LEMBAGA TEKNOLOGIS MALAYSIA
MALAYSIA BOARD OF TECHNOLOGISTS

ACADEMIC SECTOR

TECHNOLOGY & TECHNICAL ACCREDITATION STANDARD

2nd Edition

TECHNOLOGY & TECHNICAL ACCREDITATION COUNCIL

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Empowering Technology Education

ACADEMIC SECTOR

Technology & Technical Accreditation Standard 2nd Edition*

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Preface President of MBOT 3
Preface Chairman of TTAC 4
Board Members 5
TTAC Member 6
Acknowledgement 7
Technology and Technical Accreditation Secretariat (TTAS) 8
Contributors 9
Abbreviation 10
Technologists And Technicians Act 2015 (Act 768) 1
Introduction To MBOT 1
Technology And Technical Accreditation Council (TTAC) 2
TTAC Standard Philosophy 3
Accreditation Objectives and Benefits 4
Operation Definition 5
Different Nature of Academic Programme 5
1.0 7**1.1** 7**1.2**
7**1.3**
7**1.4**
7**1.5**
7**1.6**
9**2.0**
10**2.1**
10**2.2**
10**2.3**
10**2.4**
10**2.5**
14**2.6**
14**3.0**
18**3.1**
18**3.2**
18**3.3**
18**3.4**
19**4.0**
20**4.1**
20**4.2**
21**4.3**
22**5.0**
23**5.1**
23**5.2**
25**5.3**
25**5.4**
25**5.5**

PREFACE
PRESIDENT OF MBOT

Bismillahirrahmanirrahim,

Assalamualaikum Warahmatullahi Wabarakatuh,

Technology plays an important role as a catalyst to drive economic growth. In parallel with Japan, China, Singapore and many other developed countries, Malaysia needs local technology talents that are technology users and local technology developers towards making Malaysia a high-tech nation by 2030.

With that being said, the Malaysia Board of Technologists (MBOT) plays a big role in cultivating local technology talents to meet the demands of industries, not only through learning

PREFACE
CHAIRMAN OF TTAC

Bismillahirrahmanirrahim,

Assalamualaikum Warahmatullahi Wabarakatuh,

The recognition of technology programmes through the Technology and Technical Accreditation Council (TTAC) is based on the elements of development, manufacturing, testing, commissioning, and maintenance in line with the Technologists and Technician Act 2015. In this regard, it clearly shows the efforts of the Malaysian Board of Technologists in ensuring the cultivation of local technology talent starts at the education provider level.

Future education is moving towards flexible education and multidisciplinary based. Therefore, the 2nd Edition of Technology and Technical Accreditation Council Standard demonstrates TTAC's aspiration towards the future by allowing education providers to prepare a quality programme in the technology field. The standard was developed in consultation with all respective stakeholders from the public and private sectors as well as academicians and benchmarked to international standards and practices. The standard aims to assist education providers in complying with TTAC's quality assurance of technology programme as preparation for the registration of Technologists or Technicians towards becoming Professional Technologists or Certified Technicians.

In this regard, the standard will further drive the country's aspirations to create a technology-led ecosystem. My hopes are that the publication of the 2nd Edition of Technology and Technical Accreditation Council Standard will positively impact flexible education in the field of technology.

Prof. Dato' Ts. Dr.
Rosli bin Mohd Yunus

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MBOT acknowledges all contributions made by individuals and organisations towards making this Manual a reality for a reference to stakeholders in preparing quality professional technology and technical education programme.
All contributions are highly appreciated.

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TTAC Standard 2nd Edition

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ABBREVIATION

GT	-	Graduate Technologists
Ts./P.Tech	-	Professional Technologists
QT	-	Qualified Technicians
Tc./C.Tech	-	Certified Technicians
AP	-	Accreditation Panel
EP	-	Education Provider
CQI	-	Continuous Quality Improvement
MBOT	-	Malaysia Board of Technologists
MQA	-	Malaysian Qualifications Agency
OBE	-	Outcome - Based Education
SLT	-	Student Learning Time
SRR	-	Self-Review Report
TTAC	-	Technology and Technical Accreditation Council
TTAS	-	Technology and Technical Accreditation Secretariat

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 Aug 1st, 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 MBOT to cover both management & executive levels and executor & support groups, especially technical teams from technicians that can be recognised as professional under Act 768. This recognition of Technicians as professionals subsequently can elevate their status.

Introduction To MBOT

As defined by Collins, technology means “methods, systems, and devices which result from scientific knowledge 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 practice their knowledge based on the usage of tools and the implementations 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) 2015. It should be noted that 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 sections 21(1) and 22(1), Technologists are identified as any individual with a bachelor's degree recognised by the BOD (Board of Director) MBOT. At the same time, Technicians are acknowledged as any person with a certificate or relevant qualifications recognised by the BOD MBOT. MBOT has opened membership registration for technologists and technicians in two entry-level categories: Graduate Technologist (GT) for bachelor’s degree holders in Technology and Qualified Technician (QT) for the 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 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 uses the abbreviated title “Tc.” or C.Tech. Both Ts. and Tc. are entitled to use the stamp as determined by the BOD MBOT.

The scope of services for the Technologists is spelt out in Section 16(b) which involves any operations relating to product development, manufacturing, testing, commissioning, and maintenance. On the other hand, section 16(a) outlines the scope of services for Technicians that including any operations relating to product testing, commissioning, and maintenance.

The functions of MBOT are to:

i. Recognize Ts. and Tc. as professionals;
ii. Keep and maintain the Register of Technologists and Technicians under Section 17 of Act 768;
iii. Provide facilities for the promotion of education and training as well as to hold or cause to be held, professional development programmes for registered persons to further enhance their knowledge relating to their professions;
iv. Conduct assessments or create assessments to be conducted by an institution approved by the BOD MBOT for admission to the profession;
v. Determine and regulate the conduct and ethics of the technologist and technician professions;
vi. Carry out all such acts and do all such things that may appear necessary to the BOD MBOT to carry out the provisions of Act 768.

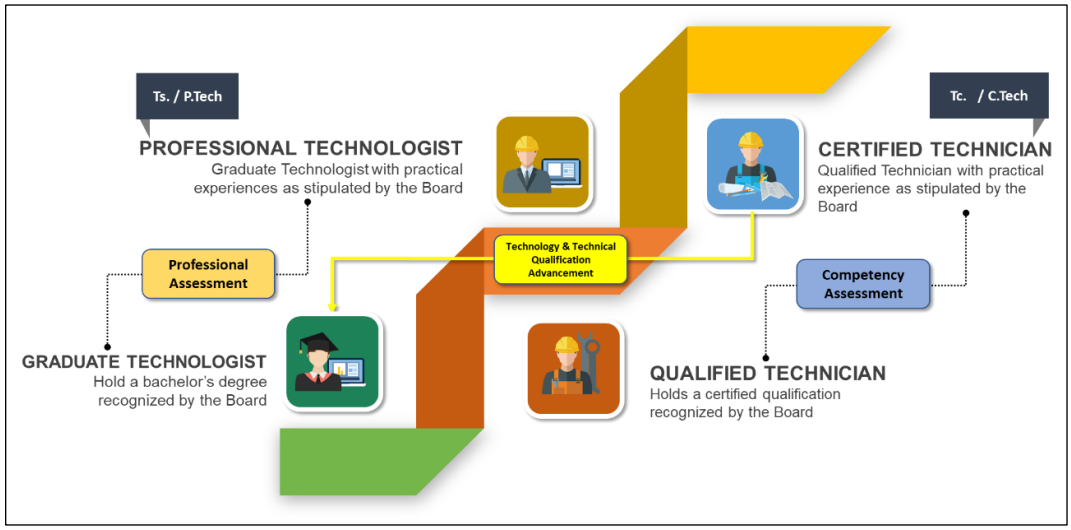

Figure 1.0 MBOT's continuous pathway for technologists and technicians

Technology And Technical Accreditation Council (TTAC)

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

TTAC members are as follows:

i. Chairman;
ii. Representative from Malaysian Qualification Agency;
iii. Representative from BOD MBOT;

iv. Representative from related Ministry;
v. Representative from Learned Society;
vi. Representative from Industries;
vii. Representatives from Academicians; and
viii. Any representative to be determined by the BOD MBOT.

The primary function of TTAC is to evaluate the quality assurance of technology programmes developed and offered by Education Providers. TTAC MBOT aims to uplift the respective programme to be a professional programme which provides multiple benefits to the graduates. The involvement of industry and professionals from other sectors is expected to close the demand and supply gap in all programmes accredited by MBOT. The other functions of TTAC MBOT are to:

i. Establish and re-condition accreditation policies and criteria;
ii. Acknowledge the extensive guidelines and processes for accreditation goals;
iii. Supervise the operational regulations and assign appraisal expert's panel;
iv. Accept assessment reports on Technology and Technical programmes and indicate its accreditation evaluations;
v. take note of any complaints or appeals with respect to the accreditation procedure and any changes in the proposal;
vi. Monitor the evolution and operation of accreditation in other countries and make recommendations to the BOD MBOT accordingly;
vii. Report accreditation operation as appropriate and recommend changes to the BOD MBOT's policy related to the accreditation;
viii. enhance positive developments and excellent practices in Technology and Technical education;
ix. Suggest public statements to the BOD MBOT that are relevant to Technology and Technical education; and
x. Become a Joint Technical Committee with the Malaysian Qualifications Agency (MQA) pursuant to section 51 of the Malaysian Qualifications Agency Act 2007 (Act 679) to coordinate the accreditation process for the Technology and Technical programmes.

TTAC Standard Philosophy

TTAC Standard is a guide for EP in offering any technology or technical academic 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 TTAC Standard represents the aspirations of MBOT to empower Technical and Vocational Education and Training (TVET) in Malaysia by providing the general guidelines for EP to produce quality and competent workforces to local or international stakeholders. The Standard is prepared by considering the nature of future education, such as multidisciplinary based, organic curriculum and flexible education; therefore, EP has autonomy over designing their programmes to meet the stakeholder's expectations.

A quality educational programme should have a proper curriculum structure, learning processes and proven assessment mechanisms to ensure all the intended outcomes and technology/technical services are met. A good quality programme should produce graduates who can uphold the dignity and reputation of their profession, as well as execute their professional skills

to the best of their ability with integrity to safeguard the public interest in matters of safety and health. The system employed by any EP should ensure the implementation of good quality assurance throughout the educational processes in an effort to maintain the highest quality of graduates. Continuous quality improvement should become a part of the culture for the programme's sustainability and keep up to date with real-life technology advancement.

Accreditation Objectives and Benefits

Quality assurance is an open-ended process in which 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 responding 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 programme offered by EP will meet the minimum requirement of technology-based education. Besides, accreditation will ensure that the graduates for the accredited programmes comply with the attributes required as professionals in the fields. There are two levels of programme accreditations, namely:

i. Provisional Accreditation; and
ii. Full Accreditation.

The main objective of Provisional Accreditation is to validate the minimum requirements to conduct a programme by an EP in relation to the seven (7) criteria of assessment, particularly the programme's 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 the preparedness of the institution concerning academic facilities (eg. lecture hall, laboratory, online system etc.) and other support facilities (eg. library, clinic, sport and recreation, substantial room etc.) to ensure all the academic programmes justify the needs and expectation of respective stakeholders.

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

All the programmes that MBOT have accredited by MBOT through TTAC MBOT will be recognised as a registered professional programme that can be referred to under the Malaysian Qualifications Register (MQR) which complies with both MQF and MBOT requirements. Hence the graduate can automatically apply to be registered as GT or QT upon graduation.

Among others, the benefits of an academic programme being accredited are:

i. The Public Service Department (PSD) utilizes the status of the accreditation in verifying 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 to 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 organizations 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 also acknowledge accredited programmes in selecting graduates for recruitment; and
vi. Institutions may franchise their accredited programmes to other institutions, subject to definite conditions.

Operation Definition

In general, the operation 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 the modernization, miniaturization, integration, and computerization 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 Technology and Technical offered by EP are:

i. Structured learning or exercise
ii. Student's exposure to the use of high technology
iii. Produces highly skilled and competent graduates who are competitive

Different Nature of Academic Programme

MQA was established in 2007 under the MQA Act 2007 (Act 679) to implement MQF. 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 Organization (UNESCO) framework. Therefore, MBOT as a professional body established under the Technologists and Technicians Act 2015 (Act 768), takes 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 also determined the eight (8) levels of education pathways that link qualifications systematically through a minimum student learning time and credit hours system as well as the general expectations of learning outcomes.

MBOT acknowledges the interest of EP 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 the 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 different implementation in curriculum structures since the qualifications and levels are already pre-determined by the MQF.

In this case, MBOT puts a firmly believes in the different implementations of the curriculum structures meant for the different job scopes. Hence, a programme should put emphasis on using advanced machinery, equipment or techniques in structured learning methodology to produce highly skilled and competent graduates of the latest technologies who are adaptable to the 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.

On the other hand, hybrid discipline-based and technology programmes require applying scientific and fundamental knowledge and methods within the discipline, combined with technical skills in supporting discipline-based activities. As the concept applies, this type of programme is oriented towards application, providing students with mathematics and science courses and a qualitative introduction to discipline-based fundamentals and applied sciences. Students are exposed to almost similar courses to those of the pure discipline-based programme curricula. However, there will be a different emphasis given to the distribution of theories and technical skills. In short, the approach is typically application-oriented but contains somewhat fewer theoretical elements as compared to the pure discipline-based counterparts.

Finally, for pure technology-based programmes, the emphasis is placed 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, manufacturing, testing, installation, commissioning and maintenance. Students are exposed to the theories and technical skills to execute the tasks in the relevant sectors. The theoretical components can either be stand-alone or embedded within specific courses. Typically, this type of programme is application-oriented emphasising techniques to execute profession-based tasks.

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 utilizing the terms 'Discipline-based & Technology' in the programme nomenclature under the field of MBOT provision may apply to TTAC MBOT for accreditation of the programmes, 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 TTAC MBOT for the programme's accreditation, subject to compliance with the requirements specified by MBOT.

1.2 Level of Programme

The level of the programme refers to the level of an educational programme offered by EP 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 Specialization (If any)

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

1.5 General Guidelines

i. The title of a particular programme must consider the breadth of professional or employment requirements for the specific title and/or descriptors.
ii. Nomenclature can be based on broad-based or specialization depending on the preferences of EP based on the stakeholders' input.
iii. EP's name should not be part of the programme nomenclature.
iv. Programme nomenclature at MQF Level 6 in Bahasa Melayu, it is preferable to use 'Sarjana Muda' instead of 'Bachelor' or 'Ijazah'. Meanwhile, for programme nomenclature at MQF Level 7 in Bahasa Melayu.
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 fields or technology competency, for example:

Table 1.0 Examples of programme nomenclature

MBOT Technology Field	Technology Field	Technology Competency
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 specialization should comprise 25-30% of the specialization courses and the specialization fields should be mentioned in the bracket. For example, Bachelor of 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, EP should not use "in collaboration" or in Bahasa Melayu "dengan kerjasama" in the nomenclature of the programme. The wording 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 EP's (Education Provider) vision and mission. The purpose of having this clear vision and mission is to ensure that the EP has a future direction and how the EP defines its strategies and objectives to position itself in providing the best education and training to the market.

2.2 Programme Educational Objectives (PEOs)

PEOs are broad statements describing what graduates will ultimately become in their career and professional life after several years of graduation. The PEOs are the programme's specific goals and should align with the EP's vision and mission.

In addition, establishing PEOs shall demonstrate the interest of the programme's stakeholders.

Therefore, to ensure the effectiveness of the objective, EP shall have a clear key performance indicator (KPI) for each PEOs, which is agreed upon through proper consultation with the representative stakeholders.

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

The programmes shall demonstrate a mechanism to monitor and evaluate the PEO's 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 respective stakeholders.

2.3 Programme Relation to EP's Vision and Mission

Programmes applying for technology or technical accreditation shall have a statement illustrating their consistency with the EP's Vision and Mission. This statement is very important to ensure the sustainability of the programmes in line with the strategic move of the EP.

2.4 Graduate Attributes (GA)

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

The graduate attributes reflect the commonly known Programme Learning Outcomes (PLOs) which become the minimal intended targets of students' competencies to perform upon completion of a programme.

The programmes shall demonstrate some forms of mechanisms to monitor and evaluate the GA attainment. Attainment of GA 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.

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

It should be noted that based on Act 768 – Technologists and Technicians Act, GT refers to a person who holds a bachelor's degree recognised by the BOD MBOT upon meeting the criteria determined by the BOD MBOT. On the other hand, QT refers to a person who holds a certificate recognised by the BOD MBOT upon meeting the criteria as specified by the BOD MBOT. With respect to QT, MBOT has agreed to recognise Advanced Diploma, Diploma and Certificate MQF Level 3 to be registered as QT upon meeting the criteria as determined by the BOD MBOT.

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Table 2.0 Generic graduate attributes of students upon completion of the programme

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

PLO6 - Lifelong Learning and Information Management / Personal Skills *(Affective Domain)*	Acknowledge the requirement of professional establishment and to employ independent continuing learning in **specialist technology.**	Acknowledge the requirement of career establishment and to employ independent continuing learning in **specialised technical knowledge.**	Acknowledge 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)*	Illustrate consciousness of management and technopreneurial routine in real perspective.	Illustrate consciousness of management and technopreneurial routine in real perspective.	Illustrate 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)*	Illustrate ethical awareness and professionalism.	Illustrate ethical awareness and professionalism.	Illustrate ethical awareness and professionalism.	Illustrate ethical awareness and professionalism.
PLO9 - Teamwork and Leadership *(Affective Domain)*	Illustrate leadership character, mentoring and work efficiently in **diverse teams.**	Illustrate leadership character and work efficiently in **diverse technical teams.**	Illustrate leadership character and work 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; or
CP2: Depth of analysis of the problem with no obvious solution; or
CP3: In-depth knowledge of the field of study; or
CP4: Involves infrequently encountered issues; or
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); or
CA2: Considering solutions for different parameters; or
CA3: Involves creativity and innovation in providing a solution; or
CA4: Sustainable solution

2.5 Technology / Technical Services

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

It is required for Bachelor programmes at MQF Level 6 respectively, denoting the minimum criteria of GT, to address 5 technology services. Meanwhile, programmes at MQF Levels 3, 4 and 5, signifying the minimum criteria of QT, should address 3 technical services. The respective requirement is stipulated in Table 3.0.

Table 3.0 Technology / Technical Services

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 EP to provide the best competency and skills training with respect to the specific field of technology and technical services, as agreed by Technology Expert Panels (TEP) during the engagement sessions. The services are expected to be included in the curriculum design. EP, however, is given the flexibility to modify the curriculum with strong evidence and justification, particularly with respect to technology advances and coverage of the services supported by authorised core industries/agencies. Nevertheless, TTAC MBOT reserves the right to advise EP and make changes where appropriate. Refer to **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 the programme meets the demands of stakeholders to ensure the long-term sustainability of the programme.

ii. Engagement with stakeholders

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

iii. Programme design and delivery

Technology or Technical programmes seeking accreditation shall establish a clear process in designing, reviewing, and evaluating the programme. It is required for the content and structure to continually keep abreast with the most current technological advances, professional practices, and international best practices in the field, and with the needs of stakeholders.

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

EP shall ensure that each programme delivery adopts various teaching-learning methods that are appropriate to ensure the achievement of the programme GAs and TPs. The programme should demonstrate a proper engagement between educators and students to ensure students take responsibility for their own learning.

Prior to conducting the programme and throughout the delivery of the programme, EP shall ensure adequate resources are in place to guarantee the achievement of the programme GAs and TPs, as well as to provide a conducive learning environment which nurtures scholarly, creative and professional development.

Table 4.0 shows the minimum requirement of a programme structure for Technologist / Technician with respect to the MQF levels.

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Table 4.0 Minimum requirement of a programme structure of Technologist or 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)
Student Learning Time, SLT-based Credit Hours++	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	Minimum 80 credit	Minimum 25 credit	Minimum 60 credit	Minimum 30 credit
General Component Consists of MPU courses, EP Compulsory courses, and others.	The remaining credit	The remaining credit	The remaining credit	The remaining credit
Theory/Knowledge-based ● Technology Component only ● SLT / Credits	Minimum 40%	Minimum 30%	Minimum 20%	Minimum 20%
Practical/Modern Tool Usage-based ● Technology Component only ● SLT / Credits	Minimum 40%	Minimum 60%	Minimum 60%	Minimum 60%

++ An academic programme which combines components of “discipline-based & Technology” programmes in its programme nomenclature is expected to have higher SLT-based credit hours and extended tenure years compared to an academic programme with “Technology”-based only.

Table 5.0 Requirement for Academic Sector

Requirement	Academic Sector
Final Year Project	Compulsory for MQF Level 4 and 6
Mini Project (stand-alone or embedded)	Highly encouraged for MQF Level 3 and 5
Industrial Training	Compulsory MQF Level 4 and 6 (minimum of eight (8) weeks)
Industrial Engagement activities	Compulsory for MQF Level 3 and 5

The project aims to develop students' capacity for independent analyses and judgements. An industry-based project should be prioritised in selecting the title for the project. While running the project, students are expected to utilise 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, EP is expected to evaluate individual performances to justify outcome attainment through the project.

The industrial mode / Apprenticeship is where students are placed in industries during the study period, and they are expected to learn theories through industry-guided real-life work learning activities. Programmes adopting the industrial mode/apprenticeship shall ensure that the student's placement is appropriate and their mentors in the industry are well-trained to achieve the programme learning outcomes. The attainment of the outcomes should be evaluated via proper assessments. It is suggested that the credits allocated for this mode be at a range of 24 – 40 credits of SLT per year or 48 – 60 credits SLT for two (2) years of implementation.

It is permitted for the EP opting for the Industrial mode/apprenticeship to conduct theoretical learning instructions and assessments on a weekly basis or block modules for the students prior to attending the industry-guided real-life work learning activities at industries. However, this has to be in consideration of students' welfare and learning processes in achieving the intended learning outcomes.

3.0 CRITERIA 2: STUDENT ASSESSMENT

The assessment indicates various methods or tools utilized 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. The final assessment shall be evaluated individually.

3.1 Relationship between Assessment and Graduate Attribute

The assessment methods shall be mapped to Graduate Attributes clearly and precisely.

3.2 Assessment Regulation and Policies

The EP shall clearly define the assessments' regulations and policies such as the mechanisms to provide feedback on the student's achievement and performance, the 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, and attainment of learning outcomes, an academic regulation handbook, records reporting students' assessments, and students' performance feedback.

3.3 Assessment Process

EP shall clearly describe the process of designing, implementing, evaluating and reviewing the assessment methods as displayed in Figure 2.0. The process shall involve the respective internal and external stakeholders. EP should clearly state the mechanisms to review the assessment methods, such as the appointment of respective committees, data collection, analysis, and documentation processes.

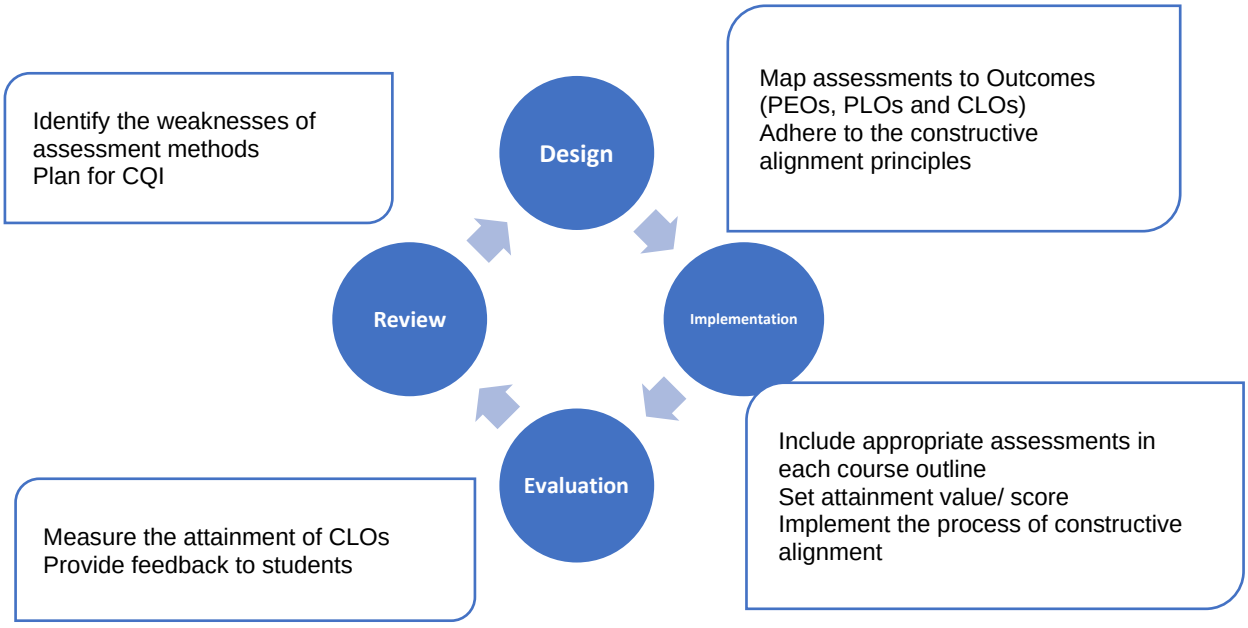

Figure 2.0: Assessment Development Process

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

3.4 Assessment Methods

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

For any group activities, the number of students shall not exceed 4 students per group. Fairness mechanisms should be in place for any group activities to encourage individual learning.

Examples of assessment methods are:

i. Examination
   a) Written examinations such as quizzes, tests, mid-term examinations, and final examinations,
   b) Oral examination,
   c) Practical examination, etc

ii. Coursework
   a) Assignments,
   b) Report,
   c) Case studies,
   d) Laboratory,
   e) Mini project, etc

iii. Project (Individual and/or Group)
   a) Report,
   b) Group Activities,
   c) Presentation,
   d) Final year project,
   e) Capstone project,
   f) Dissertation, etc

iv. Industrial Training

4.0 CRITERIA 3: STUDENTS SELECTION AND SUPPORT SERVICES

Policies and procedures on students' selection and appeals should be established and made accessible to the stakeholders.

EP shall provide student support services, including counselling, career advice, health care access, extracurricular provisions for culture, sports and leisure, and other appropriate activities.

4.1 Students Selection

The minimum student entry requirement for technology programmes are as follows:

Certificate in Technology or equivalent (MQF Level 3)

i. Pass Skills Certificate MQF level 2; or
ii. Pass SPM or equivalent with a minimum one (1) credit in any subject; or
iii. Pass SPM or enrol bridging program for students without SPM (with approval of respective ministry only); or
iv. APEL A as prescribed by MQA; or
v. Other recognised qualifications or equivalent.

Diploma in Technology or equivalent (MQF Level 4)

i. Pass Certificate MQF level 3 with a minimum CGPA 2.00 or equivalent; or
ii. Pass SPM or equivalent with a minimum of three (3) credits in any subject; or
iii. Pass a minimum of one (1) semester pre-diploma programme with SPM or equivalent with a minimum of three (3) credits in any subject; or
iv. Pass STPM or equivalent with a minimum Grade C (CGPA 2.00) in any subject; or
v. Pass STAM (Grade Maqbul) or equivalent; or
vi. APEL A as prescribed by MQA; or
vii. Other recognised qualifications or equivalent.

Advanced Diploma in Technology or equivalent (MQF Level 5)

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

Bachelor of Technology or equivalent (MQF Level 6)

i. Pass Diploma MQF level 4 with a minimum CGPA of 2.00 or equivalent; or
ii. Pass Advanced Diploma MQF level 5 with a minimum CGPA of 2.00 or equivalent; or
Pass STPM or equivalent with a minimum Grade C (CGPA 2.00) in two (2) subjects; or
iii. Pass Matriculation/ Foundation with a minimum CGPA of 2.00 or equivalent; or
iv. Pass STAM (Grade Jayyid) or equivalent; or
v. APEL A as prescribed by MQA; or
vi. Other recognised qualifications or equivalent.

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 the stakeholders.

4.2.1 Student transfer

EP 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 established and made accessible to the stakeholders. The department 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 degree to bachelor degree.

ii. Credit transfer must be based on course mapping 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 of accredited or recognised programmes from the authorized bodies in the respective country (if applicable).

iii. The vertical credit transfer policy is based on the following situation:

   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 a 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 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. The horizontal credit transfer policy is based on the following situation:

a. Credit transfer is allowed for a student that wants to change to another programme in the same field. If the change is within the same EP, there is no credit transfer limit, but it is subject to the established credit transfer requirement. On the other hand, if the change is at a different EP, 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 programme 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 other programmes at the same qualification level.

If the programme is taken in the same EP, no credit transfer limit is subjected to the credit transfer requirement.

4.3 Student Support Services and Extra-Curricular Activities

An appropriate arrangement shall be made to encourage student participation in extra-curricular activities.

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

4.3.1 Student Representative

EP 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 among the students.

EP is encouraged to establish a Student Technologist Chapter to motivate them to progress towards becoming a technologist.

4.3.2 Alumni

EP 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

EP shall have adequate and qualified teaching, technical and administrative staff.

5.1 Teaching Staff

5.1.1 Qualification

EPs shall have a recruitment policy, criteria and other related processes for teaching staff. The recruitment process has to ensure that the fields of expertise of the teaching staff are relevant to the programme being offered. The teaching staff's academic qualification must be from accredited programmes and/or reputable institutions.

A programme shall have the following:

i. Teaching staff with academic qualifications of at least one level higher than the respective academic programme; or
ii. No more than 50% of teaching staff with the same level of academic qualification with a minimum of 3 years of relevant industrial experience; or
iii. No more than 30% of teaching staff from the industry of one level lower academic qualification with a minimum of 5 years of relevant industrial experience; or
iv. No more than 5% of teaching staff from a different field of qualification with recognisable career experience in related competency. Career experience in a related field must be proven with rigorous assessment or professional certification.

EPs must ensure all academic staff have appropriate competency levels for teaching practical–oriented courses within the programme.

If the teaching staff do not meet the required level of expertise, for example, if they are from a different field or their competency is lower than the requirement, EPs should prepare them with upskilling/ reskilling programmes with professional certificates or competency training from dedicated reputable institutions. Additionally, such teaching staff should be mentored by suitable personnel in the industry to increase their skills. In this regard, the EPs should establish a systematic buddy system. However, this staff category should consist of 5% or less of the total academic staff.

For industrial-based learning or programme conducted through the Industrial Mode/Apprenticeship, EP shall have a proper mutual agreement with the respective industry. A suitable industry mentor should be appointed to assist the students with experiential learning in the industry. EP should train the industry mentor to ensure learning takes place as well as to validate assessments for outcome attainment.

5.1.2 Professional Qualification, Training, and Industrial Experience

EP shall ensure all qualified teaching staff to register as Graduate Technologists (GT) or Qualified Technician (QT). At least ONE (1) teaching staff of the programme must be a

Professional Technologist (Ts.) or Certified Technician (Tc.). If this is not met, EP shall show effort towards complying with these criteria.

5.1.3 Requirement

All academic staff shall have appropriate competency for teaching practical–oriented courses within the programme. Upskilling/reskilling programmes in relevant fields shall be in place to continuously improve the competency of teaching staff.

5.1.4 Research, Publication, Product Development and Consultation

For EP to offer Bachelor's programmes, a clear policy on research, publication, product development and consultation should be in place.

For EP offering Diploma or Certificate programmes, a clear policy should be established to encourage research, publication, product development, and consultation.

5.1.5 Staff Student Ratio

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

i. For Bachelor's degree programmes, the staff-to-student ratio should be at least 1:15 with a minimum of 6 full-time teaching staff in the field of programme. (Note: 80 credits technology course. For technology, 1 full-time teaching staff is equivalent to 15 credits. Minimum full-time staff = 80 / 15 = 5.3 ≈ 6 staff).

ii. For Advanced Diploma programmes, staff to student ratio should be at least 1:20 with a minimum of 2 full-time teaching staff in the programme field. (Note: 25 credits technology course. For technology, 1 full-time teaching staff is equivalent to 15 credits. Minimum full-time staff = 25 / 15 = 1.67 ≈ 2 staff).

iii. For Diploma programmes, staff to student ratio should be at least 1:20 with a minimum of 4 full-time teaching staff in the programme field. (Note: 60 credits technology course. For technology, 1 full-time teaching staff is equivalent to 15 credits. Minimum full-time staff = 60 / 15 = 4 staff).

iv. For Certificate MQF Level 3 programmes, the staff-to-student ratio should be at least 1:20 with a minimum of 3 full-time teaching staff in the programme field. (Note: 40 credits technology course. For technology, 1 full-time teaching staff is equivalent to 15 credits. Minimum full-time staff = 40 / 15 = 3 staff).

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 is classified as staff that 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

EP 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, EP shall plan for the technical support staff to attend and complete proper competency training relevant to the job scope.

EP shall 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

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

5.3.1 Qualification

EP 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

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

5.5 Staff Evaluation and Appraisal

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

5.6 Educators Certification

Teaching staff shall undergo a structured teaching and learning training course as well as respective competency training recognised by MBOT or a verified agency. If this is not met, EP shall show proper planning and execution are in place.

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6.0 CRITERIA 5: EDUCATIONAL RESOURCES

Educational resource refers to physical, research and development facilities, as well as financial resources to support the delivery of the programme. 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. It is also compulsory that the safety, environmental, sustainability, cultural, professional, ethical and legal factors are considered in the educational resources' planning and operation.

6.1 Physical Educational Facilities

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

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. The equipment should reflect modern technology practices.

The programmes shall have adequate physical facilities including (but not limited to):

i. Lecture Rooms (with good audio-visual resources);
ii. Laboratories / workshops / studios;
iii. Tutorial / Discussion Rooms;
iv. Activity Rooms;
v. Library Facilities;
vi. Internet Access;
vii. Adequate access to appropriate software and hardware corresponding to the needs of the programme;
viii. General / Specialised components / equipment similar to the industrial usage; and
ix. An experimental laboratory for practical work should specialize in the technical fields within the programme; and
x. Maintenance/calibration of equipment at regular intervals.

Equipment to student ratio shall be 1:4 or better. EP are 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.

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, shall be satisfactory.

6.2 Research and Development

For EP offering Bachelor programmes, shall have adequate research laboratories and equipment relevant to the learning activities which include access to the latest technical publications, dedicated laboratories, and workshops. The programme will ensure that research and development are part of the learning ecosystem.

For EP offering Advanced Diploma programmes or lower, research and development facilities are encouraged and could be geared towards cultivating research and innovation culture.

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 the programme.

The programme shall demonstrate the systematic procedure to ensure that its financial resources are sufficient and managed efficiently.

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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 emphasizes 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 performing various functions. Policies and procedures shall be established, published, and implemented.

7.2 Programme Leadership

EP shall appoint qualified and dedicated leaders from related fields to provide directions and manage resources to ensure the programme stays aligned with its mission, identity, and the requirement of stakeholder requirements.

A programme leader shall meet the following requirements:

Certificate
Minimum of Diploma in related field with two (2) years of relevant academic experience, preferably a Certified Technician (Tc.); OR minimum of Certificate with two (2) years of relevant academic experience and two (2) years of relevant industrial experience, preferably a Certified Technician (Tc.).

Diploma
Minimum of Bachelor's degree in the related field with two (2) years of relevant academic experience, preferably a Professional Technologist (Ts.); OR minimum of Diploma with three (3) years of relevant academic experience and two (2) years of relevant industrial experience, preferably a Certified Technician (Tc.).

Bachelor's Degree
Minimum of Master's degree in the related field with three (3) years of relevant academic experience, preferably a Professional Technologist (Ts.); OR minimum of Bachelor's degree with three (3) years of relevant academic experience and two (2) years of relevant industrial experience, preferably a Professional Technologist (Ts.).

7.3 Record Management

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

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

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8.0 CRITERIA 7: QUALITY MANAGEMENT SYSTEM

EP shall have systematic quality management system to achieve its educational objectives. 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

Governance and institutional support shall be sufficient to ensure the programme's quality.

8.1.1 Governance Support

EP shall establish structure and processes to manage the programme's quality assurance. The governance shall ensure shared responsibility, accountability, consistency, and transparency in assuring the programme's quality. EP shall establish a dedicated unit or committee to oversee and coordinate quality assurance deliverables.

8.1.2 Institutional Support and Resources

EP 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, teaching staff, and informed citizens, shall be obtained to continuously improve the programme's quality.

In order to institutionalise the feedback mechanism, EP should establish at least the following committees;

i. Programme advisory committee
ii. Student representatives

8.2.1 Programme advisory committee

A Programme advisory committee shall comprise an external advisor, industry advisor, alumni, and other relevant stakeholders.

External and industry advisors shall be registered with MBOT as Ts. or Tc. For programmes with more than ONE (1) external advisor and/ or industry advisor, at least ONE (1) of the active external advisors and/ or industry advisor must be a Ts. or Tc. registered under MBOT.

8.2.2 Student Representatives

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

8.3 Monitoring, Review and Evaluation

Programmes shall continually be monitored, reviewed, and evaluated, including EP's governance, institutional processes, curriculum structure, teaching and learning activities, and students and graduates' outcome attainment.

8.3.1 Examination Committee

The Examination Committee shall periodically monitor, evaluate, and review students' performance and outcome attainment.

8.4 Benchmarking

EP should conduct benchmarking in searching, learning, adapting, and implementing the best practices with other reputable institutions to ensure a comparable quality of education.

8.5 Continual Quality Improvement

The programme shall regularly and systematically be assessed and evaluated for continual improvement.

EP shall provide evidence of the following activities for continual quality improvement:

i. Periodic analysis on programme educational objective achievement; and
ii. Periodic analysis on student outcome attainment; and
iii. Periodic departmental analysis on teaching and learning activities; and
iv. Periodic analysis of students' feedback on teaching and learning activities; and
v. A comprehensive review of curriculum at least once every programme cycle; and
vi. Quality evaluation by an external assessor at least once every 2 years; and
vii. Quality evaluation by the programme advisory committee at least once every 2 years.

EP shall take remedial actions by continually improving the following criteria (but not limited to):

i. Curriculum structure and delivery; and
ii. Student assessment; and
iii. Student selection; and
iv. Staff; and
v. Educational resources; and
vi. Programme management; and
vii. Quality management system.

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9.0 ACCREDITATION

Programme accreditation is carried out through THREE (3) types of evaluation, namely Provisional Accreditation (PA), Full Accreditation (FA) and Compliance Accreditation (CA). Each type has a different quality focus depending on the state of development, delivery, and progression of the programme.

i. PA emphasises the curriculum design and the programme delivery preparatory arrangements.
ii. FA evaluation is conducted through evidence-based and verifies the actual delivery of the programme and the support systems' availability during the programme implementation. FA is granted to a programme that has gone through PA or entered a new FA cycle.
iii. CA focuses on compliance with the specific requirements specified by TTAC MBOT upon approval of FA within the same accreditation cycle. CA can be divided into two (2) 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 TTAC MBOT based on previous accreditation evaluation.

9.1 Accreditation Process

The accreditation process starts with EP submitting accreditation documents to TTAC MBOT with the consent of MQA for PA and FA. Meanwhile, for CA, the documentation must be submitted directly to TTAC MBOT. Consequently, TTAC MBOT will appoint SMEs from the approved Accreditation Panel (AP) in accordance with the respective MBOT fields.

PA serves as an evaluation of the academic quality planning for the proposed programme prior to the offering of the programme. The PA process is normally conducted through the desktop audit. TTAC MBOT reserves the right to make an accreditation visit if the condition requires it to do so.

FA serves as an evaluation of the actual implementation of the programme's academic quality. The FA process is normally conducted through an accreditation visit to the respective EP.

The evaluation of the programme's academic quality for PA and FA will be carried out based on provided evidence. EP is responsible for providing all the documents to AP to evaluate academic planning and implementation. Based on the evaluation, EP will be informed of the findings and officially notified by TTAS MBOT of the EP’s opportunity to rebut the AP’s findings before making recommendations to TTAC MBOT. Table 6.0 shows the results of accreditation:

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Table 6.0 Results of accreditation

Accreditation	Process
PA	TTAC MBOT submits recommendations to MQA for approval of PA. The result will be notified by MQA directly to EP and copied to TTAC MBOT for the accreditation record.
FA / CA	TTAC MBOT submits recommendations to BOD MBOT for the approval of FA / CA. The result will be notified by TTAC MBOT to MQA for further process of registration in the Malaysian Qualifications Register (MQR) and listed on the TTAC MBOT website.

9.1.1 Provisional Accreditation

EP requires to submit the SRR01 to MQA. The PA process is illustrated in Appendix C.

9.1.2 Full Accreditation and Compliance Accreditation

EP shall submit the FA application (SRR02) to TTAC MBOT through MQA, SIX (6) months prior to the first cohort of students of the programme completing their studies. FA process is provided in Appendix D.

Meanwhile, for CA (Extending Accreditation / Continuing Accreditation), EP shall submit the application SIX (6) months prior expiry of the initially approved FA period for the accreditation cycle. CA process is provided in Appendix E and F accordingly.

Based on the accreditation audit made by AP, EP shall make remedial actions to comply with the condition(s) or suggestions for improvement. Depending on the state of compliance with the audit condition(s), TTAC MBOT will recommend a period of accreditation subjected to the approval of BOD MBOT.

BOD MBOT decides the FA period, a maximum of six (6) years, depending on the academic quality implementation of the programme. The decision of the accreditation period is based on the accreditation rubric recommended by TTAC MBOT.

For programmes approved with FIVE (5) years of accreditation, EP may apply for an Extending Accreditation (SRR03) to extend the accreditation period for another year to complete the FA cycle, as illustrated in Appendix E.

For programmes approved with 1-4 years of accreditation period, EP may apply for a Continuing Accreditation (SRR04) to continue additional years of accreditation for completing the FA cycle, as shown in Appendix F.

For both Extending and Continuing Accreditations applications, all new applications of SRR03 and SRR04 must be submitted directly to TTAC MBOT. Otherwise, EP may opt to apply for a new cycle of FA by introducing a new SRR02.

In any case of not meeting the quality standards set by TTAC MBOT, EP may be given deferment to re-apply for accreditation subjected to TTAC MBOT approval. For Deferment Accreditation, re-application accreditation documents must be directly submitted to TTAC MBOT. Failure to do so may result in the accreditation being rejected or revoked.

EP may appeal for the rejected or revoked accreditation result directly to MBOT for the attention of the Appeal Committee, independent of the TTAC MBOT. The Appeal Committee then proposes recommendations to the BOD MBOT for the final decision.

Pre-Evaluation Accreditation Visit

Before the evaluation visit, TTAS MBOT will review the pre-evaluation report made by APs and may request additional documents to be prepared by EP before the accreditation audit. EP may provide additional documents and information within a specified period before the visit.

Evaluation Accreditation Visit

For FA (including evaluation for New Cycle Accreditation), the primary objective of the site accreditation visit is to verify the evidence is in accordance with the statement claimed by the EP 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.

Meanwhile, the CA for Continuing Accreditations is to verify the improvement made by the EP based on the condition(s) or suggestion(s) imposed by TTAC MBOT through previous accreditation evaluation. An accreditation visit may be conducted if necessary. Table 7.0 shows the FA / New Cycle Accreditation evaluation schedule, and Table 8.0 shows the schedule for an evaluation visit for Continuing Accreditation.

Table 7.0 Schedule for an FA / New Cycle Accreditation visit

Visit Day 1 (date to be determined)			
Time	**Activity**	**Location**	**Persons involved**
8.00 am	The institution picks up the panels from the Hotel	Officers Administration will inform the location/ venue.	-
8.30 - 8.45 am	Briefing to the panel / discussion session / examine the materials given for reference (Such as the project reports and	EPs will inform the location.	Only AP involved

	examination resources)		
8.45 - 9.30 am	The host organizes a welcoming ceremony. A Senior University representative, for example, the VC or DVC, usually represents the Institution.	EPs will inform the location.	AP, host, and liaison staff
9.30 - 11.30 am	Campus Tour (Labs, Computer Lab, Library, teaching / learning / workspaces as relevant	Officers Administration will insert the location	The University will insert attendees
11.30 am -1.00 pm	Document Review	EPs will inform the location.	The University will insert attendees
1.00 - 2.00 pm	Break	EPs will inform the location.	The University will insert attendees
2.00 - 3.30 pm	Document Review	EPs will inform the location.	The University will insert attendees
3.30 - 4.15 pm	Meeting with the students and graduates	EPs will inform the location.	The University will insert attendees
4.15 - 5.00 pm	Meeting with the student's representative	EPs will inform the location.	The University will insert attendees
5.00 pm	End of first day visit	-	The University will insert attendees
Visit Day 2 (date to be determined)			
Time	**Activity**	**Location**	**Persons involved**
8.00 am	The institution picks up panels from the Hotel	Officers Administration will insert the location	-
8.30 - 9.00 am	AP Meeting	EPs will inform the location.	Only AP involved
9.00 - 10.00 am	Meeting with the	EPs will inform	The University

	teaching staff together with the casual teaching staff	the location.	will insert attendees
10.00 - 11.00 am	Meeting with the Course Coordinators	EPs will inform the location.	Attendees to be inserted by University
11.00 am - 12.00 pm	Triangulation session with Head of Quality Assurance and Top Management (allocation, planning, and quality monitoring)	EPs will inform the location.	Attendees to be inserted by University
12.00 -1.00 pm	AP finalises findings	EPs will inform the location.	Only AP involved
1.00 - 2.00 pm	Break	EPs will inform the location.	-
2.00 - 3.30 pm	Preparation of the final report based on the evaluation visit by APP	EPs will inform the location.	Only AP involved
3.30 - 4.30 pm	Exit Meeting at the programme level (two-way communication)	EPs will inform the location.	AP and programme owner (two-way conversation)
4.30 - 5.00 pm	Exit Meeting at EP level (one-way communication)	EPs will inform the location.	AP, host, and liaison staff (one-way conversation)
5.00 pm	End of Visit Accreditation	-	-
The itinerary arranged complies with the specific audit priorities, issues and availability of evidence as agreed by TTAC MBOT, AP and EP.			

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Table 8.0 Schedule for Continuing Accreditation visit

Visit (date to be determined)			
Time	**Activity**	**Location**	**Persons involved**
8.00 am	The institution picks up the panels from the Hotel	Officers Administration will inform the location/ venue.	-
8.30 - 8.45 am	The host organizes a welcoming ceremony	EPs will inform the location.	AP, host, and liaison staff
8.45 - 9.30 am	Briefing to the panel / discussion session / examine the materials given for reference (Such as the project reports and examination resources)	EPs will inform the location.	Only AP involved
9.30 - 11.00 am	Campus Tour (Labs, Computer Lab, Library, teaching / learning / workspaces as relevant (based on evaluation feedback	EPs will inform the location.	The University will insert attendees
11.00 am - 1.00 pm	Interview Session (based on evaluation feedback)	EPs will inform the location.	The University will insert attendees
1.00 - 2.00 pm	Break	EPs will inform the location.	The University will insert attendees
2.00 - 4.00 pm	Document Review	EPs will inform the location.	The University will insert attendees
4.00 - 4.30 pm	Exit Meeting at the programme level (two-way communication)	EPs will inform the location.	AP and programme owner (two-way conversation)
4.30 - 5.00 pm	Exit Meeting at EP	EPs will inform	AP, host, and

	level (one-way communication)	the location.	liaison staff (one-way conversation)
5.00 pm	End of Visit Accreditation	-	-

Exit Meeting

It is expected to have two (2) exit meetings during the accreditation visit i.e.: exit meetings at the programme level and institutional level.

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

Exit meeting at an institutional level is usually conducted in a one-way communication method for the chairperson of APs to give a brief fact-finding to the top management of the EP for their information of the accreditation evaluation visit. Based on the exit meeting, EP may prepare for the rebuttal process afterwards; most importantly, for the EP to take constructive feedback from the APs for further quality improvement.

Post Evaluation Visit

At the end of the visit, the panels will make a recommendation through a formal report to TTAC MBOT. Based on the coordinated report review by the Technical Accreditation Committee (JTA), they may conclude the running of the programme as evidenced by the interview data, the related documents, and observations. The APs will provide a report consisting of commendations of the programme, feedback on the areas of concern, and recommendations for improvement. The APs should not engage with EPs personally after a visit; any additional document after a visit is unacceptable.

9.2 Submitted Document

All documents provided for the accreditation process are assumed correct and verified by all respective level management within the EP. Programme management is accountable for all the information and document provided in the accreditation evaluation process.

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

EPs are required to submit the SRR based on the accreditation type below:

Table 9.0 Type of accreditation and SRR

No	Type of Accreditation	Type of SRR
1	Provisional Accreditation	SRR01
2	Full Accreditation / New Cycle	SRR02
3	Extending Accreditation	SRR03
4	Continuing Accreditation	SRR04
5	Deferment Accreditation	SRR05
6	Curriculum Review	SRR06
7	Dual Degree / Offshore	SRR07

The template for SRR is available on the TTAS Portal: www.ttasmbot.org.my

9.3 The Accreditation Panel

APs are appointed by the TTAC MBOT as SMEs in the respective fields to represent the council as independent persons to conduct an evidence-based evaluation of the programme quality management practised by EP accordingly.

The main task of the APs is to verify that the policies and standards are in agreement and that the processes, mechanisms, and resources are suitable for the efficiency of the programme delivery. Verification involves the assessment of the quality assurance procedures' efficiencies. The APs evaluate the execution of these procedures in relation to the accomplishment of the expected programme learning outcomes.

The 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 Accreditation Decision and Cycle

Prior to the accreditation decision, EP is given an opportunity for rebuttal based on the evaluation report with new evidence of compliance to the condition(s) / suggestion for improvement specified during the visit (FA) or during the desktop audit (PA). This is also applicable to the Extending or Continuing Accreditation audit. Upon receiving feedback or rebuttal from the EP, the TTAC MBOT will deliberate a recommendation of accreditation.

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For PA, TTAC MBOT will recommend the MQA programme accreditation subjected to the approval of MQA, either with conditions or vice versa, prior to offering the programme.

Conversely, TTAC MBOT will recommend to the BOD MBOT on programme accreditation subjected to the approval of BOD MBOT with a specified accreditation period maximum six (6)

years for any cycle accreditation period. The accreditation period may differ from one (1) programme to another based on remaining in incompliance with condition(s) or suggestions during the evaluation process. Moreover, accreditation may be rejected or revoked if the BOD MBOT deems the programme is sub-standard to the TTAC MBOT standard. The accreditation result will be forwarded to MQA for the registration of programme accreditation in MQR. The EP may appeal to the TTAC MBOT for revision of rejected or revoked accreditation subjected to the approval of BOD MBOT with the newly formed independent committee to review the decision. The TTAC MBOT may refer to the accreditation rubrics prior to recommendation from the BOD MBOT, which are provided in Table 10.0.

Table 10.0 Accreditation Rubric

No	Scale	Details	Remarks
1	Accreditation Denied	i. **Non-compliance** to any **Qualifying Requirement(s)**; and ii. **Non-compliance** to any **Criteria Requirement(s)**	Applicable for PA / FA
2	Deferred	i. The document and information provided indicate the **unreadiness** of EP for accreditation evaluation; and ii. **Non-compliance** to condition(s) or suggestion of **previous PA**; or iii. **Non-compliance** to condition(s) or suggestion of the **previous FA** within the same cycle (applicable to Continuing or Extending Accreditation)	i. Applicable for PA / FA ii. Deferment up to maximum of six (6) months subjected to BOD MBOT discretion; and iii. EP needs to reapply for accreditation and bear the cost of the new accreditation evaluation
3	1 Year	i. **Compliance** with all **Qualifying Requirements**; and --- ii. **Partially closed-the-loop** of condition(s) or suggestion(s) on **previous PA**; or iii. **Partially closed-the-loop** of the condition(s) or suggestion(s) on the **previous FA** within the same cycle (applicable to Continuing or Extending Accreditation); or --- iv. **Partially closed-the-loop** based on condition(s) or suggestion(s) of the **current FA,** subjected to the approval of internal/external governance	i. Applicable for FA ii. EP needs to apply for Continuing Accreditation six (6) months prior expiry of the initially approved FA. The accreditation period of Continuing Accreditation is subjected to the compliance of the condition(s) or suggestion(s) on the previous FA; or iii. EP may opt to apply for a new cycle of FA

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4	2 - 4 Years	i. **Compliance** with all **Qualifying Requirements**; and --- ii. **Closed-the-loop** of condition(s) or suggestion(s) on **previous PA**; or iii. **Closed-the-loop** of condition(s) or suggestion(s) on **previous FA** within the same cycle (applicable to Continuing or Extending Accreditation); or --- iv. **Partially closed-the-loop** based on **condition(s)** of the **current FA** v. **Fully/Partially closed-the-loop** based on **suggestion(s)** of the **current FA**	i. Applicable for FA ii. EP needs to apply for Continuing Accreditation six (6) months prior expiry of the initially approved FA. The accreditation period of Continuing Accreditation is subjected to the compliance of the condition(s) or suggestion(s) on the previous FA; or iii. EP may opt to apply for a new cycle of FA iv. The accreditation period may differ from one programme to another based on the condition(s) and quality of academic assurance
5	5 Years	i. **Compliance** with all **Qualifying Requirements**; and --- ii. **Closed-the-loop** of condition(s) or suggestion(s) on the **previous PA**; or iii. **Closed-the-loop** of condition(s) or suggestion(s) on the **previous FA** within the same cycle (applicable to Continuing or Extending Accreditation); or --- iv. **Closed-the-loop** based on condition(s) of the **current FA,** subjected to the **approval** of internal/external governance; and v. **Fully/Partially closed-the-loop** based on suggestion(s) of the **current FA,** subjected to the **approval** of internal/external governance	i. Applicable for FA ii. EP needs to apply for Extending Accreditation six (6) months prior expiry of the initially approved FA. The accreditation period of Extending Accreditation is subjected to full approval of internal/external governance and closed-the-loop of all condition(s)/suggestion(s) iii. EP may opt to apply for a new cycle of FA iv. The accreditation period may differ from one programme to another based on the condition(s) and quality of academic assurance

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6	6 Years	i. **Compliance** with all **Qualifying Requirements**; and --- ii. **Closed-the-loop** of condition(s) or suggestion(s) on **previous PA**; or iii. **Closed-the-loop** of condition(s) or suggestion(s) on the **previous FA** within the same cycle (applicable to Continuing or Extending Accreditation); or --- iv. **Closed-the-loop** based on condition(s) / suggestion of the **current FA**	i. Applicable for FA ii. EP needs to apply for a New Cycle of FA six (6) months prior expiry of the previous FA.

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9.5 Appeal Procedures

EP may appeal to the TTAC MBOT for revision of rejected or revoked accreditation subjected to the approval of BOD MBOT with the newly formed independent appeal committee to review the decision within two (2) weeks of the official result.

Depending on the independent appeal committee's decision, EP may be required to bear all the expenses if applicable. Furthermore, EP may be required to submit new documents or information to support the application. The decision made by the independent appeal committee is considered final.

9.6 Revision of Programme

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

9.7 Conflict of Interest

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

9.8 Confidentiality

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

9.9 Expenses

All expenses involving accreditation through TTAC MBOT are displayed through MBOT's official channels. There are no hidden costs unless stated in writing. All accreditation expenses will be borne by EP accordingly. MBOT always practices the ethical values of professionalism that is clean, with integrity and free of corruption.

9.10 Publication of Accreditation Status

All accreditation results will be informed to EP in writing, either through MBOT or MQA. All accreditation results are available and accessible to the public in MQR or TTAR. The accreditation period of the particular programme will be displayed accordingly. EP is required to ensure all the information displayed in MQR or TTAR is coincidental.

EP are allowed to advertise the statements to the extent that TTAC MBOT accredits a number of the programmes.

10.0 STANDARD REVISION

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

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Appendix

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

Appendix B - TTAC MBOT Checklist of Documents for Accreditation of Programme

Appendix C – Flow Chart Provisional Accreditation

Appendix D - Flow Chart Full Accreditation

Appendix E - Flow Chart Extending Accreditation

Appendix F - Flow Chart Continuing Accreditation

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

1. **Biotechnology Technology Profiles**
   Biotechnology is the use of a living system to develop, modify or make products which consist of healthcare, agriculture, and Industrial / 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 uses organic and inorganic materials to develop, modify, service or make products consisting of commodity and speciality/fine chemicals.

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 food science in the selection, preservation, packaging, processing, distribution, and use of safe foods.

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

Agro-based Technology involves the process and technique of cultivating, breeding, and processing of the agro produce.

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. Aviation & Aerospace Technology Profiles

Aviation and Aerospace Technology is the practical application of aeronautic design, development, production, operations, maintenance processes and use of aircraft including its component and various system.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
AEROSPACE & 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 & 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 & 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 the operation, maintenance, manufacturing, navigation and control system 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	**Maintenance**	• Perform maintenance per schedule

		• Propose solution based on maintenance issues		• Diagnose maintenance issues

9. Information & Computing Technology Profiles

Information and Computing Technology uses computer technology that involves hardware and/or software to produce meaningful information or outcome.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
INFORMATION & COMPUTING TECHNOLOGY	**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 (5) major discipline areas and EP 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	/	/	/

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

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
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	/	/	/

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
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	/

Knowledge Area of Competencies	Certificate	Diploma	Bachelor
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 the 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	**Commissioning**	● Installation and configurations

		• Monitoring • 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

10.1 For Cyber Security Technology fields, EP 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 & 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 & 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 continuous quality improvement • Prepare product reviews	**Maintenance**	• Plan continuous quality improvement • Prepare product reviews

11.1 For Art Design & Creative Multimedia Technology fields, EP 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	/	/
New Media Art	/	/	NA

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

12. Electrical & 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 & 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/syste m development and analysis/material selection ● Assess efficiency/performance	**NOT APPLICABLE**	

	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 & Broadcasting Technology Profiles

Telecommunication and Broadcasting Technology involves the process, technique, and application to enable the production and transmission of content.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
TELECOMMUNICATIONS & 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 & Industrial Technology Profiles

Manufacturing and Industrial Technology involve the process and technique of producing a component or product or an assembly of components.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
MANUFACTURING & 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 process and technique of applying a sustainable and environmentally friendly approach in any 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) ● Handover planning/process (checklist) ● Verification of report	**Commissioning**	● Installation and auditing ● Reporting
	Maintenance	● Plan maintenance schedule ● Maintenance process ● Analysis and improvement planning	**Maintenance**	● Performance maintenance ● Reporting

16. Building & Construction Technology Profiles

Building and Construction Technology involves the process, method and technique used in the construction of building and civil works

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
BUILDING & 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 • Perform verification	**Testing**	• Standard testing operations • Data collection and reporting • Supervision and inspection
	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	**Maintenance**	• Defect liability period • Perform maintenance • Reporting

		• Analysis and improvement planning		

17. Resource-Based, Survey & Geomatics Technology

Resource Based, Survey & Geomatics Technology is an application and technique to identify, measure, use and preserve natural resources and to process spatially referenced information or 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) • Management, supervision, and inspection • Validation	**Commissioning**	• Installation • Reporting • Drawing • Technical report
	Maintenance	• Planned Maintenance Schedule • Maintenance process (checklist) • Analysis & Improvement planning	**Maintenance**	• Perform maintenance • Reporting • Standard monitoring

18. Atmospheric & Environmental Science Technology Profiles

Atmospheric Science and Environment Technology involve the technique, study, process, or application of related components in physics and chemistry to the earth's atmosphere and environment.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
ATMOSPHERIC & ENVIRONMENTAL SCIENCE 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 operations ● Regulatory compliance ● Verifications ● Install equipment, machines, wiring or programs ● Relate quality management system/ ISO	**Testing**	● Equipment inspection and maintenance ● Laboratory & field standard testing ● Data collection ● Regulatory compliance
	Commissioning	● Management, supervision, and inspection	**Commissioning**	● Installation ● Reporting

		• Regulatory compliance		
	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 • Proof of concept (model testing or simulation) • Carry out standard procedures involving the implementation, monitoring, and reporting of experimental operations	**NOT APPLICABLE**	

		• 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 • Compliance with specification (maker/owner/authority) • Integration and installation of marine systems	**Commissioning**	• Preparation for Commissioning of system and equipment • Installation of systems • Reporting and Documentation of trials protocol
	Maintenance	• Managing operations and maintenance of assets and system	**Maintenance**	• Perform maintenance per schedule • Inventory of spares

		• Survey and inspection, troubleshooting • Diagnosis and analysis of maintenance issues • Develop and evaluate continuous improvement systems		• Reporting and documentation of maintenance. • Technical recommendations for upgrading/improvements

20. Oil & Gas Technology Profiles

Oil and Gas Technology involves the technology, process and technique used and implemented in oil and gas production.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
OIL & 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 & Radiological Technology Profiles

Nuclear and Radiologic Technology involves the process and technique of the use of nuclear reaction and radiation in medicine, healthcare and human activities.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
NUCLEAR & 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 Technology Profiles

Material Technology involves a method or technique used to process, synthesize, and produce material in specific shapes and forms for a specific application.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
MATERIAL 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 the method or application that manipulate the individual atom and molecule of a matter to build microscopic (nanoscale) devices/service and products.

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
NANO TECHNOLOGY	**Development**	● Molecular modelling ● Nanostructure analysis and characterisation ● Process flow: design – synthesis - characterise- application of nanostructured materials	**NOT APPLICABLE**	
	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 & Medical Technology Profiles

Health and Medical Technology involved in the development and management of Health Facilities, Medical Devices, Health ICT, Infection Control, Clinical and E-Waste Management, and Mobile Health Facilities

Technology Fields	Technology Profiles	Expected Technology Competency	Technical Profiles	Expected Technical Competency
HEALTH & MEDICAL TECHNOLOGY	**Development**	• Technology Planning - Specification - Layout - Site Preparation - Mobilization - Storage • Technology Acquisition • Technology Development - Prototyping - Testing - Clinical Trial • Safety, Standard and Accreditation • Regulatory Compliance	**NOT APPLICABLE**	
	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	**Testing**	• Verification of technical specifications • Visual inspection • Performance test • Safety test

		• Compliance report • Regulatory compliance		• 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

TTAC MBOT CHECKLIST OF DOCUMENTS FOR ACCREDITATION OF PROGRAMME

Please select: Provisional Accreditation ☐ Full Accreditation ☐

Name of Programme :

MBOT Ref. No. :

MBOT Field :

Education Provider & Address :

Name of Faculty/School/Dept. :

Mode of Study :

Duration of Study :

EP Website :

Name of Liaison Officer & Phone Number :

CANCELLED

ACCREDITATION REQUIREMENTS AND CRITERIA

Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
Qualifying Requirements		
1. Minimum total credits (min. technology component)		
Bachelor's Degree: 120 (80)		
Advanced Diploma: 40 (25)		
Diploma: 90 (60)		
Certificate: 60 (30)		
2. Minimum duration of the study		
Bachelor's Degree: 3 years		

Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
Advanced Diploma: 1 year		
Diploma: 2 years		
Certificate: 1 ¼ years		
3. Final year project (MQF Level 4 and 6)		
4. Mini project (MQF Level 3 and 5)		
5. Industrial training compulsory for MQF Levels 4 and 6 (minimum of eight (8) weeks)		
6. Industrial Engagement Activities (MQF Level 3 and 5)		
7. Minimum number of full-time teaching staff in the relevant field		
Bachelor's Degree: 6 full-time staff		
Advanced Diploma: 2 full-time staff		
Diploma: 4 full-time staff		
Certificate: 3 full-time staff		
8. Minimum staff: student ratio		
Bachelor's Degree: 1:15 or better		
Advanced Diploma: 1:20 or better		
Diploma: 1:20 or better		
Certificate: 1:20 or better		
9. At least one (1) teaching staff must be a Ts. or Tc. registered under MBOT or efforts towards complying with the criteria		
10. External advisor's report		
11. Industry advisor's report		
12. Technology / technical services		
Criteria 1: Programme Design and Delivery		
1. Vision and mission of EP		

CANCELLED

	Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
2.	List of PEOs with respective KPI, monitoring and evaluation mechanism		
3.	Relation between PEO and EP's vision and mission		
4.	List of PLOs with respective KPI, monitoring and evaluation mechanism		
5.	Address the technology/technical services		
6.	Address the knowledge area of competencies (**for Information and Communication Technology, Cyber Security Technology and Art Design and Creative Multimedia Technology only**).		
7.	Market survey and need analysis		
8.	Reports on engagement with stakeholders		
9.	Procedures on programme design, review, and evaluation		
10.	Adoption of various teaching-learning methods		
11.	Final Year Project		
12.	Industrial Training / Apprenticeships (Including agreement)		
Criteria 2: Student Assessment			
1.	Mapping of assessment to PLO		
2.	Assessment regulation and policies, including: ● Feedback mechanism on student performance ● Vetting for the final examination. ● External advisor input. ● Strong room regulation. ● Grading system. ● Appeal mechanism. ● Endorsement of results. ● Attainment of learning outcomes. ● Handbook on academic regulations. ● Handling of students' assessment records.		
3.	A process for the development of the assessment method:		

CANCELLED

Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
● Process to ensure construction alignment ● Mapping of CLO, PLO, and PEO ● CLO assessment methods and KPI ● CQI on CLO, PLO, and PEO		
4. Assessment of student course performance: ● Final assessment ● Coursework ● Project (max. 4 students in a group) ● Final year project (max. 4 students in a group) ● Capstone project (max. 4 students in a group) ● Industrial training		
Criteria 3: Student Selection and Support Service		
1. Policy and procedures on application/ student selection		
2. Entry requirement for the programme		
3. Communicating criteria and policy on student selection to the public		
4. Policy and procedures on appeals		
5. Policy, regulations, procedures, and students/public awareness on articulation/ student transfer		
6. Policy, regulations, and procedures on credit transfer ● Vertical ● Horizontal ● Residential year		
7. Policy, regulations, and procedures on course exemption		
8. List of support services provided for students		
9. Evidence on adequate and qualified staff in providing counselling for students		
10. Evidence on student participation in extra-curricular activities		

CANCELLED

Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
11. Regulations, processes, and functions of a student representative organization		
12. Establishment/effort on establishing Student Technologist Chapter		
13. Linkages to alumni and activities involving alumni		
Criteria 4: Teaching and Support Staff		
1. Recruitment policy, criteria & process of teaching staff		
2. List of academic staff with academic qualifications & industrial experience:		
Teaching staff with academic qualifications of at least one level higher than the respective academic programme; or		
No more than 50% of teaching staff with the same level of academic qualification with a minimum of 3 years of relevant industrial experience; or		
No more than 30% of teaching staff from the industry of one level lower academic qualification with a minimum of 5 years of relevant industrial experience; or		
No more than 5% teaching staff from a different field of qualification with recognisable career experience in related competency		
3. Industry mentor for industrial-based programmes		
4. Policy on research, publication, product development and consultation		
5. Recruitment policy and criteria for technical support staff		
6. List of technical support staff with academic, skills, professional qualifications (QT-MBOT) and industrial experience		
7. Adequate technical staff with respect to number of teaching facilities		

CANCELLED

	Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
8.	Recruitment policy and criteria for administrative support staff		
9.	List of administrative staff with academic and professional qualifications		
10.	Adequate administrative staff to support the programme		
11.	Mechanism of continuous career development for staff. (Academic, Technical Support, Administrative)		
12.	Industry engagement involving teaching staff		
13.	Annual staff performance evaluation system		
14.	Evaluation of teaching staff by students		
15.	Structured teaching and learning training for new teaching staff		
Criteria 5: Educational Resources			
1.	List of physical facilities for teaching and learning activities		
2.	List of equipment of HT and HV		
3.	Maintenance of facilities and equipment		
4.	List of facilities provided for the well-being of students, e.g., hostel, café, CCTV, sport and recreational, health centre, student centre and transportation, among others		
5.	List of research and development facilities		
6.	Incorporation of research and development in the learning ecosystem		
7.	Allocation for operation and maintenance of the programme		
8.	Responsibilities and autonomy of the department in budgeting and resource distribution		

CANCELLED

Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
9. Procedures in managing financial resources, viability, and sustainability of the programme.		
Criteria 6: Programme Management		
1. The governance structure of the programme		
2. Policies, principles, rules, and guidelines on programme governance		
3. Qualifications of programme leader:		
Bachelor's Degree & Advanced Diploma: Master in related field with 3 yrs. academic experience OR Bachelor in a related field with 3 yrs. academic experience		
Diploma & Certificate: Bachelor in related field with 3 yrs. academic experience OR Diploma in a related field with 5 yrs. academic experience		
4. Policy or procedures in managing students records on: ● Admission ● Performance ● Completion ● Graduation.		
Criteria 7: Quality Management System		
1. The governance structure of EP		
2. Leadership at a departmental level		
3. Policies and relationships between departments with stakeholders in: ● Collegiality and clarity. ● Finance management. ● Other resources. ● Programme delivery. ● Research. ● Consultancy.		
4. Governance aspect in institutional acts		
5. Department autonomy		

CANCELLED

	Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
6.	Resources to attract, maintain, award, and administer continued professional establishment of staff		
7.	Resources to acquire, maintain and operate infrastructures, facilities, and equipment		
8.	Stakeholders (students, alumni, employers, professional bodies, teaching staff and informed citizens) engagement/ feedback to improve the programme		
9.	Programme advisory committee comprised professionals, industry representatives, external academic evaluators, subject-matter experts, alumni's and other relevant stakeholders		
10.	Student representative feedback		
11.	Report on the monitoring, review, and evaluation of: ● Governance ● Institutional process ● Functions and reports of the examination committee ● Curriculum outcomes, content, delivery, and assessment ● Students' performance (PLO attainment) ● Graduates' achievement (PEO attainment)		
12.	Benchmarking on QMS conducted.		
13.	Components of continual quality improvement: ● Curriculum and core courses are reviewed at least once every programme cycle ● External advisor report at least once in 2 years ● Industry advisors report at least once in 2 years ● Progressive evaluation of practical and industrial attachment practices ● Calibration of equipment at regular intervals ● Linkages and involvement with industry ● Dialogue sessions with stakeholders at least once every programme cycle ● Keynote speech in relevant field		

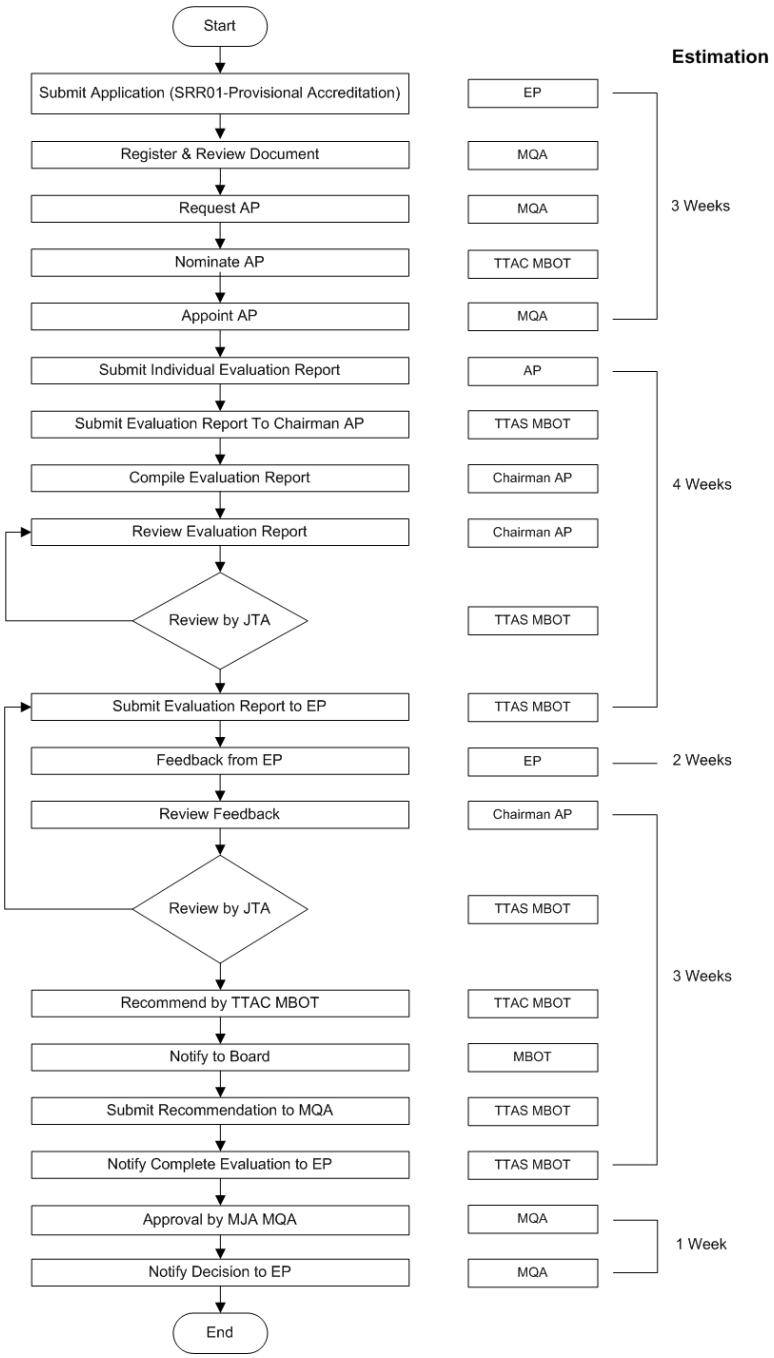
CANCELLED

Requirement/Criteria *Cross where applicable	Compliance (Yes/No)	Location of Evidence in SRR
• Active academic staff participation in conferences/seminars/workshops/ short courses • Organisation of conference/ seminar/ workshop		

CANCELLED

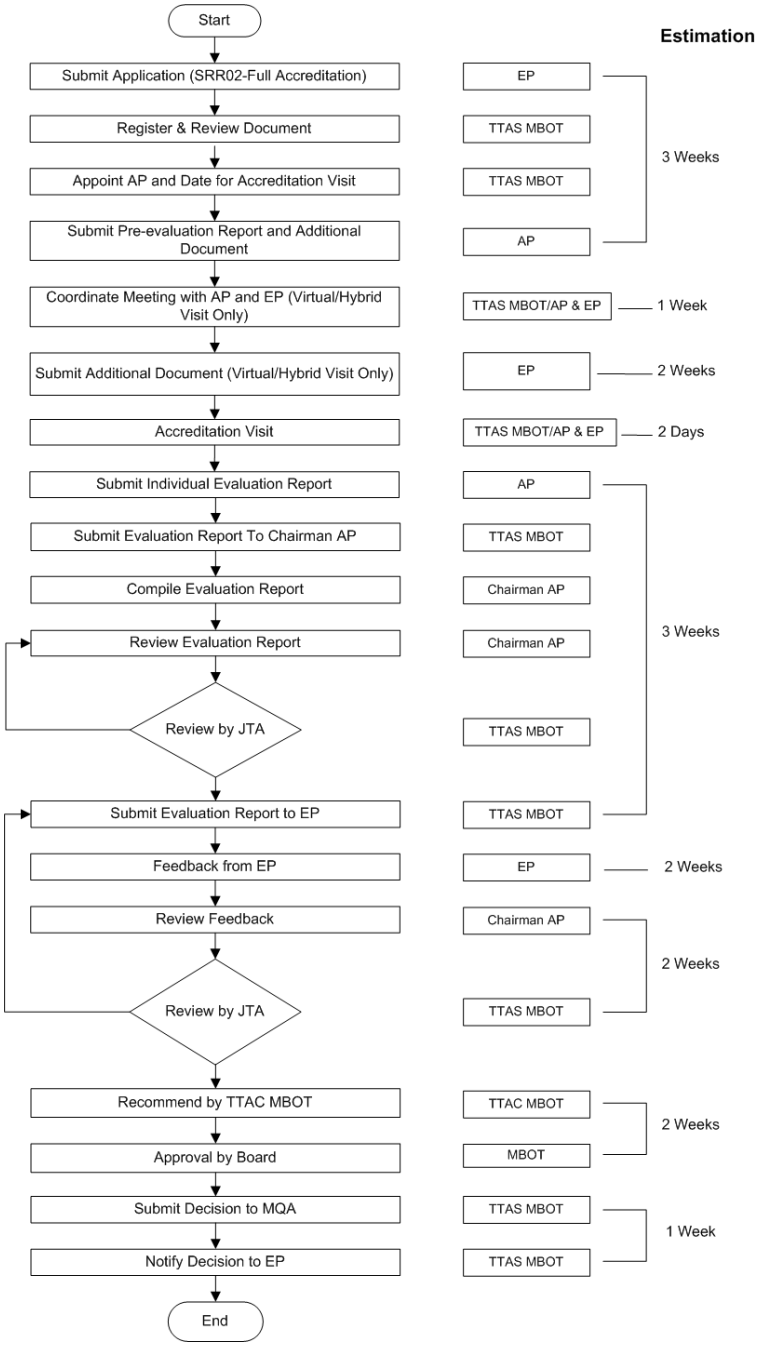
Appendix C

FLOW CHART PROVISIONAL ACCREDITATION



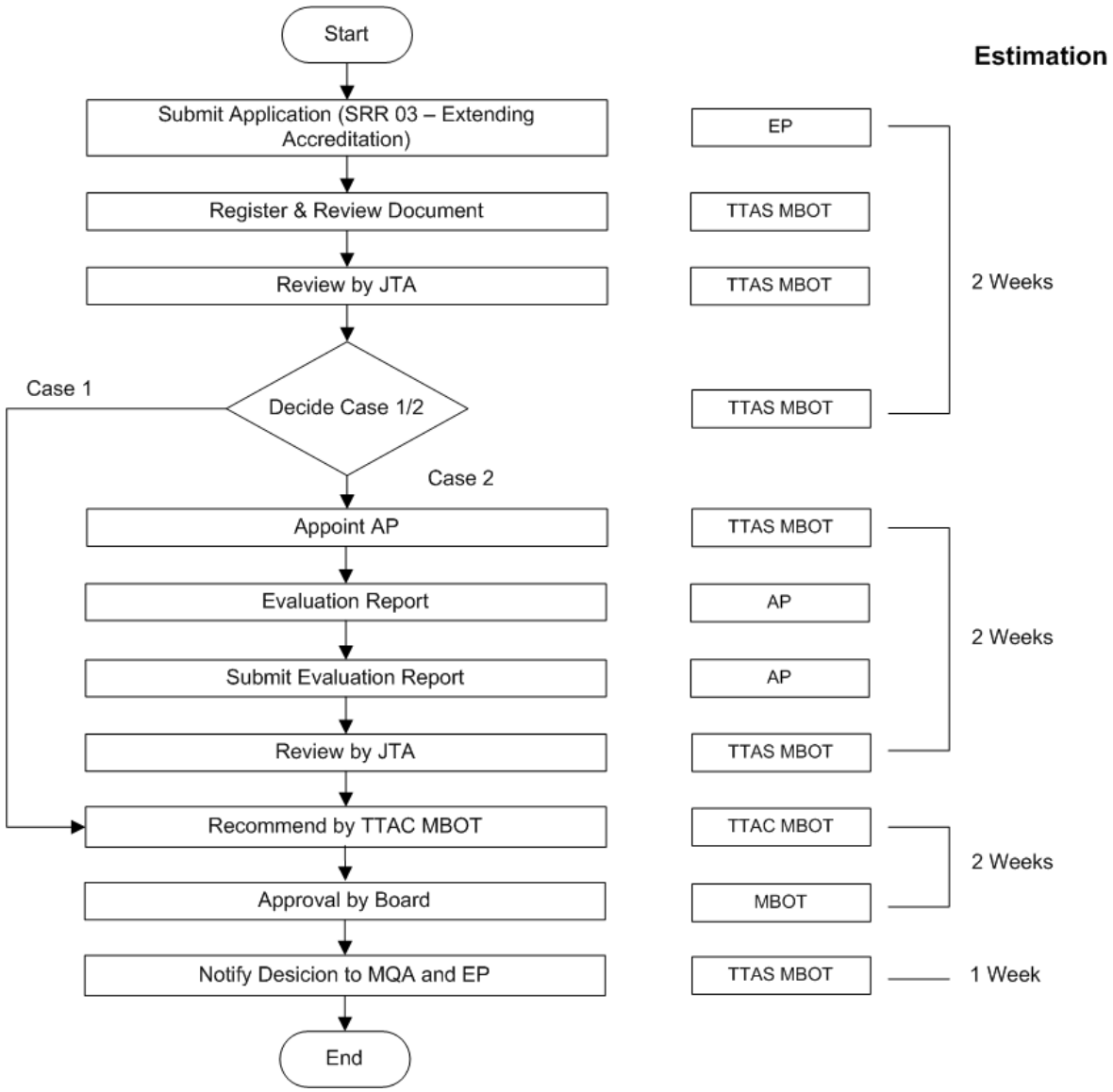
Appendix D

FLOW CHART FULL ACCREDITATION



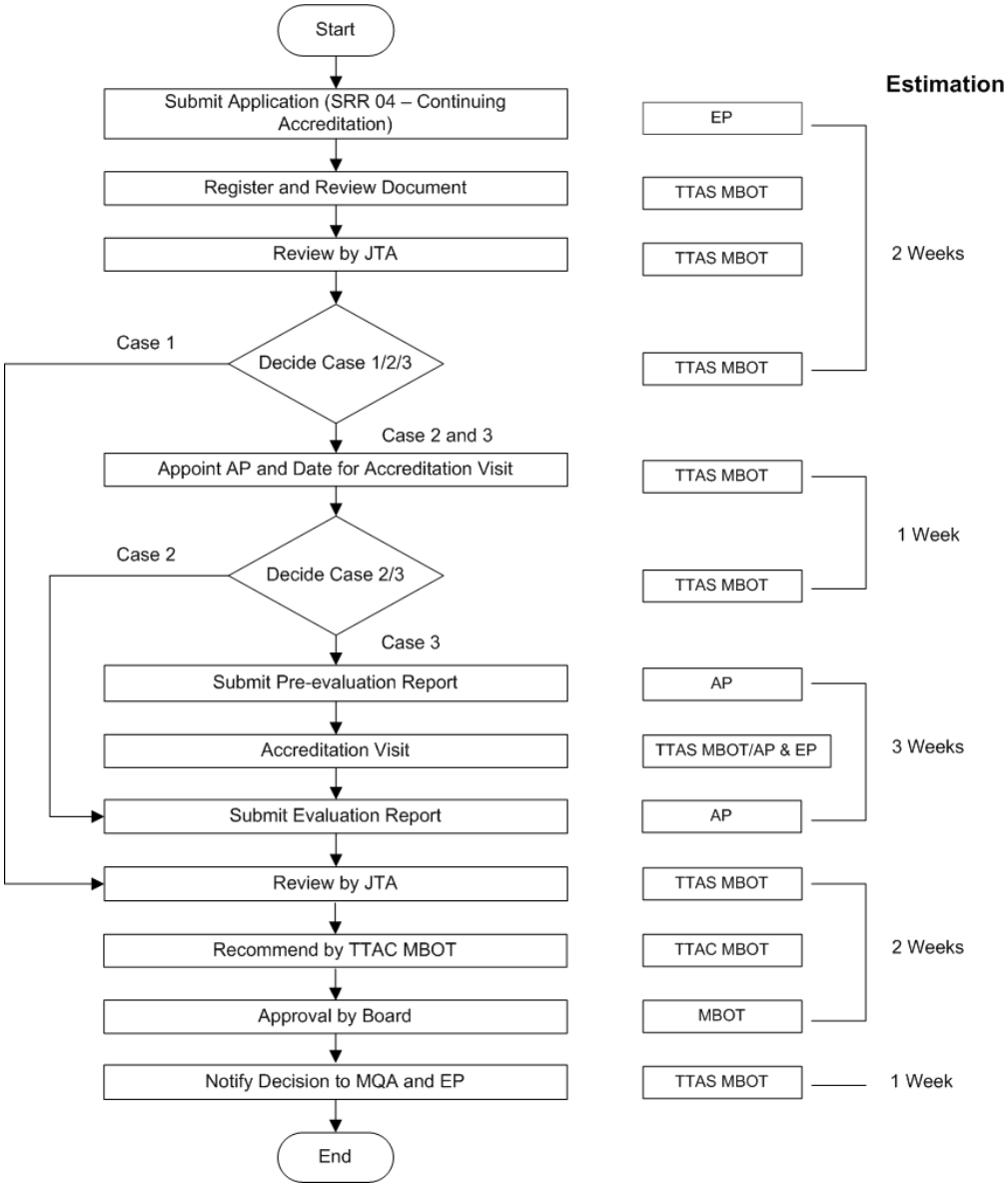
Appendix E

FLOW CHART EXTENDING ACCREDITATION



Appendix F

FLOW CHART CONTINUING ACCREDITATION



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MALAYSIA BOARD OF TECHNOLOGISTS

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