Module Synopsis
Diploma in Engineering (Mechanical – Rapid Transit Technology)

This Diploma is offered through **two** distinct pathways:

1. **Employee Path (for SBST/SMRT staff only):**
   Students must complete MC 1 to MC 5 to obtain the *Diploma in Engineering (Mechanical – Rapid Transit Technology)*, with MC 4 and MC 5 designated exclusively for SBST/SMRT staff.

2. **Public Path:**
   Open to eligible public applicants. Students must complete MC 1 to MC 3, MC 6 and MC 7 to obtain the *Diploma in Engineering (Mechanical – Rapid Transit Technology)*.

MC 1:	**Modular Certificate in Basic Engineering Technology**	**(180 hours)**
1.	**MM9400: Statics & Dynamics**	**(60 hours)**
	This module provides students with the basic concepts of applied mechanics; namely units and dimensions, equilibrium conditions, friction, kinematics and Newton's laws of motion.	
2.	**MM9304: Thermofluid Systems**	**(60 hours)**
	This module will give a strong basic foundation to students in Thermodynamics and Fluid Mechanics. Topics covered include basics of fluid mechanics, perfect gas and steam. The module is practical based and lectures are supplemented by comprehensive tutorials. Hands-on laboratory classes will reinforce concepts and will allow students to develop robust practical skill-sets on the topics studied.	
3.	**MM9101: Computer-Aided Drafting**	**(60 hours)**
	This module provides the knowledge of interpreting and preparing engineering drawing of mechanical parts based on ISO Standard recommendations. Participants will be able to use Computer-Aided Drafting & Design (CADD) software to create parametric solid models of mechanical parts and generate the corresponding basic detailed drawings.	

MC 2:	**Modular Certificate in Intermediate Engineering Technology**	**(180 hours)**
1.	**MM9401: Mechanics of Materials & Machines**	**(60 hours)**
	This module is a continuation from Statics & Dynamics and provides basic concepts of Direct Stress and Strain, Shear Force and Bending Moment Diagrams, First and Second Moment of Area, Bending Theory, Torsion Theory, Torque and Moment of Inertia, Work Power Energy, Simple Lifting Machines and Centripetal Force. These will enable students to apply these to analyse the forces and stresses acting on simple engineering structures and machines.	

2.	**MM9305: Thermofluid Power**	**(60 hours)**

This module aims to provide students with fundamental knowledge and basic principles in the second law of thermodynamics, thermodynamic power cycles, air compressors, conservation of momentum and conservation of energy. Hand-on laboratory classes will reinforce the concepts learnt and will allow students to develop robust practical skill-sets on the topics studied.

3.	**MM9402: Engineering Materials**	**(60 hours)**

This module provides students with an introduction to the basic properties and applications of general engineering materials such as steel, cast iron, aluminium, copper, thermo-setting and thermo-plastics. Students will also be taught the practical skills in mechanical testing, common Non-Destructive Testing (NDT) and metallographic techniques, as well as the knowledge in heat treatment of metallic materials and casting processes.

MC 3:	**Modular Certificate in Advanced Engineering Technology**	**(180 hours)**
1.	**MM9202: Mechanics of Machine Elements**	**(60 hours)**

This module introduces the analysis of stress and strain in bodies under a static equilibrium and basic concepts of dynamics. Applications include the design of machine and structural elements.

2.	**MM9306: Engineering Thermodynamics**	**(60 hours)**

This module aims to provide students with a basic knowledge of heat transfer, combustion, steam nozzles, steam turbine cycles and gas turbine cycles. Lectures will be conducted to introduce key concepts and principles involved. Tutorials will be conducted for individual classes where students will consolidate their knowledge learnt in lectures by doing both descriptive and calculation questions under the guidance of a tutor.

3.	**MM9205: Robotics & Mechanical Design**	**(60 hours)**

This module aims to equip students with the knowledge of robot programming and mechanical design. Robot programming comprise of setting up robot to perform assembly, material handling, machine tending and dispensing work with the help of vision system and sensor technology. Mechanical design encompasses concepts, principles, design processes, and best practices to realise a quality end effector and tooling design. Students will 3-D print the designed mechanical components and integrated it with robot to perform industrial processes.

Module Synopsis
Diploma in Engineering (Mechanical – Rapid Transit Technology)

(OJT) MC 4:	Modular Certificate in Fundamental Technical Training	(180 hours)

1.	ET0821:	Rail Systems Maintenance I	(90 hours)

This module provides students with the knowledge, skills and competencies to perform preventive and corrective maintenance activities as well as modification and/or overhaul works on passenger trains and its components. Students will be able to carry out troubleshooting to perform fault analyses, repairing of electronics, electrical and mechanical equipment of passenger trains as well as performing routine vehicle inspections in accordance to maintenance procedures and instructions.

2.	ET0822:	Workplace Safety and Health I	(45 hours)

This module provides students the abilities to identify and manage risks associated with fatigue within the work environment to ensure all personnel are fit to perform assigned duties, maintain Workplace Safety and Health (WSH) standards and practices when working at heights by establishing safety protocols and complying with regulatory and other Work at Height (WAH) and WSH requirements.

Implement safety procedures and risk control measures in a public transport workplace environment and public access areas to ensure safety of staff and commuters. Assess casualties and apply first aid, Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) skills and abilities in the workplace.

3.	ET0823:	Rail Operation	(15 hours)

This module equips students the skills as Communication Controller to keep track of daily rail operations activities and supports the Operations Control Centre (OCC) in executing its tasks and requirements. Student will be able to monitor passenger activities and train operations to monitor passenger activities and train operations via close-circuit television (CCTV), and communication and alert systems, to provide train service information and updates to commuters and the public.

Student will possess excellent communication skills and is able to succinctly disseminate train service information in real-time and under pressure. Student will be savvy in operating a range of surveillance and broadcast communication equipment.

4.	ET0834:	Maintenance Management	(30 hours)

This module provides the students how to prepare organisational budgets to support short- and long term business plans through forecasting, allocation and financial policy setting. Learn to develop and implement business continuity plans for organisational preparedness of disruptive events. Manage organisational change management systems to drive organisation success and outcomes by preparing, equipping and supporting adoption of change. Students have the capability to identify data sets for the application of statistical techniques to analyse and interpret large complex data to uncover trends or patterns to locate and define new process improvement

opportunities. Write reports using terminology appropriate to the reader as well as identify requirements for written reports.

(OJT) MC 5:	**Modular Certificate in Advanced Rapid Transit Technology**	**(180 hours)**

1.	**MM9531:**	**Rail Systems Maintenance II**	**(90 hours)**

This module provides students with the knowledge, skills and competencies to perform preventive and corrective maintenance activities as well as modification and/or overhaul works on passenger trains and its components. Students will be able to carry out troubleshooting to perform fault analyses, repairing of electronics, electrical and mechanical equipment of passenger trains as well as performing routine vehicle inspections in accordance to maintenance procedures and instructions.

Students will be confident to manage the operations of train stations to achieve rail service continuity, safety and reliability.

2.	**MM9803:**	**Workplace Safety and Health II**	**(30 hours)**

This module provides the knowledge to create and maintain a Workplace Safety and Health culture based on a common set of attitudes, behaviours, and competencies. Student will be able to perform duties with proper supervision and safety precautions, when working in confined spaces and manage safety to minimise risks and hazards when performing electrical-related maintenance activities.

Students will learn to formulate and execute fire safety protocols and processes to minimise risk posed to customers during emergency situations involving fire and Investigate Workplace Safety and Health incidents and accidents based on root cause analysis and identification of corrective actions to prevent recurrences.

3.	**MM9804:**	**Process Improvement & Business Management**	**(30 hours)**

This module prepares our student to develop resource allocation plans and implementation of strategies and polices. Formulate the strategies polices that are forward looking and focuses on bottom line results. Student will be able to build actionable organisation strategy plan and policies that are forward looking, anticipate strategic risks and focus on bottom line results.

Student will possess excellent communication skills, and is able to succinctly disseminate train service information in real-time and under pressure. He is savvy in operating a range of surveillance and broadcast communication equipment.

4.	**MM9805: Critical Core Skills (Leadership)**	**(30 hours)**

Student will learn how to formulate and implement inventory management strategies targeted at ensuring availability of equipment, tools and materials for maintenance work. Equip with the skills to manage vendor by ensuring adherence to contract terms and organisation safety and operating requirements.

MC 6:	**Modular Certificate in Rapid Transit Technology**	**(180 hours)**
1.	**ET0846: Rapid Transit Signalling System**	**(90 hours)**

Provides students with knowledge of the principles of train control and supervision in an urban transit signalling system. The module covers roles and importance of the Signalling system in Railway Operation, Signalling System configuration, architecture and interfaces with other systems, Signal Interlocking System, Train Supervision System and Train Control System, fundamentals of digital communications and transmission line. Students will have a chance to demonstrate their knowledge of the module by designing and implementing a railway model as their graded assignment.

2.	**ET0852: Rapid Transit Technology (Application)**	**(90 hours)**

This module provides students with an understanding of the principles of operation of various technologies within the rapid transit system (RTS). An overview of key features of various sub-systems within the RTS (i.e. Power network, Signalling & Communication, Integrated Supervisory Control System, Permanent Way, Environmental Control System, E&M for Building services, Electrical-Rolling Stock and Automatic Fare Collection) are introduced. With the emerging trend of digital transformation technologies (e.g. IoT, Data Analytics) impacting across all sectors of industry, student will learn the integration of technologies into operations of the RTS to enhance the efficiency, reliability and quality of their operation and services.

MC 7:	**Modular Certificate in Rail Systems & Infrastructure**	**(180 hours)**
1.	**MM9806: Rail Systems Design & Integration**	**(60 hours)**

This module provides students with the knowledge and application skills in identifying the main features and functions of various systems within a rapid transit system (RTS). The module covers history of rapid transit system, main functions and features of different systems within the rapid transit network such as Communication and Control systems, Power Supply and services, Mechanical and Fire Protection systems, Environment Control systems, Permanent Way and Rolling Stock. Railway systems engineering, planning and operations will also be introduced.

2.	**MM9807:**	**Rolling Stock Dynamics & Maintenance**	**(60 hours)**

This module provides students with the knowledge and application skills in identifying the main features and functions of rolling stock systems within a rapid transit system (RTS). The module covers rolling stock design, system, propulsion and brakes, wheel-rail interface, manufacturing and testing, and maintenance of rolling stock equipment. Train data management system in rapid transit environment will also be introduced to allow students to appreciate what goes behind the scenes for every train ride.

3.	**MM9808:**	**Rail Infrastructure Design & Maintenance**	**(60 hours)**

This module aims to provide students with the knowledge and application skills in identifying the main design features of railway infrastructures and its maintenance within a rapid transit system (RTS). The module covers track systems and structures, and its associated maintenance requirements, tunnelling systems and construction, station design and capacity. Lifts, escalators and tunnel ventilation systems, infrastructures commonly seen in rapid transit environment, will also be introduced to allow students to appreciate what entails behind the scenes for every train ride.