

**COURSE MODULE****Course No. CE 27: PROMOTIONAL JE****Duration:08Weeks****Effective Days: 48**

S. N.	CM No.	Subjects	Periods
1	27.1	Introduction to Railway Organization, P.Way and Track Machines	20
2	27.2	Electrical & Electronics	44
3	27.3	Hydraulics, Pneumatics & Mechanical	44
4	27.4	I.C. Engine & Workshop Technology	44
5	27.5	Track Machines & Working Principles	48
6	27.6	Establishment, Stores & Rajbhasha	14
7	27.7	Computer	11
8	27.8	Technical Film Show	3
9	27.9	Library	2
10	27.10	Visit to CPOH & Track Machines Working Sites	10
11	27.11	Examination (Theory/Practical/Viva-voce)	30
		Introduction & Valediction	2
		<b>Total</b>	<b>272</b>

- Note:**
- 1. Eligibility: Promoted JE, who has some exposure of track machines working.**
  - 2. Medical Awareness Programme shall be covered under Module No. 27.6. Faculty for this programme may be drawn from Medical Department.**
  - 3. Computer, Technical Film Show and Library periods shall be scheduled during the afternoon session.**
  - 4. 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.**

**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 JE**

**Course No.CE 27**

**Module No.27.1**

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

**Duration- 20 Periods**

<b>Sub-discipline</b>	<b>Lesson</b>	<b>Contents</b>	<b>Period</b>	<b>Total Period</b>
<b>Track Technology</b>	<b>Introduction to Railway Organization</b>	History of Railways, Zonal Railways, Divisions, Production units,TT Organization on Indian railways.	2	2
	<b>Railway Track, Rails</b>	Constituents of Railway Track. Requirements of Good Railway Track, Classification of Routes	1	2
		Different Gauges. Functions, Types & Standard Rail Section, Standard length, Rolling marks	1	
	<b>Sleepers Fastenings &amp; Ballast</b>	Functions, Types & Sleeper Density, Requirements of PRC sleepers-their advantages and disadvantages.	1	2
		Rail to Rail fastenings, Rail to Sleeper fastenings, Functions & Specifications of Ballast.	1	
	<b>Points &amp; Crossings</b>	Functions & Important terminology, Constituents of Turnout. Switch Angle, Flange way clearance, Heel divergence, Throw of switch	1	2
		Types of Crossings, Crossing number & Main constituents of Built-up Crossing	1	
	<b>Welding of Rails &amp; LWR</b>	Evil effects of Rail joints, Different types of Welding.	1	2
		S.W.R/L.W.R/C.W.R, Theory of Welded rails.	1	
	<b>Track Renewals, Maintenance of Track, Engineering Restrictions &amp; Indicators</b>	Classification of Track Renewals. Provisions on Works incidental to Regular Track maintenance with thrust on Deep Screening.	1	2
		Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals	1	
	<b>Curves</b>	Necessity of curves: their types, TTP, CTP & Transition lengths, Radius, Degree, Versine & Field Measurement.	1	2
		Super-elevation: Cant deficiency, Cant excess, Cant gradient, Equilibrium cant, Negative Super-elevation, Gauge widening.	1	
	<b>Schedule of Dimensions</b>	Different Schedules, Standard Dimensions	1	2
Loading Gauge, ODC.		1		
<b>Track Machines</b>	<b>Types of Track Machines</b>	Introduction of Track Machines in chronological order	1	2
		Functions and output of Track machines	1	
<b>IRTMM</b>	<b>Introduction to IRTMM and RDSO TM Reports</b>	Track Machine Organization & Duties of Operator & Technician, Rules for Movement & Working of Track.	1	2
		Machines, Planning, Operation & Monitoring of Track Machines. RDSO TM Reports	1	
		<b>Total</b>	20	<b>20</b>

**PROMOTIONAL COURSE – PROMOTIONAL JE**  
**Course No.CE 27** **Module No.27.2**  
**SUB: ELECTRICAL & ELECTRONICS SYSTEM**  
**Duration: 44 Periods**

Sub-discipline	Lesson	Contents	Period	Total Period
<b>Period Electrical System:</b>	<b>Fundamentals of Electricity &amp; Electrical Components</b>	Symbols, Basic Concept of voltage and current, Ohm's law, Power law, Resistor: Definition, Unit, Symbol, Power Rating, Tolerance, Types, Combinations, Application	1	<b>4</b>
		Capacitor: Definition, Unit, Symbol Types, Combinations, Application	1	
		Inductor: Definition, Unit, Symbol Types, Combinations, Application.	1	
		Demonstration of Resistor, Capacitor & Inductor in model room, Faults and Troubleshooting	1	
	<b>Auto Electrical</b>	Battery: Definition of Cell & Battery, Types, Rating, Specific Gravity, Construction, Working of Lead-acid Cell & Battery. Maintenance, Testing by Hydrometer and Load tester	1	<b>8</b>
		Alternator & Self Starter,: Construction, Working, Regulator Maintenance and Troubleshooting.	1	
		Relay: Definition, Construction, Operation, Types, Pin diagrams , Testing; Demonstration, checking and testing of Relays in Electronics Model Room	1	
		Description , Function of Engine Circuits Types of Engine Circuits	2	
		Description of Safety Circuit	1	
		Description of Lighting Circuits	1	
		Description of ZF Circuits	1	
<b>Electronic System:</b>	<b>Fundamentals of Electronics</b>	Symbols, Nomenclatures, Fundamentals of Electronics & Applications.	1	<b>2</b>
		Active components & Passive components	1	
	<b>Semiconductor Components</b>	Semiconductor Diode: Construction, Working, Forward bias and Reverse bias, V-I Characteristics of P.N. Junction. Types of Diodes, Construction, Working, Application of Zener Diode, LED, Photo Diode.	1	<b>4</b>
		Transistor: Construction, Description of Terminals, NPN & PNP Transistor, Mode of Connections, Applications as Switch and Amplifier, Testing	1	
		Electronics model room for demonstration & checking of Electronic components	1	
	<b>Transducer</b>	Definition, Principle, Classification, Types, Tamping Depth Transducer Function and Calibration	1	<b>4</b>
		Pendulum & Height Transducer: Function and Calibration.	1	
		Lining Transducer, Measuring Transducer, Satellite Transducer, Hook Transducer	1	

		Function and Calibration Encoder: Function and Calibration		
		Electronics model room for demonstration, checking and calibration of Transducers.	1	
	<b>Operational Amplifier</b>	Definition, Symbol, Function of each terminal, Open loop, Close loop, +ve feedback, -ve feedback, Characteristics,	1	<b>2</b>
		Application of Operational Amplifier as Buffer, Inverter, Non Inverter, Adder, Subtractor, Integrator etc.	1	
	<b>Power Supply</b>	Need, Types, DC to DC Converter & Regulator, Functional description of Power supply PCBs EK813SV, EK816SV, EK819SV & EK851SV.	1	<b>2</b>
		Electronics Model Room for demonstration, checking and calibration of PCB EK813SV, EK816SV & EK819SV, Troubleshooting	1	
	<b>Programmer unit and Logic Plan</b>	Function and Description of Programmer Unit, Multi-check PCB EK28V, EK207V, Different Parts of Logic Plan..	1	<b>4</b>
		Description of different PCBs of Programmer Unit i.e. EK501P, EK553P, EK552P, EK554P.	1	
		Demonstration of Programmer unit & Logic Plan in Electronics Model Room	1	
		Demonstration of Programmer unit & Logic Plan in Electronics Model Room	1	
	<b>Tamping Unit Control Circuit DUO/ CSM/3X /Unimat's</b>	Functional Description of Tamping Unit Control Circuit, Calibration, Troubleshooting & Faultfinding.	1	<b>4</b>
		Different Positions of Tamping Unit & their Description, Current of Proportional valve.	1	
		Demonstration, of Tamping Unit Control Circuit in Electronics Model Room.	1	
		Demonstration, of Tamping Unit Control Circuit in Electronics Model Room.	1	
	<b>Front Input Circuit: DUO/ CSM/3X/09-3X Dynamic /Unimat</b>	Functional Description of Front Input Circuit, Front Input Potentiometer, Slew, Versine, General Lift etc.	1	<b>2</b>
		Basic idea of ALC and Laser Lining	1	
	<b>Lining Control Circuit, DUO/ CSM/3X/09-3X Dynamic /Unimat's</b>	Functional Description of Lining Control Circuit & Lining PCBs.	2	<b>4</b>
		Basic concept of 3 Point Regulator / 3 Stage Regulator, calibration, troubleshooting & Faultfinding.	2	
	<b>Leveling &amp; Lifting Control Circuit of DUO/ CSM/3X/09-3X Dynamic /Unimat's</b>	Functional Description of Leveling Control Circuit & Leveling PCBs.	2	<b>4</b>
		Basic concept of 3 Point Regulator / 3 Stage Regulator, calibration troubleshooting & Faultfinding.	2	
		<b>Total</b>		<b>44</b>

**PROMOTIONAL COURSE – PROMOTIONAL JE**  
**Course No.CE 27** **Module No. 27.3**  
**SUB: HYDRAULICS, PNEUMATICS & MECHANICAL**  
**Duration: 44 Periods**

<b>Sub-discipline</b>	<b>Lesson</b>	<b>Contents</b>	<b>Period</b>	<b>Total Periods</b>
<b>Hydraulics</b>	<b>Fundamentals , Symbols, Oil, Tank and Filter</b>	Introduction, Hydraulic Symbols, Functions and Properties of Hydraulic oil, Functions and Parts of Hydraulic Tank.	1	<b>2</b>
		Functions and Types of filters, Importance of filtration.	1	
	<b>Accumulator, Hydraulic Seal, ‘O’ Ring, Hose and Fitting</b>	Functions, Types, Working of Bladder Accumulator, Charging of Accumulator, Precautions during providing Hydraulic Seals, Causes of Failure	1	<b>2</b>
		Hose specification: DIN, SAE & EN standards, Hydraulic Fittings, Precautions during mounting Hydraulic Hoses and Fittings.	1	
	<b>Hydraulic Pump</b>	Definition, Functions, Classification, Working and Construction of Vane pump	1	<b>4</b>
		Practical disassembly and assembly of Vane pump	1	
		Working and construction of Axial Piston Pump, Precautions during mounting, Troubleshooting, Aeration & Cavitation.	1	
		Practical disassembly and assembly of Axial Piston Pump	1	
	<b>Pressure Control Valve</b>	Working and Construction of Relief Valve, Unloader valve, Pressure Reducing valve and Trouble shooting.	1	<b>2</b>
		Practical disassembly and assembly of Relief valve	1	
	<b>Direction Control Valve</b>	Function and Types such as Spring centered valves; Spring offset valves, Check valve, POC valve, Troubleshooting.	2	<b>2</b>
	<b>Proportional Valve, Servo Valve and Flow Control Valve</b>	Function and Troubleshooting.	2	<b>4</b>
		Practical disassembly and assembly of Proportional valve and Servo valve	2	
<b>Hydraulic Cylinder and Motor</b>	Function, Types and Parts, Working of Vane motor, Gear motor and. Axial Piston motor, Troubleshooting.	2	<b>2</b>	
<b>Hydraulic Transparent Models</b>	Demonstration of Hydraulic Motor, D.C. Valves, Cylinder, Accumulator, Pressure Gauge, Pressure control valves, Flow control valve, Check Valve, Pilot Operated Check Valve etc.	2	<b>2</b>	

	<b>Hydraulic Circuits</b>	Hydraulic circuits of CSM, DUO, Unimat	2	<b>4</b>
		Hydraulic circuits of 3X , 09-3X Dynamic	2	
	<b>Demonstration of Hydraulic Equipment Sets</b>	Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.	2	<b>2</b>
<b>Pneumatics</b>	<b>Pneumatic Symbols and Pneumatic Components</b>	Pneumatics symbols and Application of air on Track machines, Working and maintenance of Air Compressor, Cooling Coil, Safety valve,	1	<b>2</b>
		Working and maintenance of Air dryer, Water separator, Air oiler, DC Valve ,KE Valve, Cylinder and Pneumatic Hoses.	1	
	<b>Pneumatic Circuits and Troubleshooting</b>	Pneumatic Working circuits and Brake circuits, Failure Analysis and Troubleshooting of Pneumatic Assemblies.	1	<b>1</b>
	<b>Demonstration of Pneumatic Equipment Sets</b>	Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.	2	<b>2</b>
<b>Mechanical</b>	<b>Power Transmission</b>	Block Diagram, Types of Power Transmission, Mechanical Transmission, 'V' belt, Chain, Pulley, Cardon Shaft.	1	<b>1</b>
	<b>Gear Box and Clutch Assembly in DUO, Driving Axle</b>	Working, Construction and Maintenance practices of Main gear box, Clutch assembly.	1	<b>2</b>
		Working, Construction and Maintenance practices of Reversing gear box, Six speed gear box and distributor Gear Box, setting of crown & tail pinion on Driving Axle.	1	
	<b>Z. F. Hydro-dynamic Gear Box</b>	Function and Construction, Precautions during working and Maintenance aspects,	1	<b>2</b>
		Failure Analysis and Troubleshooting.	1	
	<b>Funk Gear Box, Reduction Gear Box and Satellite Axle Gear Box.</b>	Working, Construction and Maintenance practices.	2	<b>2</b>
	<b>Tamping Unit, Lifting and Lining Unit, Bearings.</b>	Function and Parts, Precautions during working & repairing, Maintenance schedule, Setting of bearings and spacers on vibration shaft	1	<b>2</b>
		Failure Analysis and Troubleshooting.	1	
	<b>Lubrication</b>	Oil and Lubricants used in different Gearboxes, Tamping unit, Lifting unit, Screen Drum etc., types and their capacities.	2	<b>2</b>
<b>Maintenance Schedules</b>	Maintenance Schedules and IOH/POH of machines.	2	<b>2</b>	
		<b>Total</b>	44	<b>44</b>

**PROMOTIONAL COURSE – PROMOTIONAL JE**  
**Course No.CE 27** **Module No.27.4**  
**SUB: I.C. ENGINE & WORKSHOP TECHNOLOGY**  
**Duration: 44 Periods**

<b>Sub-discipline</b>	<b>Lesson</b>	<b>Contents</b>	<b>Period</b>	<b>Total Period</b>
<b>I.C. Engine</b>	<b>General</b>	I.C. and E.C. Engine, Advantages and disadvantages,.	1	<b>2</b>
		Classification of I.C. Engine and Main Systems of I.C. Engine	1	
	<b>Working Principle of I.C. Engine</b>	T.D.C., BDC, Swept volume	1	<b>10</b>
		Clearance volume, Compression ratio	1	
		Stroke length, Cylinder bore	1	
		Working Principle of 4 Stroke Diesel Engine (Diesel cycle).	1	
		Working Principle of 2 Stroke Diesel Engine and 2 & 4 Stroke Petrol Engine (Otto cycle).	1	
		Demonstration in I.C. Engine Model Room	1	
		Combustion of fuel, Actual Working cycle of 4 Stroke Diesel Engine	1	
		Deviations between Actual Working cycle and theoretical cycle,	1	
		Firing orders and VT diagram	1	
		Power flow in Multi cylinder engine	1	
		<b>Air Supply system of Diesel Engine</b>	Requirement of Air, Types of Air cleaner, Cleaning and checking of Dry type Air cleaner. Draw backs of choking of Air Cleaner.	
	Supercharging, Turbocharger and After cooler, Importance of After cooling		1	
	<b>Fuel Supply system of Diesel Engine</b>	Functions and classification of Fuel supply system	1	<b>6</b>
		Block diagram Fuel Injection Pumps Injectors and Filters	1	
		Mico Bosch and Cummins PT Fuel supply system and Difference between them	1	
		Cetaine Number, Octane Number, Delay Period and Knocking of fuel	1	
		Drawbacks of keeping low HSD Oil level in tank	1	
		Removing of Air Lock	1	
	<b>Lubricating System of Diesel Engine.</b>	Different type of Lubricating system, Blow bye, Crank case ventilation	1	<b>2</b>
		Reasons of Low lubricating oil pressure and high Oil consumption, Lubricating Circuit	1	
	<b>Cooling system of Diesel Engine</b>	Air Cooling system, Water Cooling system Drawbacks of over cooling	1	<b>2</b>
		Reasons for overheating, Demonstration in I.C. Engine Model Room	1	
	<b>Maintenance Steps and Maintenance schedule</b>	Maintenance step, Maintenance schedule	2	<b>8</b>
		Precautions in providing Piston ring on Piston	1	
		assembling in Cylinder liner	1	
Adjustment of Valve (Tappet) clearance		1		
Adjustment of Injection timing , Inspection of Crankshaft		1		
Troubleshooting		1		
Demonstration in Model Room	1			

<b>Workshop Technology</b>	<b>Welding and Related Processes</b>	Types of Welding, Gas Welding, Arc Welding.	1	<b>2</b>
		Related Processes: Soldering, Brazing etc.	1	
	<b>Bench Work and Fitting, Fits and Surface Quality</b>	Various Tools, their uses and Bench work, Interchangeability, Limits, Fits	1	<b>2</b>
		Allowances, Tolerances and Surface finish and Measuring Instruments	1	
	<b>Workshop Machines</b>	Lathe Machines	1	<b>8</b>
		Different Lathe Machines Operations	1	
		Drilling	1	
		Boring Machines	1	
		Shaper	1	
		Planner and Slotting	1	
Milling Machine and Gear Cutting Machines		1		
Different types of threads		1		
	<b>Total</b>	44	<b>44</b>	



**PROMOTIONAL COURSE – PROMOTIONAL JE**  
**Course No.CE27** **Module No.27.5**  
**SUB: TRACK MACHINES & WORKING PRINCIPLES**  
**Duration: 48Periods**

<b>Sub-discipline</b>	<b>Lesson</b>	<b>Contents</b>	<b>Periods</b>	<b>Total Period</b>
<b>Tamping Machines</b>	<b>08-Duomaticand WST/VPR</b>	Main features, Main assemblies and components,	1	<b>2</b>
		Working Principle and Power Transmission.	1	
	<b>09-32-CSM</b>	Main features technical data.	1	<b>4</b>
		Main assemblies and components,	1	
		Working Principle	1	
		Power Transmission.	1	
	<b>08-275-2S&amp;3SUNIM AT</b>	Main features, Main assemblies and components	1	<b>2</b>
		Working Principle and Power Transmission.	1	
	<b>08-2754S UNIMAT</b>	Main features, Main assemblies and components	1	<b>2</b>
		Working Principle and Power Transmission.	1	
	<b>Tamping Express.</b>	Main features, Main assemblies and components	1	<b>2</b>
		Working Principle and Power Transmission.	1	
	<b>UTV,RBMV, MDU</b>	Main features ,Main assemblies and components	1	<b>2</b>
		Working Principle and Power Transmission.	1	
<b>Ballast Handling Machines</b>	<b>BCM: RM-76</b>	Main features	1	<b>2</b>
		Units and their functions	1	
	<b>RM-80,92U,HOTBCM</b>	Main features.	1	<b>2</b>
		Units and their functions	1	
	<b>FRM-80,85F</b>	Main features, units and their functions.	1	<b>2</b>
		Units and their functions	1	
	<b>B.R.M.</b>	Main features, units and their functions.	1	<b>2</b>
		Units and their functions.	1	
<b>Track Laying Machines</b>	<b>TLE</b>	Main features, Units, Working Principle	1	<b>2</b>
		Yard Activities, Fabrication of Panels.	1	
	<b>TRT</b>	Main features, Units,		<b>2</b>
		Working Principle, Yard Activities,	1	
	<b>T-28</b>	Main features, Units,	1	<b>2</b>
		Working Principle.	1	
<b>Dynamic Track Stabilizer</b>	<b>DTS/DGS</b>	Main features of machines	1	<b>2</b>
		Working Principle and mode of working.	1	
<b>RGM</b>	<b>RGM</b>	Main features of machines,	1	<b>2</b>
		Working Principle and mode of working.	1	
<b>Quality Control</b>	<b>Tamping Machines and BCM</b>	Tamping Machines: Pre-tamping, Post Tamping, during tamping attention.	1	<b>2</b>
		BCM: Pre- requisites, Operations prior to deployment, Operations during Traffic Block and Post Block Operations.	1	

<b>Maintenance Schedule</b>	<b>Tamping Machines</b>	Maintenance schedule of Tamping machines	2	<b>2</b>
<b>Maintenance Schedule</b>	<b>Non-Tamping Machines</b>	Maintenance schedules of Non- Tamping machines.	2	<b>2</b>
<b>Working Principle</b>	<b>Lining</b>	Principle of Single chord lining,	1	<b>4</b>
		4 Point lining & their Left Over error.	1	
		Calculation of $V_m$ value,	1	
		3 Point lining & their left over error And Design lining.	1	
	<b>Leveling</b>	Double chord leveling system	1	<b>4</b>
		Criteria of Base line selection	1	
		General lift, ramp	1	
		Design leveling.	1	
	<b>Hands On</b>	OEMs Manual	1	<b>2</b>
		Hands on training for using manual for finding $V_m$ , Versines, K and X Correction	1	
		<b>Total</b>	48	<b>48</b>

**PROMOTIONAL COURSE – PROMOTIONAL JE**  
**Course No.CE 27** **Module No.27.6**  
**SUB: ESTABLISHMENT, STORES & RAJBHASHA**  
**Duration: 14 Periods**

<b>Sub-discipline</b>	<b>Lesson</b>	<b>Contents</b>	<b>Periods</b>	<b>Total Period</b>
<b>Establishment</b>	<b>Leave Rules &amp; Pass Rules</b>	Various types of Leaves, Eligibility	1	<b>2</b>
		Various types of passes, Eligibility etc	1	
	<b>D&amp;A and Conduct Rules</b>	Minor and Major Penalties	1	<b>2</b>
		Important Provisions of Service Conduct Rules.	1	
	<b>H O E R</b>	Classification and Duty roster.	2	<b>2</b>
<b>Store</b>	<b>Introduction to Engg. Stores</b>	Stock heads of Accounts,	1	<b>2</b>
		Disposal of released and surplus materials	1	
		Indenting procedure, Issue note and Write-off statement.	2	<b>2</b>
<b>Medical Awareness</b>	<b>Medical Awareness Programme</b>	Family Welfare, AIDS, Family Management & First Aid.	2	<b>2</b>
<b>Rajbhasha</b>	<b>Rajbhasha</b>	Constitutional Provisions, Official Language Act 1963,	1	<b>2</b>
		Official Language Rules 1976, Policy Guidelines & Instructions.	1	
		<b>Total</b>	<b>14</b>	<b>14</b>

**PROMOTIONAL COURSE – PROMOTIONAL JE**  
**Course No. CE** **27 Modules No. 27.7**  
**SUB: COMPUTER**  
**Duration: 11 Periods**

<b>Sub-discipline</b>	<b>Lesson</b>	<b>Contents</b>	<b>Period</b>	<b>Total Period</b>
	<b>Microsoft Office</b>	MS Word, MS Excell& MS PowerPoint	1	<b>2</b>
		Internet & Web-surfing, e-mail and demonstration for making e-mail ID	1	
<b>Computer</b>	<b>Automatic Guiding Computer/ALC,CMS,CWS &amp; DRP</b>	Introduction of Automatic Guide Computer (ALC) & its Hardware. Introduction of WinALC Software, DRP, CMS, CWS	4	<b>9</b>
		Hands on ALC,CMS,CWS & DRP	5	
		<b>Total</b>	11	<b>11</b>