and international best practices in the field, including the needs of stakeholders.

It is also important for TVET provider to consider, design and offer programmes which correspond to future-ready jobs.

The programme shall ensure that the learning outcomes, delivery and assessment are constructively aligned.

The programme shall adopt appropriate teaching and learning methods to ensure achievement of the programme PLOs. The programme should demonstrate a proper engagement between educators and students to ensure students are responsible for their own learning.

Prior to conducting the programme and throughout the programme delivery, TVET provider shall ensure adequate resources for student placement to guarantee the programme achievement PLOs.

TVET Programme Structure

The programmes shall be offered in industry mode, which is in the form of cooperative studies or apprenticeship, adopting work-based learning approach that complies with the minimum requirement of a programme structure for technologist/technician with regard to the MQF levels as shown in Table 4.0. A programme is considered as an industry mode if a minimum 20% of the total credits is offered through real-life work experience courses. In industry mode, students are placed in industries during their study period and are expected to learn through real industry activities. This is to expose students to real industrial practice, including the managerial/supervisory, safety, legal and ethical aspects at work.

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Table 4.0. Minimum requirement of a programme structure of technologist / technician with respect to the MQF levels

Items	Bachelor Degree (MQF Level 6)	Advanced Diploma (MQF Level 5)	Diploma (MQF Level 4)	Certificate (MQF Level 3)
Minimum Total Graduating Credit**	Minimum 120	Minimum 40	Minimum 90	Minimum 60
Studies Duration	Minimum 3 years	Minimum 1 year	Minimum 2 years	Minimum 1 ¼ years
Technology Component Consists of Common Core, Discipline Core, Final Year Project, Industrial Training related to the field of study *Industrial training can be replaced with other technology components.	Minimum 92 credits	Minimum 25 credits	Minimum 73 credits	Minimum 45 credits
General Component Consists of MPU courses, TVET Provider Compulsory courses, and others.	Remaining credit	Remaining credit	Remaining credit	Remaining credit
Theory/Knowledge-based ● Technology Component only ● Face-to-face SLT	Minimum 40%	Minimum 30%	Minimum 30%	Minimum 20%
Practical/Modern Tool Usage-based ● Technology Component only ● Face-to-face SLT	Minimum 50%	Minimum 60%	Minimum 60%	Minimum 70%

++ A programme which combines components of “Discipline & Technology” in its programme nomenclature is expected to have higher minimum total graduating credit as compared to a programme with “Technology” component only.

The programme shall consist of the curriculum components as stipulated in Table 5.

Table 5.0. Required curriculum components

Curriculum components	MQF Level
Final year project	Compulsory for MQF Level 4 and Level 6
Mini project (stand-alone or embedded)	Compulsory for MQF Level 3 and Level 5

Mutual agreement shall be made between TVET provider and industry partners in the programme delivery.

Programmes that adopt WBL approach shall ensure that the SLT is based on effective learning time (ELT) for related courses.

Students shall be provided with, and briefed on, current information about (amongst others) the objectives, structure, outline, schedule, credit value, learning outcomes, methods of programme assessment, relevant academic policies, regulations and guidelines, empowering students to navigate their academic journey effectively, make informed decisions, including adhere to established standards.

The programme shall adopt appropriate teaching and learning methods to ensure achievement of the programme PLOs. The programme shall ensure adequate resources are established to guarantee the achievement of programme PLOs, as well as to provide a conducive learning environment which nurtures scholarly, creative and professional development.

The final year project and mini project aim to develop students' capacity for independent analyses and judgements. While running the project, students are expected to use the latest and relevant techniques and tools practised in the industry. The project report can be made in the form of individual-based or collaborated-based. For collaborated project reports, TVET provider is expected to evaluate individual performance to justify outcome attainment through the project.

The programme shall cover the theoretical or practical component of courses embedded in the curriculum structure of programmes. The programme shall involve a team of instructors, which comprise a mentor from the industry and a visiting lecturer/supervisor from the university for teaching and learning activities, including evaluation and assessment during student attachment at the industry.

It is permitted for the TVET provider opting for the industrial mode to conduct theoretical learning instructions and assessments weekly or block modules for the students before undergoing real industrial activities. However, this must also include students' welfare and learning processes in achieving the intended learning outcomes.

3.0 CRITERIA 2: STUDENT ASSESSMENT

The assessment indicates various methods or tools used in evaluating, measuring and documenting the students' academic readiness, skill acquisition, learning progress or educational requirements. The assessments may be classified into two types: Continuous assessment and final assessment. For courses with final assessment, the final assessment shall be evaluated individually.

3.1 Relation between Assessment and PLOs

The assessment alignment to PLOs shall be appropriately implemented.

3.2 Assessment Regulation and Policies

The TVET provider shall clearly define the regulations & policies of assessments, such as the mechanisms to provide feedback on the student achievement and performance, management of the final examination processes, including but not limited to vetting and moderation, input from an external advisor, strong room regulations, grading systems, appeal mechanisms, endorsement of results as well as attainment of learning outcomes, academic regulation handbook, records reporting student assessments, and student performance feedback.

3.3 Assessment Process

TVET provider shall have appropriate process of designing, implementing, evaluating and reviewing the assessment methods as displayed in Figure 2.0. The process shall involve respective internal and external stakeholders. TVET provider shall have mechanisms to review the assessment methods, such as appointment of respective committees, data collection, analysis and documentation processes.

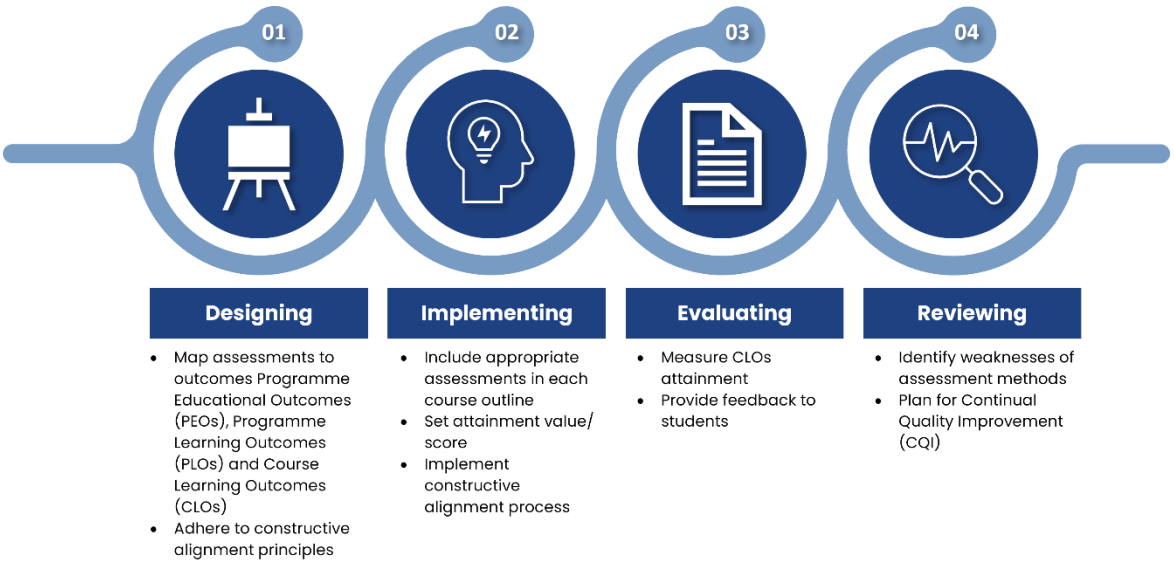

Figure 2.0. Assessment Development Process

The principles of constructive alignment shall be adhered in defining learning outcomes and aligning outcomes with assessments, teaching strategies and learning activities.

3.4 Assessment Methods

The assessment methods shall signify progress as well as the final evaluation of each course. Combination of multiple evaluation approaches shall indicate accomplishment of the learning outcomes.

For any group activities, the number of students per group shall not exceed five students. Fairness mechanism should be in place for any group activities to encourage individual learning.

Programme assessment methods shall confirm that an individual can satisfactorily perform a specific skill or competency in accordance with standards set by the industry. Assessment of learning outcome cannot be adequately measured through traditional means such as paper examination. Instead, more emphasis should be given in finding suitable means to demonstrate learners' capacity to carry out assigned tasks competently in the workplace.

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4.0 CRITERIA 3: STUDENT SELECTION AND SUPPORT SERVICES

Policies and procedures on student selection and appeals shall be established and made accessible to stakeholders.

For PA, TVET provider shall plan to provide access to student support services, both on campus and at workplace, including counselling, career advice, healthcare and students' welfare. In order to assist the students' life on campus and establish self-character development, facilities such as hostels, cafeteria, CCTV, sport and recreational centres, health centres, student centres, and transportation, should be satisfactory.

For FA, TVET provider shall ensure access to student support services, both on campus and at the workplace.

4.1 Students Selection

The programme shall have minimum student entry requirement as follows:

Certificate in Technology or equivalent (MQF Level 3) - At least one of the followings:

i. Pass Skills Certificate MQF Level 2
ii. Pass SPM or equivalent with a minimum one credit in any subject
iii. Pass SPM or enrol bridging programme for students without SPM (with approval of respective ministry only)
iv. APEL A as prescribed by MQA
v. Other recognised qualifications or equivalent.

Diploma in Technology or equivalent (MQF Level 4) - At least one of the followings:

i. Pass Certificate MQF Level 3 with a minimum CGPA 2.00 or equivalent
ii. Pass SPM or equivalent with a minimum of three credits in any subject
iii. Pass a minimum of one semester pre-diploma programme with SPM or equivalent with a minimum of three credits in any subject
iv. Pass STPM or equivalent with a minimum Grade C (CGPA 2.00) in any subject
v. Pass STAM (Grade Maqbul) or equivalent
vi. APEL A as prescribed by MQA
vii. Other recognised qualifications or equivalent.

Advanced Diploma in Technology or equivalent (MQF Level 5) - At least one of the followings:

i. Pass Diploma MQF Level 4 with a minimum CGPA of 2.00 or equivalent
ii. Other recognised qualifications or equivalent.

Bachelor of Technology or equivalent (MQF Level 6) - At least one of the followings:

i. Pass Diploma MQF Level 4 with a minimum CGPA of 2.00 or equivalent
ii. Pass Advanced Diploma MQF Level 5 with a minimum CGPA of 2.00 or equivalent
Pass STPM or equivalent with a minimum Grade C (CGPA 2.00) in two subjects
iii. Pass Matriculation/ Foundation with a minimum CGPA of 2.00 or equivalent

iv. Pass STAM (Grade Jayyid), or its equivalent
v. APEL A as prescribed by MQA
vi. Other recognised qualifications or equivalent.

Student selection shall comply with the stipulated minimum entry requirements for the programme.

4.2 Articulation Regulations, Credit Transfer and Course Exemption

The programme shall have well-defined policies, regulations and processes of articulation practices, credit transfers and course exemptions. Policies, regulations, and processes should be established and accessible to stakeholders.

4.2.1 Student transfer

TVET provider shall have well-defined policies and mechanisms to facilitate students' mobility which may include student transfer within and between institutions. Related policies and mechanisms should be accessible to the stakeholders. TVET provider shall ensure that the inbound students have the capacity to follow the programme structure successfully.

4.2.2 Credit Transfer

i. Credit transfer can be implemented in two categories as follows:

   a. Vertical – credit transfer from a lower to a higher qualification level.
   b. Horizontal – credit transfer from the same qualification level, such as from certificate to certificate/diploma to diploma/bachelor's degree to bachelor's degree.

ii. Credit transfer must be based on course mapping shall be as follows:

   a. Passing grade – minimum Grade C; and
   b. Course curriculum similarity – at least 80% of course content or outcomes, and
   c. Credit value – equivalent to credit currency of respective countries (if applicable) and
   d. Credit transfer courses must be accredited or recognised programmes from authorised bodies in the respective countries (if applicable).

iii. Vertical credit transfer policy is based on the following situations:

   a. A maximum of 30% credit transfer from certificate to diploma level is allowed.
   b. A maximum of 30% credit transfer from a diploma to a bachelor's degree is allowed. Presuming that the programme curricula have been designed (home-grown or through formal collaboration partners) to ensure continuity, coherence, and completeness from diploma to bachelor's degree. In that case, the maximum credit transfer allowed is 50% or, subject to the latest National Credit Transfer Policy.
   c. A maximum of 50% credit transfer from advanced diploma qualification (with diploma qualification) or equivalent to bachelor's degree is allowed.

d. Credit transfer from a higher (e.g., bachelor's degree) to a lower qualification level (e.g., diploma) is not allowed.

iv. Horizontal credit transfer policy is based on the following situations:

a. Credit transfer is allowed for a student who wants to change to another programme in the same field. If the change is within the same TVET provider, there is no credit transfer limit, but it is subjected to the established credit transfer requirement. On the other hand, if the change is at a different TVET provider, the percentage of the credit transfer is subjected to one semester of student's residential requirement.
b. Credit transfer (including compulsory courses) is not allowed for a student that has failed in the programme of study and plans to pursue the study in other programme at the same level of academic qualification.
c. Credit transfer is allowed to students that discontinue the programme and plan to resume their studies in another TVET provider at the same qualification level.
d. Credit transfer is not allowed for students that failed their studies and want to resume their studies but in another TVET provider at the same qualification level.

4.3 Student Support Services and Welfare

TVET provider shall ensure that student welfare is well taken care of during industrial attachment.

Student support services and student welfare shall be supported with adequate and qualified administrative personnel. Provided support services should be supervised and benchmarked against other similar institutions, whereby essential strategies should be established to boost the quality of services.

4.3.1 Student Representative

TVET provider shall have well-defined regulations and processes for students to establish the representative organisation.

Established student representative organisations shall function well to provide essential managerial and leadership experiences and character-building amongst students.

4.3.2 Alumni

TVET provider shall have active linkages with alumni to support the development, review and continually improve the programme. The programme should have access to an updated alumni registry containing information related to their latest employment, continuing study, and professional activities.

5.0 CRITERIA 4: TEACHING AND SUPPORT STAFF

TVET provider shall have adequate and qualified teaching, technical and administrative staff.

5.1 Teaching Staff

5.1.1 Qualification

TVET provider shall have a recruitment policy, criteria and other related processes for teaching staff as outlined in Table 6. The recruitment process has to ensure that the fields of expertise of the teaching staff are relevant to the programme offered.

Table 6.0. Qualification requirements of teaching staff

Qualification/ MQF Level	Qualifications of Teaching Staff
Certificate/ MQF Level 3	MQF Level 4 TVET diploma in the relevant fields; or MQF Level 4 diploma in the relevant fields with one year of related industrial experience; and TVET teaching competency.
Diploma/ MQF Level 4	MQF Level 5 TVET advanced diploma in the relevant fields; or MQF Level 5 advanced diploma in the relevant fields with two years of related industrial experience; or MQF Level 6 TVET bachelor's degree in the relevant fields; or MQF Level 6 bachelor's degree in the relevant field with one year of related industrial experience; and TVET teaching competency.

Advanced Diploma/ MQF Level 5	MQF Level 5 TVET advanced diploma in the relevant field with one year of related industrial experience; or MQF Level 5 advanced diploma in the relevant fields with two years of related industrial experience; or MQF Level 6 TVET bachelor's degree in the relevant field; or MQF Level 6 bachelor's degree in the relevant field with two years of related industrial experience; and TVET teaching competency.
Bachelor's Degree / MQF Level 6	For theoretical component: MQF Level 7 master's degree in the relevant fields; and For practical component: MQF Level 6 TVET bachelor's degree in the relevant fields with one year of related industrial experience; or MQF Level 6 bachelor's degree in the relevant fields with two years of related industrial experience; and TVET teaching competency.

TVET provider shall appoint industry mentors to assist students with experiential learning in the industry. TVET provider shall train the industry mentors to ensure quality teaching and learning activities are established.

5.1.2 Professional Qualification

TVET provider shall ensure all qualified teaching staff register as GT or QT. At least one teaching staff of the programme shall be a Ts. or Tc. If this is not met, TVET provider shall show effort towards complying with these criteria.

5.1.3 Training and Industrial Experience

TVET provider shall ensure teaching staff keep abreast with latest practices by accumulating at least one- month industrial activities in every two years.

5.1.4 Technology and Technical Services

A clear policy and mechanism on teaching staff involved in technology/technical services shall be in place.

5.1.5 Staff Student Ratio

Staff to student ratio is an essential component in effort to produce competent graduates. To start a programme, it shall have the minimum full-time staff in relevant fields as follows:

i. For bachelor's degree programmes, the staff-to-student ratio shall be at least 1:20 with a minimum of six full-time teaching staff in the field of programme
ii. For advanced diploma programmes, staff-to-student ratio shall be at least 1:20 with a minimum of two full-time teaching staff in the programme field.
iii. For diploma programmes, staff-to-student ratio shall be at least 1:20 with a minimum of four full-time teaching staff in the programme field.
iv. For certificate MQF Level 3 programmes, the staff-to-student ratio shall be at least 1:20 with a minimum of three full-time teaching staff in the programme field.

For the full-time and part-time staff ratio, at least 60% of the teaching staff is full-time.

5.2 Technical Support Staff

The technical support staff are classified as staff who are not directly involved in teaching the students. Alternatively, they assist the teaching staff during teaching and learning activities to ensure effective delivery.

5.2.1 Qualification

TVET provider shall have a recruitment policy and criteria for the technical support staff. The qualification of the support staff should be relevant to the intended job specifications.

5.2.2 Continuous Professional Development

All qualified technical support staff in the programme should register as QT. If this is not met, TVET provider must plan for the technical support staff to attend and complete proper competency training relevant to the job scope.

TVET provider must have a continuous professional development scheme to ensure the staff keep up-to-date with the latest practices.

5.2.3 Adequacy of Technical Support Staff

Each teaching facility shall be adequately staffed to enable its intended function and compliance with safety requirements.

5.3 Administrative Support Staffs

TVET provider shall allocate a sufficient number of administrative support staff for the programme.

5.3.1 Qualification

TVET provider shall have a recruitment policy and criteria for administrative support staff. The qualification of the support staff should be relevant to the intended job specifications.

5.4 Staff Industry Engagement

TVET provider shall provide a clear guideline for encouraging industry engagement amongst the teaching and technical support staff. TVET provider shall have a continuous industry engagement to ensure teaching and learning activities are industry relevant.

5.5 Staff Evaluation and Appraisal

TVET provider shall have an assessment system for staff annual evaluation and appraisal. TVET provider shall have a mechanism for students to evaluate the quality of teaching and learning activities.

5.6 TVET Teaching Competency

All teaching staff shall have appropriate competency for teaching practical-oriented courses within the programme. TVET teaching competency can be obtained through internal or external structured training.

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6.0 CRITERIA 5: EDUCATIONAL RESOURCES

Educational resource refers to physical facilities and financial resources to support the delivery of programme and technology/ technical services. The programme shall have sufficient and appropriate educational resources to ensure its effective delivery.

It is essential that students utilise and benefit from the educational resources made available. TVET provider shall ensure that safety factors are considered in the educational resources planning and operation. TVET provider shall also ensure that environmental, sustainability, cultural, professional, ethical and legal factors are considered in the planning and operation of educational resources.

6.1 Physical Educational Facilities

The physical facility is the infrastructure in which teaching and learning activities take place. This includes, but is not limited to, classrooms, workshops, laboratories, libraries, internet connections, software, and relevant equipment with regular maintenance. The programme shall ensure the quality, availability, relevancy and utilisation of facility.

Adequate and suitable experimental and practical facilities shall be accessible since technology programmes acquire substantial practice-oriented learning. This is to ensure that the students experience practice-oriented learning. TVET provider is allowed to arrange the physical facilities with external parties or to arrange the scheduling to ensure the adequacy of physical facilities for teaching and learning activities.

6.2 Technology/ Technical Services and Innovation

TVET provider shall have adequate facilities and resources to encourage staff in providing technology/technical services to community and industry.

6.3 Financial Resources

Financial resources include all funds to conduct the programme. The programme shall demonstrate financial viability and sustainability for the operation and maintenance of programme.

7.0 CRITERIA 6: PROGRAMME MANAGEMENT

Programme management controls the programme resources, including staff, finances and facilities, in order to achieve its objectives. Programme management requires good governance, inspiring leadership and detailed record management while adopting a professional, ethical work culture that seeks continuous improvement and emphasises safety, environmental and sustainability factors.

7.1 Programme Governance

Governance refers to structure, policies and procedures designed to ensure accountability, transparency, responsiveness, stability, equity and inclusiveness, empowerment, and broad-based participation.

The programme shall have a governance structure supported by staff or committees that include industry partners to perform various functions. Policies and procedures shall be established, published, and implemented.

7.2 Programme Leadership

TVET provider shall appoint qualified and dedicated leaders in related fields to provide directions and manage resources to ensure the programme stays aligned with its mission, identity, and the stakeholders' requirements.

7.3 Records Management

Records management refers to a set of activities for efficient monitoring of the creation, distribution, usage, maintenance and disposal of recorded information declared as documentation of the programme activities and transactions.

TVET provider shall maintain students' records related to their admission, performance, completion and graduation as well as preserve them for future reference. TVET provider shall maintain a proper record of staff academic qualification, appointment, training, appraisal and other related documents.

8.0 CRITERIA 7: QUALITY MANAGEMENT SYSTEM

Elements of the quality management system include governance and institutional support, stakeholders' involvement, curriculum review, as well as facilities planning and management.

8.1 Quality Assurance

TVET provider shall establish structure and processes to manage the programme quality assurance

8.1.1 Governance Support

TVET provider shall establish a dedicated unit or committee to oversee and coordinate quality assurance deliverables through shared responsibility, accountability, consistency, and transparency in assuring the programme quality.

8.1.2 Institutional Support and Resources

TVET provider shall ensure available support and resources (including system, staff, financial and infrastructure) are adequate to support quality assurance activities.

8.2 Stakeholder's Engagement in Programme Review

Feedback from stakeholders, including students, alumni, employers, professional bodies and teaching staff, shall be obtained to continuously improve the programme quality.

8.2.1 Programme advisory committee

TVET provider shall have a monitoring and review programme advisory committee with representatives from the industry and academia related to the programme. One of the industry advisors and one of the academic advisors shall be a Ts. or Tc. registered under MBOT.

8.2.2 Student Representatives

Student representation enables students to provide feedback to improve the programme quality.

8.3 Monitoring, Review and Evaluation

Programmes shall continually be monitored, reviewed, and evaluated, including TVET provider's governance, institutional processes, curriculum structure, teaching and learning activities, as well as student and graduate outcomes attainment.

8.3.1 Examination Committee

The Examination Committee shall periodically monitor, evaluate, review student performance as well as outcome attainment.

8.4 Benchmarking

The programme shall conduct benchmarking in searching, learning, adapting, and implementing the best practices with other reputable institutions to ensure a comparable programme quality.

8.5 Continual Quality Improvement

The programme shall regularly and systematically be assessed and evaluated for CQI.

TVET provider shall provide appropriate evidence of the following activities for CQI:

i. Periodic analysis on programme educational objective achievement
ii. Periodic analysis on student outcome attainment
iii. Periodic departmental analysis on teaching and learning activities
iv. Periodic analysis of students' feedback on teaching and learning activities
v. A comprehensive review of curriculum at least once every programme cycle
vi. Quality evaluation by an external assessor at least once every two years
vii. Quality evaluation by the programme advisory committee at least once every two years.

TVET provider shall take remedial actions by continually improving the following:

i. Programme design and delivery
ii. Student assessment
iii. Student selection and support services
iv. Teaching and support staff
v. Educational resources
vi. Programme management
vii. Quality management system.

9.0 ACCREDITATION

Programme accreditation is carried out through three types of evaluation, namely PA, FA and compliance accreditation (CA). Each type has a different quality focus, depending on the state of development, delivery and progression of programme.

i. PA emphasises the curriculum design and the programme delivery preparatory arrangements. The PA process is conducted through the desktop audit However, MBOT reserves the right to make an accreditation visit if the condition requires.
ii. FA evaluation is conducted through evidence-based and verifies the actual delivery of programme and the availability of support systems during the programme implementation. FA is granted to a programme that has gone through PA or entered a new FA cycle. The FA process is conducted through an accreditation visit to the respective TVET provider.
iii. CA focuses on compliance with the specific requirements specified by MBOT upon approval of FA within the same accreditation cycle. CA can be divided into two categories, i.e., continuing accreditation and extending accreditation. Both accreditations are granted to the programme that has been accorded the FA and applicable for extension of the accreditation period in the same cycle, respectively, in accordance with the state of compliance of conditions stipulated by MBOT based on previous evaluation. The CA process is conducted through the desktop audit or accreditation visit, depending on the required condition.

9.1 Accreditation Process

MQA is responsible for the accreditation process of PA while MBOT is responsible for FA and CA. The process starts with submission of accreditation documents to MQA by TVET provider for PA and FA. Panels for PA, FA and CA are appointed in accordance with the respective MBOT fields. MBOT will recommend PA panel to MQA for appointment. Meanwhile, MBOT is responsible for appointing the FA panel. The CA documents must be submitted directly to MBOT, which subsequently appoint the CA panel.

The evaluation of the programme quality for PA, FA and CA will be carried out based on provided evidence. TVET provider is responsible for providing evidence in evaluating the programme planning and implementation. Based on the evaluation, TVET provider will be informed of the findings and officially notified by MBOT of TVET provider's opportunity to rebut the AP's findings before making recommendations to MBOT. Table 7.0 shows the results of accreditation.

Table 7.0. Results of accreditation

Accreditation	Process
PA	MBOT submits recommendations to MQA for approval. then, the result will be notified by MQA to TVET provider. Upon approval, MBOT will receive a copy for accreditation record and is then published in MBOT website.

FA & CA	MBOT submits results to MQA. Then, the result will be notified by MQA to TVET provider. The result will finally be registered in the Malaysian Qualifications Register (MQR) and is then published in MBOT website.

9.1.1 Provisional Accreditation

TVET provider requires to submit the Self-Review Report (SRR) 01 to MQA.

9.1.2 Full Accreditation and Compliance Accreditation

TVET provider shall submit the SRR02 to MBOT through MQA in six months prior to the first student cohort of programme completion.

For CA, TVET provider shall submit the application not later than six months before the date of the accreditation approval letter ends.

Meanwhile, for New Cycle accreditation, TVET provider shall submit the application six months prior to expiry of the initially approved FA period for the accreditation cycle.

Based on the evaluation made by AP, TVET provider shall make remedial actions to meet the requirements for improvement. MBOT will decide an accreditation period based on the improvement made.

MBOT decides the FA period, a maximum of six years, depending on the quality implementation of the programme.

For programmes approved with five years of accreditation, TVET provider may apply for an SRR03 to extend the accreditation period for one year to complete the FA cycle. For programmes approved with one year - four years of accreditation, TVET provider may apply for a SRR04 to continue additional years of accreditation for completing the FA cycle. SRR03 and SRR04 must be submitted to MBOT. Otherwise, TVET provider may opt to apply for a new cycle of FA by submitting a new SRR02.

For Deferment Accreditation, SRR05 must be directly submitted to MBOT within six months subjected to MBOT discretion. Failure to do so may result in the accreditation being rejected or revoked.

TVET provider may appeal for the denied accreditation result to MBOT for the attention of the Appeal Committee. The Appeal Committee will review and propose recommendations to MBOT for the final decision.

Pre- Accreditation Visit

Prior to the accreditation visit, MBOT will review the pre-assessment report made by APs and may request additional documents to be prepared by TVET provider before the visit. TVET

provider may provide additional documents and information within a specified period before the visit.

Accreditation Visit

For FA (including evaluation for new cycle accreditation), the primary objective of the accreditation visit is to verify the evidence is in accordance with the statement claimed by the TVET provider in the SRR02 and additional provided documents as proof of the quality of services within the programme. A visit may also verify a qualitative evaluation of factors that are not clearly documented in written form, including facilities inspection.

CA is to verify the improvements made by TVET provider based on the requirements imposed by MBOT through previous evaluation. Table 8.0 shows the schedule of FA visit, while Table 9.0 shows the schedule for CA visit.

Table 8.0. The FA schedule for accreditation visit

Day 1	
Time	**Activity**
8.30 am – 8.45 am	Coordination meeting with secretariat and AP
8.45 am – 9.30 am	Briefing by TVET provider on the background of TVET provider and involved programmes
9.30 am – 11.30 am	Visit to facilities, such as library/resource centre, laboratories, workshops related to the programme and lecture halls, including a meeting with responsible officers
11.30 am – 1.00 pm	Document review by AP with programme leader
1.00 pm – 2.00 pm	Break
2.00 pm – 3.30 pm	Document review by AP with programme leader
3.30 pm – 4.15 pm	Group meeting with students and AP
4.15 pm – 5.00 pm	Meeting of student representative council with AP
5.00 pm	End
Day 2	
Time	**Activity**

8.30 am – 9.00 am	Coordination meeting with secretariat and AP
9.00 am – 10.00 am	Meeting of teaching staff with AP and review of course portfolios, examination papers and answer sheets
10.00 am – 10.30 am	Online meeting of industry mentors with AP
10.30 am – 11.30 am	Meeting of programme leader with AP
11.30 am – 12.30 pm	Triangulation session with the head of quality assurance unit and top management (allocation, planning, quality monitoring)
12.30 pm – 1.00 pm	Coordination meeting with secretariat and AP
1.00 pm – 2.00 pm	Break
2.00 pm – 3.30 pm	Preparation assessment report (individual) by AP
3.30 pm – 4.30 pm	Closing meeting with programme (two-way communication)
4.30 pm – 5.00 pm	Closing meeting with TVET provider (one-way communication)
5.00 pm	End

Table 9.0. The CA schedule for accreditation visit

Time	Activity
8.30 am – 9.00 am	Coordination meeting with secretariat and AP
9.00 am – 11.00 am	Document review by AP
11.00 am – 12.00 pm	Meeting with relevant parties (if necessary) example: programme coordinators, academic staff, student affairs department, dean, and department heads
12.00 pm – 1.00 pm	Visit to facilities, such as library/resource centre, laboratories, workshops related to the programme and lecture halls, including meeting with responsible officers
1.00 pm – 2.00 pm	Break
2.00 pm – 3.00 pm	Coordination meeting with secretariat and AP Preparation assessment report by AP
3.00 pm – 4.00 pm	Closing meeting with programme (two-way communication)
4.00 pm – 5.00 pm	Closing meeting with TVET provider (one-way communication)
5.00 pm	End

Exit Meeting

It is expected to have two exit meetings during the accreditation visit, namely exit meetings at the programme level and TVET provider level.

Exit meeting at the programme level is intended for AP to give insight findings of the accreditation visit based on findings. The purpose of the meeting is to give chance for AP to verify the findings with the programme leader as well as for programme leader to give final feedback for any highlighted concerns by the AP and may provide new evidence which may change the outcomes. This is a two-way communication of both parties to deliberate the outcomes.

Exit meeting at TVET provider level is conducted in a one-way communication method for the Chairman of AP to give a brief on finding to TVET provider top management for their information of the accreditation visit.

Post- Accreditation Visit

At the end of the visit, the APs will make recommendations through a formal report to MBOT. The AP should not engage with TVET provider personally after a visit; any additional document after a visit is unacceptable.

9.2 Submitted Document

All documents provided for the accreditation process is verified by all respective level management within the TVET provider. Programme management is accountable for all the information and document provided in the accreditation process.

Any false information provided by TVET provider in any form which misleads during the accreditation process commits an offence and shall be liable for any claim subject to the applicable law.

TVET provider are required to submit the SRR based on the accreditation type as indicated in Table 10.0.

Table 10.0. Type of accreditation and SRR

No	Accreditation	SRR
1	Provisional Accreditation	SRR01
2	Full Accreditation	SRR02
3	Extending Accreditation	SRR03
4	Continuing Accreditation	SRR04
5	Deferment Accreditation	SRR05
6	Curriculum Review	SRR06

7	Dual Degree / Offshore	SRR07

9.3 Accreditation Panel

AP are appointed by the MBOT to represent the MBOT as an independent person to conduct an evidence-based evaluation of the programme quality management practised by TVET provider accordingly.

The main task of the AP is to verify that the policies and standards are in agreement with the programme delivery. Verification involves the assessment of the quality assurance procedure efficiencies. The AP evaluate the execution of these procedures in relation to the accomplishment of the expected programme learning outcomes.
Members of the AP are nominated, depending on the type, level and discipline of the programme to be assessed, as well as the availability, suitability, expertise, experience and neutrality of the prospective panel members.

9.4 Appeal Procedures

TVET provider may appeal to MBOT for the denied accreditation result to review the decision in two weeks of the official result.

Depending on the Appeal Committee's decision, TVET provider may be required to bear all the expenses if applicable. Furthermore, TVET provider may be required to submit new documents or information to support the application.

9.5 Revision of Programme

All programmes are required to undergo CQI within the programme to keep abreast of technological advances. For any changes less than 30%, TVET provider is required to inform MBOT. However, for more than 30% of changes, TVET provider needs to get approval from MBOT for the changes. Failure to do so may result in accreditation being revoked.

9.6 Conflict of Interest

All parties are believed to perform their task professionally. Any possible conflicts of interest concerning the accreditation process must be informed to MBOT. Failure to do so may result in legal liability and MBOT is not responsible for negligence of the parties involved.

9.7 Confidentiality

All information provided throughout the accreditation process is confidential and classified. All parties involved in the process are required to maintain confidentiality unless a written permission is obtained from relevant parties. Failure to do so may result in legal liability and MBOT is not responsible for negligence of the parties involved.

9.8 Expenses

All accreditation expenses will be borne by TVET provider accordingly. MBOT always practices the ethical values with integrity.

9.9 Publication of Accreditation Status

All accreditation results will be informed to TVET provider in writing. All accreditation results are available and accessible to the public in MQR or MBOT portal. TVET provider is required to ensure all the information displayed in MQR or MBOT is consistent in both portals.

10.0 STANDARD REVISION

MBOT reserves the right to make any amendments to the standard at any time. Any recent amendments will be communicated to all TVET provider prior to enforcement.

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Appendix

Appendix A - Expected Technology and technical competencies for the 24 MBOT technology fields

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Appendix A

The following are the standard technology and technical competencies for the 24 MBOT technology fields:

1. **Biotechnology Technology Profiles**

   Biotechnology is the use of living system to develop, modify or make products which consist of healthcare, agriculture and industrial or manufacturing.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
BIOTECHNOLOGY	**Development**	● Cell culture / tissue culture ● Screening and selection ● Natural Chemistry ● Sequencing and cloning ● Experimental design ● Bioethics and Biosafety	**NOT APPLICABLE**	
	Manufacturing	● Any competency related to fermentation/ breeding/ extraction/ biomolecular ● Proof of concept/ prototype ● Process of product registration and certification		
	Testing	● Bioanalytical testing including cell/ tissue viability, product efficacy, product effectiveness, contamination testing ● Test selection and planning	**Testing**	● Bioanalytical testing including cell/ tissue viability, product efficacy, product effectiveness, contamination testing ● Data collection
	Commissioning	● Commissioning planning ● Process scale-up ● Technology transfer ● Verification & Calibration	**Commissioning**	● Verification & calibration ● Instrument operation ● Reporting

	Maintenance	● Planning of maintenance schedule ● Data analysis and improvement planning for product maintenance	**Maintenance**	● Maintenance process ● Reporting

2. Chemical Technology Profiles

Chemical technology is the use of or organic or inorganic material to develop, modify, service, produce or manufacture which consists of chemical commodity and specialty/fine chemical or analytical services.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
CHEMICAL TECHNOLOGY	**Development**	● Planning and implementation ● Experimental design and optimisation ● Process improvement ● Safety (OSHA) ● Proof of concept/Prototype	**NOT APPLICABLE**	
	Manufacturing	● Quality control (product, process, plant - manufacturing) ● Quality approach concept		
	Testing	● Data analysis ● Test selection and planning ● Testing procedure ● Diagnosis procedure	**Testing**	● Standard measurement ● Standard testing ● Data collection ● Standard diagnostic
	Commissioning	● Calibration, verification, and validation ● Commissioning planning ● Handover planning/process (checklist)	**Commissioning**	● Standard operating procedure ● Installation ● Reporting
	Maintenance	● Planning of operating schedule ● Operation and maintenance planning ● Operation and maintenance checklist ● Maintenance reporting	**Maintenance**	● Verification techniques ● Shut down and start-up ● Perform maintenance task ● Pre/post for operation

		● Improvement planning for product maintenance		● Complete service report

3. Food Technology Profiles

Food Technology is the application of science and technology related to principles and techniques that involve physical, chemical, and microbiological aspects in the processes of manufacturing, processing, preservation, packaging, distribution, bioprocess, and safety for safe food production and human consumption.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
FOOD TECHNOLOGY	**Development**	● Apply "Design Thinking" concept/element/approach - perform idea generation and selection - design and determine proof of concept - develop prototype - determine basic product characteristics (sensory evaluation, packaging, storage / shelf life, Physico-chemical testing) - perform market testing ● Perform and analyse feasibility study	**NOT APPLICABLE**	
	Manufacturing	● Plan, designed and monitor unit operation (process, plant layout, machinery) ● Perform pilot scale testing ● Able to plan and run the manufacturing process during actual practice		

	Testing	● Plan, analyse and interpret Physico-chemical testing, microbiological testing and sensory evaluation	**Testing**	● Perform Physico-chemical testing, microbiological testing, and sensory evaluation
	Commissioning	● Plan and determine raw material and packaging specification, processing parameters, product specification, quality control, quality assurance, packaging design and labelling	**Commissioning**	● Perform and monitor raw material and packaging specification, processing parameters, product specification, quality control and quality assurance
	Maintenance	● Determine and establish the control of operation through standard operating procedure ● Establish and manage food safety program / management system (GMP, HACCP, food security, etc.)	**Maintenance**	● Execute and monitor the control of operation through standard operating procedure ● Perform and monitor food safety program / management system (GMP, HACCP, food security, etc.)

4. Agro-Based Technology Profiles

Application of technology which involves in production, services and postharvest handling related to agriculture

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
AGRO-BASED TECHNOLOGY	**Development**	● Problem identification ● Propose solution ● Experimental design ● Risk analysis	**NOT APPLICABLE**	
	Manufacturing	● Configure of concept/prototype/ system ● Proof of concept/prototype/system ● Quality approach concept		

	Testing	• Test selection and planning • Testing procedure • Diagnosis procedure • Verification and calibration	**Testing**	• Carry out standard testing • Carry out standard diagnosis • Collect data from fields trials (sampling/measurements/lab test)
	Commissioning	• Commissioning planning • Handing over planning/process	**Commissioning**	• Carry out commissioning task • Reporting
	Maintenance	• Planning of maintenance schedule • Maintenance process • Planning of improvement for product maintenance	**Maintenance**	• Perform maintenance task • Pre/post for maintenance operation • Complete service/maintenance report

5. Automotive Technology Profiles

Automotive Technology is an application, method and process of automotive industry which involves design, development, manufacturing, marketing, maintenance, and servicing.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
AUTOMOTIVE TECHNOLOGY	**Development**	• Concept generation and selection • Sketching • Drawing • Modelling • Feature List and Engineering Bill of Material (eBOM) selection • Vehicle architecture	**NOT APPLICABLE**	
	Manufacturing	• Geometry, dimensioning, tolerance • Fabricate/prototype		

		• Manufacturing Bill of Material (mBOM) Selection		
	Testing	• Test selection and planning (procedure) • Testing procedure • Diagnosis procedure	**Testing**	• Standard testing • Data collection • Standard diagnostic
	Commissioning	• Commissioning planning (site) • Handover report	**Commissioning**	• Installation • Reporting
	Maintenance	• Plan maintenance schedule • Maintenance process (checklist) • Analysis and improvement planning	**Maintenance**	• Perform maintenance • Reporting

6. Aerospace and Aviation Technology Profiles

Aerospace covers the industrial activities that relate to design, development, manufacturing, construction, maintenance & disposal of aircraft, spacecraft, missiles and rockets. Aviation covers the industrial activities that relate to operations of aircrafts and its supporting functions.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
AEROSPACE AND AVIATION TECHNOLOGY	**Development**	• Project management • Product design and Computer Aided Design (CAD) • Product Life Cycle Management (PLM) • Stress analysis • Fatigue and Damaged Tolerance (F&DT) • Tooling design • Material familiarisation	**NOT APPLICABLE**	
	Manufacturing	• Computer-Aided Design and Manufacturing (CAD/CAM)		

		• Process control • Production planning • System Integration • Quality assurance and inspection		
	Testing	• Assembly, Integration and Testing (AIT) • Non-Destructive Testing (NDT)	**Testing**	• Assembly, Integration and Testing (AIT) • Non-Destructive Test (NDT)
	Commissioning	• Commissioning Planning (Site) • Handover planning/process (checklist)	**Commissioning**	• Installation • Reporting
	Maintenance	• Equipment maintenance • Tooling maintenance • Facility maintenance	**Maintenance**	• Equipment maintenance • Tooling maintenance • Facility maintenance

7. Transportation and Logistic Technology Profiles

Transportation and Logistic Technology is a method and technique to carry or move people or goods by various modes using land, sea and air.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
TRANSPORTATION AND LOGISTIC TECHNOLOGY	**Development**	• Concept generation and selection • Risk identification • Sketching & modelling • Cost and benefit analysis • Feasibility study (transport environmental impact assessment) • Electronic data interchange (EDI) • Technical documentation	**NOT APPLICABLE**	
	Manufacturing	• Prototyping • Proof of concept		

		• Fabrication		
	Testing	• Test selection and planning (procedure) • Audit and quality control • Verification • Diagnostics and troubleshooting • Risk analysis	**Testing**	• Standard testing • Data collection • Standard diagnostic
	Commissioning	• Commissioning Planning • Handover planning/process • Risk assessment	**Commissioning**	• Installation • Reporting
	Maintenance	• Preventive maintenance schedule • Corrective maintenance • Maintenance process (checklist) • Analysis & Improvement planning	**Maintenance**	• Perform maintenance • Evaluation & reporting

8. Maritime Technology Profiles

Maritime Technology involves the technique and method used in operation, maintenance, manufacturing, navigation and control systems of ships and related marine vessels, including technology and technique used in ports, oil rigs and other marine facilities.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
MARITIME TECHNOLOGY	**Development**	• Select new/existing processes/equipment/tools of marine vessel construction/repair • Carry out standard procedures involving the design, operations, and maintenance of a marine vessel • Apply rules/regulations during the development process	**NOT APPLICABLE**	

	Manufacturing	● Construct prototype/model vessels according to the ship construction method ● Perform marine vessel construction/ship repair activities		
	Testing	● Prepare testing procedure as per specification/manual ● Conduct failure analyses, document results, and recommend corrective actions	**Testing**	● Perform testing per specification ● Record testing data
	Commissioning	● Prepare plan and procedure for commissioning/decommissioning ● Prepare commissioning/decommissioning report	**Commissioning**	● Install systems and equipment ● Conduct operation of system and equipment for commissioning
	Maintenance	● Plan operations and maintenance of marine vessel equipment/system ● Propose solution based on maintenance issues	**Maintenance**	● Perform maintenance per schedule ● Diagnose maintenance issues

9. Information and Communication Technology Profiles

Information and Communication Technology is the field of expertise that involve hardware, software, data and computer network to create the technology to improve quality of life.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
INFORMATION AND COMMUNICATIONTECHNOLOGY	**Development**	● Prepare appropriate project plan ● Analyse project requirement ● Design appropriate solution	**NOT APPLICABLE**	

	Manufacturing	• Select appropriate tools/ equipment/hardware/software • Implement proposed design • Integrate related modules/tasks		
	Testing	• Identify appropriate test tools • Prepare test plan • Evaluate testing results	**Testing**	• Perform test plan • Produce testing results
	Commissioning	• Organise project delivery • Evaluate user acceptance testing	**Commissioning**	• Install & configure project • Perform user acceptance testing
	Maintenance	• Propose an appropriate type of maintenance • Design a business continuity plan (BCP) • Organise performance evaluation • Manage project change	**Maintenance**	• Perform appropriate maintenance • Execute performance evaluation • Implement project change

9.1 For Information & Computing Technology, there are five major discipline areas and TVET provider should map courses to the following knowledge area of competencies.

a) Core Knowledge Area of Competencies

Core Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Computer Architecture	/	/	/
Database Fundamentals	/	/	/
Basic Mathematics	/	NA	NA

Network & Data Communication	/	/	/
Operating System	/	/	/
Programming Fundamentals	/	/	/
Cyber Security Fundamentals	/	/	NA
System Analysis and Design Fundamentals	/	/	/
Statistics and Probability	NA	/	NA
Ethics in Computing	NA	/	NA
Discrete Mathematics	NA	/	NA
Calculus & Algebra	NA	/	NA

b) Major Discipline Knowledge Area of Competencies

i) Information Technology

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Cyber Security	NA	/	/
Global Professional Practice	NA	/	/

Information Management	NA	/	/
Integrated Systems Technology	/	/	/
Networking	/	/	/
Platform Technologies	NA	/	/
Cloud Computing	NA	/	/
Discrete Structure	NA	/	/
System Paradigms	/	/	/
Software Fundamentals	NA	/	/
User Experience Design	/	/	/
Web and Mobile Systems	/	/	/

ii) Information System

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Foundational IS	/	/	/
Data / Information Management	NA	/	/

IT Infrastructure	/	/	/
Secure Computing	NA	/	/
Systems Analysis & Design	NA	/	/
Application development / programming	/	/	/
IS Management & Strategy	/	/	/
Ethics, Sustainability, Use and Implications for society	/	/	/
IS Project Management	/	/	/

iii) Computer Science

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Algorithms and Complexity	NA	/	/
Architecture and Organization	/	/	/
Computational Science	NA	NA	/
Discrete Structures	NA	/	/
Graphics and Visualization	NA	NA	/

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Human-Computer Interaction	/	/	/
Information Assurance and Security	NA	NA	/
Information Management	NA	NA	/
Intelligent Systems	NA	/	/
Networking and Communication	NA	/	/
Operating Systems	NA	NA	/
Platform-based Development	NA	/	/
Parallel and Distributed Computing	NA	/	/
Programming Languages	/	/	/
Software Development Fundamentals	/	/	/
Software Engineering	NA	NA	/
Systems Fundamentals	NA	/	/
Social Issues and Professional Practice	NA	NA	/

iv) Software Engineering

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Software Requirements	/	/	/
Software Design	/	/	/
Software Construction	NA	NA	/
Software Testing	/	/	/
Software Sustainment	NA	NA	/
Software Process and Life Cycle	/	/	/
Software Systems Engineering	NA	NA	/
Software Quality	/	/	/
Software Security	/	/	/
Software Safety	/	/	/
Software Measurement	NA	NA	/
Project Management	/	/	/
Behavioural Attributes	/	/	/

v) Data Science

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Discrete Structure (DS)	NA	NA	/
Analysis and Presentation (AP)	NA	NA	/
Artificial Intelligence (AI)	NA	NA	/
Big Data Systems (BDS)	NA	NA	/
Computing and Computer Fundamentals (CCF)	NA	NA	/
Data Acquisition, Management, and Governance (DG)	NA	NA	/
Data Mining (DM)	NA	NA	/
Data Privacy, Security, Integrity, and Analysis for Security (DPSIA)	NA	NA	/
Machine Learning (ML)	NA	NA	/
Professionalism (PR)	NA	NA	/
Programming, Data Structures, and Algorithms (PDA)	NA	NA	/
Software Development and Maintenance (SDM)	NA	NA	/

10. Cyber Security Technology Profiles

Cyber Security Technology is an applied body of knowledge in the process, practice, design, and technique to protect information, data and networks in preserving the CIA (Confidentiality, Integrity and Availability).

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
CYBER SECURITY TECHNOLOGY	**Development**	● Describe cryptography concepts ● Apply data integrity ● Apply fundamental design principles including least privilege, open design, and abstraction ● Describe security requirements and their role in the design ● Identify vulnerabilities of system components ● Design systems, architecture, models, and standards ● Apply holistic approach ● Implement personal data privacy and security	**NOT APPLICABLE**	
	Manufacturing	● Identify component lifecycle ● Apply secure component design principles ● Analyse supply chain management security ● Implement physical and software component interfaces ● Apply access control ● Reverse engineering		
	Testing	● Implement static and dynamic testing ● Implement system and security testing	**Testing**	● Perform static and dynamic testing ● Perform system and security testing
	Commissioning	● Propose information storage security ● Propose configuration management ● Determine connection and transmission attacks ● Monitoring	**Commissioning**	● Installation and configurations

		● Educate awareness and understanding ● Implement risk management ● Describe governance and policy ● Describe laws, ethics, and compliance ● Implement strategy and planning ● Discuss common criteria for certification		● Prepare system Documentation
	Maintenance	● Implement end-to-end secure communications ● Implementation issues ● Apply ethics, especially in development, testing and vulnerability disclosure ● Propose security policy ● Implement a business continuity plan & disaster recovery ● Describe cybercrime ● Describe cyber law, ethics, and policy ● Describe social engineering ● Perform digital forensics ● Propose identity management ● Develop patching ● Perform security audit ● Vulnerability assessment ● Penetration testing	**Maintenance**	● Deploy patching and software update ● Perform maintenance ● Prepare maintenance report

9.2

10.1 For Cyber Security Technology fields, TVET provider should map courses to the following knowledge area of competencies.

a) Core Knowledge Area of Competencies

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Computer Architecture	/	/	/
Database Fundamentals	/	/	/
Basic Mathematics	/	NA	NA
Network & Data Communication	/	/	/
Operating System	/	/	/
Programming Fundamentals	/	/	/
Cybersecurity Fundamentals	/	/	NA
System Analysis and Design Fundamentals	/	/	/
Statistics and Probability	NA	/	NA
Ethics in Computing	NA	/	NA
Discrete Mathematics	NA	/	NA
Calculus & Algebra	NA	/	NA

b) Major Discipline Knowledge Area of Competencies

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Data Security	/	/	/
Software Security	/	/	/
Component Security	/	/	/
Connection Security	/	/	/
System Security	/	/	/
Human Security	/	/	/
Organizational Security	/	/	/
Societal Security	/	/	/

11. Art Design and Creative Multimedia Technology Profiles

Art Design and Creative Multimedia Technology involve the process, technique, and application of technology to produce creative content.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
ART DESIGN AND CREATIVE MULTIMEDIA TECHNOLOGY	**Development**	● Identify issues and gaps ● Conduct user and design research ● Plan design process ● Design sketching and storyboard ● Produce drawings/illustrations/low-fidelity prototype/high-fidelity prototype/mock-ups	**NOT APPLICABLE**	
	Manufacturing	● Development actual production		
	Testing	● Apply post-production techniques ● Prepare critiques ● Prepare test plans ● Conduct user testing and evaluation ● Apply visual enhancement (editing, grading, 3D lighting, compositing) ● Create audio design (mixing, mastering) ● Perform rendering	**Testing**	● Apply post-production techniques ● Prepare critiques ● Prepare test plans ● Conduct user testing and evaluation ● Apply visual enhancement (editing, grading, 3D lighting, compositing) ● Create audio design (mixing, mastering) ● Perform rendering
	Commissioning	● Organise product delivery ● Conduct exhibition	**Commissioning**	● Organise product delivery ● Conduct exhibition
	Maintenance	● Plan CQI ● Prepare product reviews	**Maintenance**	● Plan CQI ● Prepare product reviews

11.1 For Art Design & Creative Multimedia Technology fields, TVET provider should map courses to the following knowledge area of competencies.

a) Core Knowledge Area of Competencies

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Database Fundamentals	/	/	/
Programming Fundamentals	/	/	/
System Analysis and Design Fundamentals	/	/	/

b) Major Discipline Knowledge Area of Competencies

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
Animation	/	/	/
Education Technology	NA	NA	/
Games Development	NA	/	/
Intermedia Advertising	/	/	/
Sonic / Audio Design	/	/	/
Cinematics	NA	/	/

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
New Media Art	/	/	NA
Web & Mobile Content Design	/	/	/
Immersive & Interactive Media	/	/	/
Spatial Design	/	/	/
Simulation Design	NA	/	/

12. Electrical and Electronics Technology Profiles

Electrical and Electronic Technology involves the process, technique, and application of any electrical and electronic-related works.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
ELECTRICAL AND ELECTRONICS TECHNOLOGY	**Development**	● Perform benchmarking/reverse engineering/value engineering/ literature review ● Drawing/modelling/schematic drawing/layout development ● Prototyping/verification/proof of concept (POC) ● Translate and handle technical documentation/specification ● Select appropriate tools/equipment/ hardware/software ● Perform relevant process/ interconnection/encapsulation/system	**NOT APPLICABLE**	

		development and analysis/material selection ● Assess efficiency/performance		
	Manufacturing	● Data collection/monitoring/reporting ● Data analysis/process improvement/ electrical and electronics geometry, dimensioning, tolerance ● Fabricate device/tools/components/ circuit/module/systems		
	Testing	● Perform test selection and planning (procedure) ● Testing/analyses (electrical/failure/ material/reliability/life cycle) ● Diagnose/verify/troubleshoot (diagnostic more to the system, troubleshoot more to focused component)	**Testing**	● Perform standard testing ● Perform data collection ● Perform standard diagnostic/ troubleshooting
	Commissioning	● Plan commissioning process (product/ site/equipment/tools) ● Prepare test run procedure ● Prepare handover planning/process (checklist/document)	**Commissioning**	● Perform installation ● Perform test run ● Prepare standard report
	Maintenance	● Plan a predictive maintenance schedule ● Prepare failure mode and effect analysis (FMEA)/out-of-control action plan (OCAP) process (checklist) ● Analyse standard maintenance report	**Maintenance**	● Perform routine maintenance ● Perform failure mode and effect analysis (FMEA)/ - of-control action plan (OCAP) process (checklist) ● Prepare standard maintenance report

13. Telecommunications and Broadcasting Technology Profiles

Telecommunication and Broadcasting Technology involves process to develop, install, testing, commissioning, operate and maintain of system prior to content delivery including acquisition, production, transmission, contribution, distribution information through variety media platform.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
TELECOMMUNICATIONS AND BROADCASTING TECHNOLOGY	**Development**	● Concept generation and selection ● System and schematic drawing ● Modelling ● Proof of concept (POC) ● Prototyping ● Technical documentation	**NOT APPLICABLE**	
	Manufacturing	● Industrial design and manufacturing/fabrication ● System Integration/Installation/ Configuration		
	Testing	● Test selection and planning (procedure) ● Testing ● Diagnostic and troubleshoot (Diagnostic on the system, troubleshoot on focused component) ● Verification ● Standard compliance	**Testing**	● Standard testing procedure ● Data collection ● Standard system diagnostic ● verification ● Standard compliance
	Commissioning	● Commissioning planning (site) ● Handover planning/process (checklist) ● Technical report	**Commissioning**	● Technical reporting ● System commissioning /handover execution
	Maintenance	● Planned maintenance schedule ● Maintenance process (checklist)	**Maintenance**	● Execute maintenance (preventive & condition based)

		• Detail analysis & improvement planning • Technical reporting		• Problem-solving & diagnose issues/faults. • Technical reporting

14. Manufacturing and Industrial Technology Profiles

Manufacturing and Industrial Technology involves the design and development, planning process, method and technique of producing a component or product or an assembly of components, quality control and product risk analysis.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
MANUFACTURING AND INDUSTRIAL TECHNOLOGY	**Development**	• Product drafting and specification • Sketching • Drawing • Modelling • Analyse finite element analysis (FEA) • Prototype • Perform material selection • Plant layout design • Simulation and modelling - operation design	**NOT APPLICABLE**	
	Manufacturing	• Geometry, dimensioning and tolerance • Manufacturing process • Quality control • Production instruction • Production planning and control • risk Assessment • Optimization/design for excellence (DFX)/design for manufacturing (DFM) • Automation/industry 4 technologies		

		• Quality system • Manufacturing execution system • Production management technology • Operation system		
	Testing	• Quality assurance • Testing procedure • Production standard • Product life cycle • Reliability	**Testing**	• Standard testing • Data collection • Standard diagnostic
	Commissioning	• Commissioning planning (site) • Handover planning/process (checklist)	**Commissioning**	• Installation • Reporting
	Maintenance	• Plan maintenance schedule • Maintenance process (checklist) • Analysis and improvement planning • Predictive maintenance	**Maintenance**	• Performance maintenance • Reporting

15. Green Technology Profiles

Green Technology involves the development and application of products, equipment systems and techniques used to conserve the natural environment and resources, which mitigate the negative impact of human activities.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
GREEN TECHNOLOGY	**Development**	• Concept generation and selection • Benchmarking	**NOT APPLICABLE**	
	Manufacturing	• Prototyping/fabrication		
	Testing	• Develop procedure • Testing • Diagnosis procedure • Inspection on installation	**Testing**	• Standard testing • Data collection • Standard diagnostic
	Commissioning	• Commissioning planning (site)	**Commissioning**	• Installation and auditing

		• Handover planning/process (checklist) • Verification of report		• Reporting
	Maintenance	• Plan maintenance schedule • Maintenance process • Analysis and improvement planning	**Maintenance**	• Performance maintenance • Reporting

16. Building and Construction Technology Profiles

Building and Construction Technology involves the ability to analyse, synthesise and evaluate development, construction and asset management factors in order to produce efficient and effective technical solutions which satisfy performance, production and procurement criteria.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
BUILDING AND CONSTRUCTION TECHNOLOGY	**Development**	• Drawings and survey • Feasibility • Estimating and scheduling • Specifications and contractual Documentation • Authority requirement	**NOT APPLICABLE**	
	Manufacturing	• Risk identification and monitoring and safety • Project management (work scheduling and reporting, procurement and coordination of labour and equipment) • Inspection and supervision		
	Testing	• Perform equipment selection • Testing planning and management • Testing equipment operations • Standards and specifications compliance	**Testing**	• Standard testing operations • Data collection and reporting • Supervision and inspection

		• Perform verification		
	Commissioning	• Management, supervision, and Inspection • Comply with standards & specifications	**Commissioning**	• Supervision on Commissioning • Inspection of Installation • Reporting
	Maintenance	• Defect liability period • Maintenance scheduling and operations • Analysis and improvement planning	**Maintenance**	• Defect liability period • Perform maintenance • Reporting

17. Resource Based, Survey & Geomatics Technology

Resource Based, Survey & Geomatics Technology is art of science which involves application and technique to identify, measure, utilise and to sustain natural resources based on information process or spatially referenced data.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
RESOURCE BASED, SURVEY & GEOMATICS TECHNOLOGY	**Development**	• Concept Generation and Selection • Analyses and Design • Modelling	**NOT APPLICABLE**	
	Manufacturing	• Geometry, dimensioning, tolerance • Process output		
	Testing	• Test selection and planning (procedure) • Testing procedure • Calibration	**Testing**	• Standard testing • Data collection • Instrument calibration
	Commissioning	• Commissioning planning (site) • Handover planning/process (checklist)	**Commissioning**	• Installation • Reporting • Drawing

		• Management, supervision, and inspection • Validation		• Technical report
	Maintenance	• Planned Maintenance Schedule • Maintenance process (checklist) • Analysis & Improvement planning	**Maintenance**	• Perform maintenance • Reporting • Standard monitoring

18. Atmospheric Science and Environmental Technology Profiles

Atmospheric Science and Environment Technology is the study, technique, process, and application of related components in the physics and chemistry of the earth through clean technology that minimizes environmental impact in product development, manufacturing, commissioning, testing, operation, and maintenance for the preservation of the earth (atmosphere) and environment, in promoting sustainable, low carbon and resilience development, excluding other MBOT's specific field of technology

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
ATMOSPHERIC SCIENCE AND ENVIRONMENTAL TECHNOLOGY	**Development**	• Identification and evaluation • Prevention and Control • Regulations • Basic programming and applied • Contract law	**NOT APPLICABLE**	
	Manufacturing	• Management (work schedule, reporting, procurement, coordination of labour and equipment) • Supply chain • Project management tools • Computer-aided drawing (CAD) software competence		
	Testing	• Equipment selection • Testing planning and management	**Testing**	• Equipment inspection and maintenance

		• Testing equipment operations • Regulatory compliance • Verifications • Install equipment, machines, wiring or programs • Relate quality management system/ ISO		• Laboratory & field standard testing • Data collection • Regulatory compliance
	Commissioning	• Management, supervision, and inspection • Regulatory compliance	**Commissioning**	• Installation • Reporting
	Maintenance	• Maintenance scheduling and operations – IoT Sensor • Data (big data) analytic • Performance-based monitoring • Smart technology, remote monitoring	**Maintenance**	• Perform maintenance • Reporting

19. Marine Technology Profiles

Marine Technology involves processes and techniques used in studying, conserving, exploring, protecting and intervening in the marine environment.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
MARINE TECHNOLOGY	**Development**	• Enabling the introduction and exploring new and advancing technology and other relevant developments. • Identify constraints and exploit opportunities for the development and transfer of technology within own chosen field • Conceptualizing process of marine structure equipment or system	**NOT APPLICABLE**	

		• Proof of concept (model testing or simulation) • Carry out standard procedures involving the implementation, monitoring, and reporting of experimental operations • Develop appropriate recommendations (i.e., taking account of cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact) • Compliance with industry-standard or rules/regulations		
	Manufacturing	• Marine equipment manufacturing & fabrication • Risk assessment and quality control monitoring • Processes and production of substances/chemicals/additives/etc., specifically for marine application		
	Testing	• Validating of design input of equipment • Performance as per specification/manual • Physical scaled-model testing and simulations • Data analysis and reporting	**Testing**	• Perform tests per specification • Calibrations • Troubleshooting • Data collection • Reporting & documentation of results
	Commissioning	• Prepare protocol or SOP of completed marine structure, equipment, and applications	**Commissioning**	• Preparation for Commissioning of system and equipment • Installation of systems

		• Compliance with specification (maker/owner/authority) • Integration and installation of marine systems		• Reporting and Documentation of trials protocol
	Maintenance	• Managing operations and maintenance of assets and system • Survey and inspection, troubleshooting • Diagnosis and analysis of maintenance issues • Develop and evaluate continuous improvement systems	**Maintenance**	• Perform maintenance per schedule • Inventory of spares • Reporting and documentation of maintenance. • Technical recommendations for upgrading/improvements

20. Oil and Gas Technology Profiles

Oil and Gas Technology involves the technology, process and technique used and implemented in the petroleum exploration and production, petroleum transportation (pipeline system), petroleum product manufacturing and energy production.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
OIL AND GAS TECHNOLOGY	**Development**	• Apply project management and scheduling • Perform total life cycle cost analysis • Apply new/existing technologies and their applicability to project needs	**NOT APPLICABLE**	
	Manufacturing	• Comply with technical specifications and drawings, code, and standard/statutory requirement/ HSE requirement • Implement quality assurance and quality control • Apply continuous improvement process to increase efficiency		

	Testing	• Prepare test selection, planning and diagnostic procedure • Evaluate and analyse test result • Conduct failure analyses, document results, and recommend corrective actions.	**Testing**	• Execute and monitor testing • Perform standard diagnostic • Record testing data
	Commissioning	• Prepare plan and procedures for commissioning • Analyse user/site acceptance test data • Prepare commissioning report	**Commissioning**	• Comply with commissioning task/job method statement and procedure • Perform user acceptance testing (Data collection) • Perform site monitoring
	Maintenance	• Prepare inspection and maintenance schedules and work plans • Perform troubleshooting of equipment performance deterioration/failure • Identify obsolescence/decommissioning of equipment • Provide site report and recommendation	**Maintenance**	• Perform inspection and maintenance task • Perform basic troubleshooting

21. Nuclear and Radiological Technology Profiles

Nuclear and Radiological Technology involves the techniques, skills, methods, and processes used in the peaceful application of ionizing radiation in the consumer products, food and agriculture, industry, medicine and scientific research, transport, and water resources and the environment.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
NUCLEAR AND RADIOLOGICAL TECHNOLOGY	**Development**	● Identify, detect, and understand system or plant failure ● Perform measurement and analysis ● Prepare technical specifications, Drawing and schematic diagram ● Identify and understand regulatory requirement ● Compliance with safety guidelines ● Conduct technology development and advancement	**NOT APPLICABLE**	
	Manufacturing	● GMP/ standard compliance ● Fabricate/ prototyping ● Prepare technical specifications, characterization of product properties		
	Testing	● Techniques/ method selection and planning ● Develop procedure/protocol with compliance with safety ● Develop checklist ● Data evaluation, interpretation, decision making and reporting ● Conduct troubleshooting and diagnosis	**Testing**	● Perform checklist ● Prepare equipment and apparatus ● Data collection ● Adherence to safety procedures

	Commissioning	• Develop operation manual • Develop emergency preparedness and response • Evaluate and revise the effectiveness of the commissioning and emergency plan • Identify risk and environmental impact • Conduct safety culture activities	**Commissioning**	• Operation • Reporting • Adherence to safety procedures
	Maintenance	• Develop maintenance schedule and checklist • Data analysis, reporting and improvement planning • Conduct safety culture activities	**Maintenance**	• Perform maintenance with checklist • Reporting • Adherence to safety procedures

22. Material Science Technology Profiles

Material Technology involves materials selection methods or techniques used to synthesize, produce and/or process materials to obtain the required properties for intended technical and technology services.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
MATERIAL SCIENCE TECHNOLOGY	**Development**	• Materials development • Materials selection • Technical drawing • Simulation and modelling	**NOT APPLICABLE**	
	Manufacturing	• Metrology • Synthesis and/or fabrication and/or processing		

	Testing	• Test selection and experimental design • Testing procedures including automation • Failure analysis and root-cause analysis • Results interpretation • Materials asset integrity	**Testing**	• Standard testing • Data collection • Standard diagnostic • Perform inspection • Materials asset integrity
	Commissioning	• Commissioning planning • Handover planning/ process (checklist) • Mitigation plan	**Commissioning**	• Installation • Reporting
	Maintenance	• Planned maintenance schedule • Analysis and improvement planning • Predictive/preventive/unplanned maintenance • Reverse engineering • Condition-based monitoring	**Maintenance**	• Perform maintenance • Reporting • Perform standard monitoring

23. Nano Technology Profiles

Nano Technology is a technology performed on a nanometer scale (1nm to 100nm) that involves design, prototyping, production, characterization, and application of structures, devices and systems in various industrial sector by controlling shape, size and functionality at nanometer scale.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
NANO TECHNOLOGY	**Development**	• Molecular modelling • Nanostructure analysis and characterisation	**NOT APPLICABLE**	

		• Process flow: design – synthesis - characterise-application of nanostructured materials		
	Manufacturing	• Bottom-up, and top-down synthesis • Nanofabrication/nanodevice prototyping		
	Testing	• Nano imaging (nanoscopy) • Spectroscopy • Safety and regulation (nanotoxicity)	**Testing**	• Nano imaging (nanoscopy) • Spectroscopy • Safety and regulation (nanotoxicity)
	Commissioning	• Functional validation on nanotechnology application • Enabling nanotechnology application	**Commissioning**	• Functional validation on nanotechnology application
	Maintenance	• Nanomaterial deterioration testing • Stability testing	**Maintenance**	• Stability testing

24. Health and Medical Technology Profiles

Health and Medical Technology is involved in the technical development and technical management of Medical Equipment, Medical ICT, and Healthcare Facilities.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
HEALTH AND MEDICAL TECHNOLOGY	**Development**	• Technology Planning - Specification - Layout - Site Preparation - Mobilization	**NOT APPLICABLE**	

		- Storage ● Technology Acquisition ● Technology Development - Prototyping - Testing - Clinical Trial ● Safety, Standard and Accreditation ● Regulatory Compliance		
	Manufacturing	● Production & assembly planning and management ● Modification and refurbishment ● Quality assurance and control ● Labelling and packaging ● Safety, standards, and accreditation ● Regulatory compliance		
	Testing	● Verification of technical specifications ● Visual inspection ● Performance test ● Safety test ● Compliance report ● Regulatory compliance	**Testing**	● Verification of technical specifications ● Visual inspection ● Performance test ● Safety test ● Compliance report ● Regulatory compliance
	Commissioning	● Licensing of equipment ● Licensing of facility ● User and technical training ● Systems Integration ● Acceptance ● Estimated life span/obsolescence ● Regulatory compliance	**Commissioning**	● Licensing of equipment ● Licensing of facility ● User and technical training ● Systems Integration ● Acceptance ● Estimated life span/obsolescence ● Regulatory compliance

	Maintenance	• Equipment/system operation and technical specifications • Asset & inventory management • Warranty management • Schedule maintenance • Unscheduled maintenance • Calibration • Routine inspection • Predictive maintenance • Spare-part management • Service contract management • Safety, standards, and accreditation • Adverse event investigation and reporting • Quality assurance and risk management • Recall, decommissioning and disposal • Regulatory compliance	**Maintenance**	• Equipment/system operation and technical specifications • Asset & inventory management • Warranty management • Schedule maintenance • Unscheduled maintenance • Calibration • Routine inspection • Predictive maintenance • Spare-part management • Service contract management • Safety, standards, and accreditation • Adverse event investigation and reporting • Quality assurance and risk management • Recall, decommissioning and disposal • Regulatory compliance

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Technology And Technical Accreditation Secretariat (TTAS)
Malaysia Board Of Technologists (MBOT)
A1-3-1, Ayer@8, Jalan P8G, Precinct 8,
62250, Putrajaya, MALAYSIA