

COURSE MODULE			
<u>Course No. CE 29: PROMOTIONAL TECHNICIAN-III</u>			
Duration: 06Weeks			Effective Days:36
S. N.	CM No.	Subjects	Periods
1	29.1	Introduction to Railway Organisation, P.Way and Track Machines.	16
1	29.2	Electrical & Electronics	32
2	29.3	Hydraulics, Pneumatics & Mechanical	32
3	29.4	I.C. Engine & Workshop Technology	32
4	29.5	Track Machines & Working Principles	32
5	29.6	Establishment &Rajbhasha	8
6	29.7	Technical Film Show	4
7	29.8	Library	4
8	29.9	Visit to CPOH & Track Machines WorkingSites	10
9	29.10	Examination (Theory/Practical/Viva-voce)	32
10	29.11	Introduction & Valediction	2
		Total	204

- Note:**
- 1. Eligibility: Promoted Technician-III from Gr.'D' Staff, who has some exposure of track machines working.**
 - 2. Medical Awareness Programme shall be covered under Module No. 29.6 Faculty for this programme may be drawn from Medical Department.**
 - 3. To bridge the gap between theory and practical, 2 visits to CPOH for demonstration and giving hands-on training and 1 day visit to Track Machines Working Sits for proper understanding of machine working shall be arranged.**
 - 4. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.**

PROMOTIONAL COURSE – PROMOTIONAL TECHNICIAN-III

Course No.CE 29

Module No.29.1

SUB: Introduction to Railway Organization, P.Way and Track Machines

Duration: = 16 Periods

Sub-discipline	Lesson	Session wise Contents	Period	Total Period
Track Technology	Introduction to Railway Organization	History of Railways, Zonal Railways, Divisions	1	2
		TT Organization, CPOH.	1	
	Railway Track	Constituents of Railway Track. Formation , Ballast,	1	2
		Requirements of Good Railway Track, Classification of Routes. Different Gauges.	1	
	Rails, Sleepers and fastenings	Functions, Types & Standard Rail Section Standard length, Rolling marks &UTS Functions, Types& Sleeper Density	1	2
		Requirements of PRC sleepers-their and disadvantages. Rail to Rail fastenings Rail to Sleeper fastenings Functions &Specifications	1	
	Points &Crossings	Functions & Important terminology Constituents of Turnout. Switch Angle, Flange way clearance,	1	2
		Heel divergence, Throw of switch Types of Crossings, Crossing number & Main constituents of Built-up Crossing.	1	
	Welding of Rails& LWR	Evil effects of Rail joints, Different types of welding..	1	2
		Development of Welded rails, welding Terminology	1	
	Engineering Restrictions & Indicators	Emergency Protection of track: Single Line& Double Line	1	2
		Detonators & Flare Signals.	1	
	Curves	Necessity of curves: their types, TTP, CTP &Transition lengths, Radius, Degree, Versine & Field	1	2
		Measurement. Super-elevation Cant deficiency, Cant excess, Cant gradient, Equilibrium cant.	1	
Track Machines	Types of Track Machines	Introduction of Track Machines in chronological order	1	2
		Their functions and output.	1	
		Total	16	16

PROMOTIONAL COURSE – PROMOTIONAL TECHNICIAN-III
Course No.CE 29 **Module No.29.2**

SUB: ELECTRICAL & ELECTRONICS SYSTEM

Duration: = 32 Periods

Sub-discipline	Lesson	Session wise Contents	Period	Total Period
Electrical System:	Fundamentals of Electricity & Electrical Components	Symbols, Basic Concept of Voltage and Current, Resistor: Definition, Unit, Symbol, Power Rating, Tolerance, Types.	1	2
		Capacitor & Inductor: Definition, Unit, Symbol, Types, Combinations, Application, Faults and Troubleshooting	1	
	Auto Electrical	Battery: Definition of Cell & Battery, Types, Rating, Specific Gravity,	1	8
		Construction, Working of Lead-acid Cell & Battery, Maintenance, Testing by Hydrometer and Load tester	1	
		Alternator, Regulator & Self starter: Construction, Working, Maintenance and Troubleshooting	1	
		Relay: Definition, Construction & Operation, Types, Pin diagrams,	1	
		Testing; Demonstration and checking Of Relays in Electronics Model Room	1	
		Engine Circuit: Description Functions, Types, Safety Components, Faults & Troubleshooting	1	
		Z.F. Circuit : Description Functions, Types, Safety Components, Faults & Troubleshooting	1	
		Lighting and warning circuit of different machine	1	
Electronic System:	Fundamentals of Electronics	Nomenclatures, Fundamentals of Electronics and Applications, Active components & Passive components	2	2
	Semiconductor Components	Semiconductor Diode: Construction, Working, Forward bias and Reverse bias, V-I Characteristics of P.N. Junction,	1	4
		Types of Diodes, Construction, Working Symbol and Application of Zener Diode, LED, Photo Diode	1	
		Transistor, Construction, Description of Terminals, NPN & PNP Transistor, Mode of Connections, Applications as Switch and Amplifier, Testing	1	
		Testing; Demonstration and checking Of Diode & Transistor in Electronics Model Room	1	
	Transducer	Definition, Principle, Classification, Types, Electronics model room Tamping Depth Transducer.	1	6
		Function and Calibration of Pendulum.	1	
		Function and Calibration of Lining Transducer, Measuring Transducer,	1	
		Function and Calibration of Satellite Transducer, Hook Transducer, Height Transducer and Encoder:	1	
		Demonstration, checking and calibration of Transducers in Electronics model room	2	

	Power Supply	Need, Types, DC to DC Converter & Regulator, Functional description of Power supply PCBs EK813SV, EK816SV,	1	2
		Functional description of Power supply PCBs K819SV, EK851SV, Calibration and Testing & Troubleshooting.	1	
	Programmer unit and Logic Plan. Multi-check/ Multiplexer PCB	Function and Description of Programmer Unit, Different Parts of Logic Plan.	1	4
		Description of different PCBs of Programmer Unit i.e. EK 501P, EK553P, EK552P, EK554P, Multiplexer PCB	1	
		Demonstration of Programmer unit & Logic Plan, Multiplexer PCB in Electronics Model Room	2	
	Tamping Unit Control Circuit	Functional Description of Tamping Unit Control Circuit,	1	2
		Different Positions of Tamping Unit & their Description, Current of Proportional valve.	1	
	Lining & leveling Control Circuit.	Functional Description of Lining Control Circuit and Lining PCBs	1	2
		Description of Lining & leveling Control Circuit and leveling PCBs	1	
		Total	32	32

PROMOTIONAL COURSE – PROMOTIONAL TECHNICIAN-III**Course No.CE 29****Module No.29.3****SUB: HYDRAULICS, PNEUMATICS & MECHANICAL****Duration: = 32 Periods**

Sub-discipline	Lesson	Session wise Contents	Period	Total Periods
Hydraulics	Fundamentals, Symbols, Oil, Tank, Filter & Accumulator	Introduction, Hydraulic Symbols, Functions, Properties of Hydraulic oil, Functions and Parts of Hydraulic Tank	1	2
		Functions and Types of filters, Importance of filtration, Functions, Types, Charging of Accumulator	1	
	Hydraulic Seal, 'O' Ring, Hose and Fitting, Hydraulic Cylinder	Precautions during providing hydraulic Seals, Causes of Failure, Hydraulic Hose	1	2
		Hydraulic Fittings, Precautions during mounting Hydraulic Hoses and Fittings, Functions and type of cylinder.	1	
	Hydraulic Pump and Motor	Definition, Functions and Classification, Working and Construction of Vane pump, Axial Piston Pump,	1	4
		Practical Disassembly and Assembly of Vane pump, Axial Piston pump.	2	
		Functions and types of motor, Precautions during Mounting, Troubleshooting, Aeration & Cavitation.	1	
	Pressure Control Valve	Working and Construction of Relief Valve & Unloader valve	1	4
		Working and Construction of Pressure reducing valve, Troubleshooting.	1	
		Practical Disassembly and Assembly of Proportional valve, Servo valve, Relief valve	2	
	Direction Control and Servo Valve	Function and Types such as Spring centered valves; Spring offset valves, Check valve	1	2
		Pilot Operated Control valve, Function of Proportional & Servo Valve and Troubleshooting	1	
	Hydraulic Transparent Models	Demonstration of Hydraulic motor, D.C. Valves, Cylinder, Accumulator, Pressure Gauge, Pressure control valves,	1	2
		Demonstration of Flow control valve, Check Valve, Pilot Operated Check Valve etc.	1	
	Demonstration of Hydraulic Equipment Sets	Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.	2	2

Pneumatics	Pneumatic Symbols and Pneumatic Components	Pneumatics symbols and Application of air on Track machines, Working and maintenance of Air Compressor, Cooling Coil, Safety valve	1	2
		Working and maintenance of Air dryer, Water separator, Air Oiler, DC Valve, KE Valve Cylinder and Pneumatic hoses. Braking System	1	
	Demonstration of Pneumatic Equipment Sets	Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.	2	2
Mechanical	Power Transmission, Lubrication	Block Diagram, Types of Power Transmission, Mechanical Transmission, 'V' belt, Chain, Pulley, Cardon Shaft.	1	2
		Oil and Lubricants used in different gear boxes, Tamping unit, Lifting unit, Screen Drum etc., types and their capacities.	1	
	Z.F. Hydro-Dynamic Gear Box	Function and Construction, Precautions during working and Maintenance aspects	1	2
		Failure Analysis and Troubleshooting.	1	
	Distributor Gear Box, Funk Gear Box, Reduction Gear Box, Driving Axle	Working, Construction and Maintenance practices, setting of crown & tail pinion on Driving Axle	2	2
	Tamping Unit, Bearings.	Function and Parts, Precautions during working & repairing.	1	2
		Maintenance schedule, setting of bearings and spacers on vibration shaft, Failure Analysis and Troubleshooting.	1	
	Maintenance Schedules	Maintenance Schedules and IOH/POH of machines.	2	2
		Total	32	32

PROMOTIONAL COURSE – PROMOTIONAL TECHNICIAN-III**Course No.CE 29****Module No.29.4****SUB: I.C. ENGINE & WORKSHOP TECHNOLOGY****Duration: = 32 Periods**

Sub-discipline	Lesson	Session wise Contents	Periods	Total Periods
I.C. Engine (including Q series engine)	General	I.C. and E.C. Engine, Classification of I.C. Engine and Main Systems of I.C. Engine.	2	2
	Constructional Details of Engine	Cylinder, Cylinder head, Piston and Piston rings and Connecting rod, Crank shaft, Flywheel, Cam shaft and Sump.	2	4
		Inlet and Exhaust valve, Push rod, Rocker arm, Valve clearance, Valve operating mechanism	1	
		Demonstration of Engine components in I.C. Engine Model Room.	1	
	Basic Terminology	T.D.C., BDC, Swept volume and Clearance volume,	1	2
		Compression ratio, Stroke length and Cylinder bore.	1	
	Working Principle of I.C. Engine	Working Principle of 4 Stroke Diesel Engine (Diesel cycle).	2	6
		Demonstration in I.C. Engine Model Room	2	
		Firing orders and VT diagram Requirement of Air, Types of Air cleaner	2	
	Air Supply system of Diesel Engine	Cleaning and checking of Dry type Air cleaner, Turbocharger and After cooler	1	2
		Demonstration in I.C. Engine Model Room	1	
	Fuel Supply system of Diesel Engine	Functions and classification of Fuel supply system,	1	2
		Block diagram, Fuel Injection Pumps, Injectors and Filters.	1	
	Lubricating system of Diesel Engine	Functions of Lubricating oil, Oil pump, Relief Valve, Filters	1	2
		Functions of Oil Cooler, Strainer, Oil Pressure Gauge, Oil Pressure Indicating light.	1	
	Cooling system of Diesel Engine	Different methods of Engine cooling, Air Cooling system, Water Cooling system, reasons for overheating,	1	2
		Demonstration in I.C. Engine Model Room	1	
	Maintenance Schedule and Maintenance Steps	Maintenance Schedules, Adjustment of Injection timing & Troubleshooting	2	2

Workshop Technology	Welding and Related Processes	Types of Welding, Arc Welding, Related Processes: Soldering, Brazing etc., Procedure for welding of tamping tool and defects in Tamping Tool welding,	1	2
		Welding of BCM turret gears, main links, intermediate links and cutter bar and grinding operation.	1	
	Bench Work and Fitting	Various Tools, their uses and Bench work.	2	2
	Limits, Fits and Surface Quality	Measuring Instruments.	2	2
	Threads	Different types of threads.	2	2
		Total	32	32

PROMOTIONAL COURSE – PROMOTIONAL TECHNICIAN-III

Course No.CE 29

Module No.29.5

SUB: TRACK MACHINES & WORKING PRINCIPLES

Duration: = 32 Periods

Sub-discipline	Lesson	Session wise Contents	Periods	Total Periods
Tamping Machines	08-Duomatic & WST/VPR	Main features, Main assemblies,	1	2
		Working Principle and Power Transmission.	1	
	09-32-CSM	Main features, Main assemblies,	1	2
		Working Principle and Power Transmission.	1	
	08-275-2S & 08-275-3S,4S UNIMAT	Main features, Main assemblies	1	2
		Working Principle, Power Transmission and difference between UNI-2S &UNI-3S & UNI -4S	1	
	09-3x Tamping Express/3X Dynamics	Main features, Main assemblies,	1	2
		Working Principle, Power Transmission	1	
Ballast Handling Machines	BCM: RM-80	Main features main units and assemblies.	1	2
		Working principle.	1	
	RM-80-92U/HOTBCM	Main features main units and assemblies.	1	2
		Working principle.	1	
	FRM-80,85	Main features main units and assemblies.	1	2
		Working principle.	1	
	B.R.M/DGS/RBMV/UTV/MDU	Main features main units and assemblies.	1	2
		Working principle.	1	
Track Laying Machines	TLE	Main features, Fabrication of Panels, Rake Formation.	1	2
		Yard Activities, mode of working	1	
	TRT	Main features, Yard Activities	1	2
		Modified BRHs & Rake formation mode of working.	1	
	T-28	Main features .	1	2
		Working Principle.	1	
Quality Control	Quality Control	Pre-tamping, Post tamping and during tamping attention	1	2
		Maintenance Schedule of Tamping Machine & Non-tampers.	1	
Working Principle	Lining	Principle of Single chord lining. .	1	4
		4 Point lining& left over error.	1	
		3 point lining and left over error and concept of Design Lining	1	
		Introduction to ALC, DRP,CMS, CWS	1	
	Leveling	Double chord system, General lift,	2	4
		Ramp in and out, Selection of baseline.	2	
		Total	32	32

PROMOTIONAL COURSE – PROMOTIONAL TECHNICIAN-III

Course No.CE 29

Module No.29.6

SUB: ESTABLISHMENT &RAJBHASHA

Duration:=8 Periods

Sub-discipline	Lesson	Session wise Contents	Periods	Total periods
Establishment	Leave Rules	Various types of Leaves, Eligibility etc.	2	2
	Pass Rules	Various types of passes, Eligibility etc.	2	2
	D&A Rules	Minor Penalties	1	2
		Major Penalties	1	
Rajbhasha	Rajbhasha	Constitutional Provisions, Official Language Act 1963	1	2
		Official Language Rules 1976. Policy Guidelines & Instructions	1	
		Total	8	8