



S. N.	Module No.	Course Name	Eligibility
1	CE-26	Initial SE/JE-II	Direct SE/JE-II & Promoted SE/JE-II having no exposure of Track M/c working.
2	CE-27	Promotional JE-II	Promoted JE-II having some exposure of Track M/c working.
3	CE-28	Initial Technician	Direct Technician-III & Promoted Tech-III having no exposure of Track M/c working.
4	CE-29	Promotional Technician-III	Promoted Technician-III from Gr. 'D' Staff having some exposure of Track M/c working.
5	CE-30	Refresher Technician	Working Technician I/II/III.
6	CE-31	Refresher SSE/SE/JE	Working SSE/SE/JE.
7	CE-33	Promotional SE	Promoted SE from JE.
8	CE-34	Refresher JS/SS Officers	Track Machine JS/SS Officers
9	CE-35	Refresher JAG/SG Officers	Track Machine JAG/SG Officers
10	CE-36	Special Course for SE/JE (P.Way)	Direct SE/JE-II (P.Way)
11	CE-37	Track M/c Interaction Course for P.Way & Machine Staff	Working SSE/SE/JE-II (P.Way & Track Machine)
12	CE-38	Special Course on 09 CSM & Tamping Express (3X)	SSE/SE/JE/Technicians with Diploma/ITI.
13	CE-39	Special Course on Unimat 2S/3S/4S & MPT	SSE/SE/JE/Technicians with Diploma/ITI.
14	CE-40	Special Course on Unomatic, Duomatic & WST	SSE/SE/JE/Technicians with Diploma/ITI.
15	CE-41	Special Course on BCM & SBCM	SSE/SE/JE/Technicians with Diploma/ITI.
16	CE-42	Special Course on Track Relaying M/c- PQRS, TRT, T-28	SSE/SE/JE/Technicians with Diploma/ITI.
17	CE-43	Special Course on DGS, BRM & UTV	SSE/SE/JE/Technicians with Diploma/ITI.
18	CE-44	Special Course on Hydraulic Circuits	SSE/SE/JE/Technicians with Diploma/ITI.
19	CE-45	Special Course on Maintenance Schedule of Track Machines	SSE/SE/JE/Technicians with Diploma/ITI.
20	CE-46	Special Course on Overhauling of Tamping Unit	SSE/SE/JE/Technicians with Diploma/ITI.
21	CE-47	Special Course on I. C. Engine	SSE/SE/JE/Technicians with Diploma/ITI.
22	CE-48	Special Course on Overhauling of Gear Box	SSE/SE/JE/Technicians with Diploma/ITI.
23	CE-49	Special Course on Introduction to Track Machines	SSE/SE/JE (P.Way)
24	CE-50	Special Course on Electronics	SSE/SE/JE/Technicians with Diploma/ITI.
25	CE-52	Special Course for IRSE(P) & Gr. 'B' Officers	IRSE(P) & Gr. 'B' Officers.

COURSE MODULE

Course No. CE 26: Initial SE/JE-II

Duration: 26 Weeks

Effective Days: 150

S. N.	CM No.	Subjects	Sessions	Periods
1	26.1	Electrical & Electronics	74	148
2	26.2	Hydraulics, Pneumatics & Mechanical	74	148
3	26.3	I.C. Engine & Workshop Technology	80	160
4	26.4	Track Machines & Working Principles	74	148
5	26.5	P.Way, Establishment, Stores, Accounts & Rajbhasha	74	148
6	26.6	Group Inter Personal Skill Development (GIPSD)	7	14
7	26.7	Computer	24	48
8		Technical Film Show	10	20
9		Library	10	20
10		Visit to CPOH & Track Machines Working Sites	42	84
11		Examination (Theory/Practical/Viva-voce) & Valediction	18	36
		Total	487	974

- Note:**
- A. 1. **Eligibility:** Directly Recruited SE/JE-II and such Promoted SE/JE-II, who has no exposure of track machines working.
 2. Computer, Technical Film Show and Library periods shall be scheduled during the afternoon session.
 3. M&C Training shall be covered under Module No. 26.3. Faculty for M&C Training may be drawn from M&C Directorate of RDSO.
 4. Medical Awareness Programme shall be covered under Module No. 26.5. Faculty for this programme may be drawn from Medical Department.
 5. Faculty for GIPSD may be drawn from CBWE, Min. of Labour & Employment or from Management Institutes.
 6. To bridge the gap between theory and practical, every alternate week visit to CPOH & Track Machines Working Sites shall be arranged for demonstration and proper understanding of machine working.
 7. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.
- B. Besides above training at IRTMTC, the zonal railways will arrange 3-4 week Initial Transportation training in Train working rules at their ZTCs during the six months field training.

INDUCTION COURSE – INITIAL SE/JE II
Course No. CE 26 **Module No. 26.1**

SUB: ELECTRICAL & ELECTRONICS SYSTEM
Duration: 74 Sessions = 148 Periods

Sub-discipline	Lesson	Session wise Contents
Electrical System: Lessons: 03 Sessions:15	Lesson-I: Fundamentals of Electricity	Session-1: Symbols, Basic Concept of voltage and current, Ohm’s law, Power law
	Lesson–II: Electrical Components	Session-2: Resistor: Definition, Unit, Symbol, Power Rating, Tolerance, Types
		Session-3: Resistor: Colour coding, Combination, Application, Faults & Troubleshooting
		Session-4: Capacitor: Definition, Unit, Symbol Types, Combinations, Application, Faults and Troubleshooting
		Session-5: Inductor: Definition, Unit, Symbol Types, Combinations, Application, Faults and Troubleshooting
		Session-6: Electronics Model Room for demonstration, checking of Resistor, Capacitor and Inductor
		Lesson–III: Auto Electrical
	Session-8: Working of Lead-acid Cell & Battery. Maintenance, Testing by Hydrometer and Load tester	
	Session-9: Alternator, Regulator, Construction, Working, Maintenance and Troubleshooting	
	Session-10: Self starter: Construction, Working, Maintenance and Troubleshooting	
	Session-11: Relay: Definition, Construction & Operation, Types, Pin diagrams, Testing	
	Session-12: Electronics Model Room for demonstration, checking and testing of Relays	
	Session-13: Engine Circuit: Description, Function and Types	
	Session-14: Working, Safety Components, Faults & Troubleshooting	
	Session-15: Z.F. Circuit: Description, Working, Safety Components, Sensors, Faults & Troubleshooting	
Electronic System: Lessons:19	Lesson-I: Fundamentals of Electronics	Session-1: Electronics Symbols and Nomenclatures
		Session-2: Fundamentals of Electronics and Applications, Active components & Passive components

		Lesson-II: Semiconductor Theory	Session-3: Difference between Conductor, Semiconductor & Insulator. Properties of Semiconductor, Covalent Bonds, Energy Bands, Types of semiconductor, i.e. Intrinsic, extrinsic, (P-Type, N-Type)
		Lesson-III: Semiconductor Diode	Session-4: Semiconductor Diode: Construction Working, Forward bias and Reverse bias, V-I Characteristics of P.N. Junction Session-5: Application of P.N. Junction Diode as Rectifier - Half wave & Full wave Rectifiers (Centre Tap and Bridge Rectifier), Polarity, Protection Device Session-6: Types of Diodes, Construction, Working Symbol and Application of Zenor Diode, LED, Photo Diode, Optocoupler.
		Lesson-IV: Transistor	Session-7: Transistor, Construction, Description of Terminals, NPN & PNP-Transistor Session-8: Mode of Connections, Amplifying function, Applications as Switch and Amplifier, Testing Session-9: Electronics Model Room for demonstration, checking and testing of Diodes and Transistors.
		Lesson-V: Transducer	Session-10: Definition, Principle, Classification, Types, Tamping Depth Transducer, Function and Calibration Session-11: Lining and Measuring Transducer, Satellite Transducer, Hook Transducer. Session-12: Pendulum, Height Transducer, Encoder. Session-13: Electronics model room for demonstration of checking and calibration of Transducers.
		Lesson-VI: Operational Amplifier	Session-14: Definition of Operational Amplifier, Symbol, Function of each terminal, Open loop, Close loop, +ve feed back,-ve feed back, Characteristics Session-15: Application of Operational Amplifier as Buffer, Inverter, Non Inverter, Adder, Subtractor, Integrator etc. Session-16: Operational Amplifier ICs used in different PCBs in machines and their Pin diagrams Session-17: Electronics Model Room for demonstration of working of Operational Amplifiers in different applications
		Lesson-VII: Digital Electronics	Session-18: Number system i.e. Binary, Decimal, Hexadecimal, Logic Gates and Flip-Flop Session-19: Electronics model room for demonstration of working of Logic Gates Session-20: Basic Idea of Microprocessor, Semiconductor memories, Multiplexer
		Lesson-VIII: Electronic Circuits and PCBs:	Session-21: Discrete Circuit & Integrated Circuit, Advantage & Disadvantage of PCBs used in different machines, Description, Name Quantity and their Functions

	Lesson-IX: Power Supply:	Session-22: Need of Power supply, Types of power supply, DC to DC Converter & Regulator
		Session-23: Functional description of Power supply PCBs EK813SV, EK816SV, EK851SV, Calibration, Testing & Troubleshooting
		Session-24: Electronics Model Room for demonstration, checking and calibration of PCB EK813SV
	Lesson-X: Programmer unit and Logic Plan.	Session-25: Function and Description of Programmer Unit, Description of different PCBs of Programmer Unit i.e. EK 501P, EK553P
		Session-26: Description of EK552P, EK554P, Different Parts of Logic Plan
		Session-27: Electronics Model Room for demonstration, checking and testing of Programmer unit
		Session-28: Reading of Logic Plan and Input & Output of Programmer with the help of Logic Plan
		Session-29: Electronics Model Room for demonstration of Logic Plan
	Lesson-XI: Multi-check/ Multiplexer PCB	Session-30: Description of Multi-check PCB EK28V, Different measurements taken by Multi-check PCB.
		Session-31: Electronics Model Room for demonstration of Multi-check PCB
	Lesson-XII: Tamping Unit Control Circuit UNO/DUO/ CSM/3X /Unimat	Session-32: Functional Description of Tamping Unit Control Circuit, Function and Calibration of Depth Selector and Depth Transducer
		Session-33: Different Positions of Tamping Unit & their Description, Current of Proportional valve
		Session-34: Functional Description of Tamping Unit control PCBs EK16V, EK132V
		Session-35: Functional Description of Tamping Unit Control PCBs EK176V, EK1AP7
Session-36: Calibration, Testing and Troubleshooting		
Session-37: Electronics Model Room for demonstration, testing and calibration of Tamping unit PCB		
Lesson-XIII: Lining Control Circuit, UNO/DUO/ CSM/3X /Unimat	Session-38: Functional Description of Lining Control Circuit and Input Potentiometer (Slew & Versine)	
	Session-39: Functional Description of Lining PCB EK349LV, EK335LV, Basic concept of 3 Point Regulator / 3 Stage Regulator	
	Session-40: Functional Description of EK2038, EK2173 and Over-slew PCB EK290LV	
	Session-41: Calibration of Servo Valve, Transducers & Input Potentiometer.	
	Session-42: Calibration of Lining PCBs and Troubleshooting	
Lesson-XIV Front Input Circuit:	Session-43: Functional Description of Front Input Circuit, Front Input Potentiometer, Slew, Versine, General Lift etc.	
	Session-44: Basic idea of ALC, GVA and Laser Lining	

	UNO/DUO/ CSM/3X /Unimat	Session-45: Functional description of Front Input PCB EK345LV, EK2072LV etc. Calibration, Troubleshooting & Fault finding
	Lesson-XV Leveling & Lifting Control Circuit of UNO/DUO/ CSM/3X /Unimat	Session-46: Functional Description of Leveling & Lifting Control Circuit, Transducers and Input Potentiometers
		Session-47: Functional Description of PCB EK347LV& EK346LV
		Session-48: Functional Description of PCB EK2041LV, EK2042LV
		Session-49: Calibration of Leveling & Lifting PCBs and Troubleshooting.
	Lesson-XVI Satellite Control Circuit:	Session-50: Functional Description of Satellite Control Circuit, Description of different positions of Satellite, Satellite Transducer, PCBs.
		Session-51: Functional Description of Satellite Control PCBs EK24V & EK202V.
		Session-52: Calibration of Satellite Control, PCB Troubleshooting & Fault finding.
	Lesson-XVII Work Drive Control Circuit:	Session-53: Functional Description of Work Drive Control Circuit, Encoder, PCB ELT-5034
		Session-54: Functional Description of Work Drive PCB EK319LV& VT-3005.
		Session-55: Calibration of Work Drive PCB, Troubleshooting & Fault finding
Lesson-XVIII Hook Control circuit	Session-56: Functional Description of Hook Control Circuit and Transducer	
	Session-57: Functional Description of Hook Control PCB EK120V & EK144V	
	Session-58: Calibration of Hook Control PCB, Troubleshooting & Fault finding	
Lesson-XIX Panel Boxes & Cable List	Session-59: Main Panel Boxes i.e Working & Engine Panel boxes, Cable List	

INDUCTION COURSE – INITIAL SE/JE-II
Course No. CE 26 **Module No. 26.2**

SUB: HYDRAULICS, PNEUMATICS & MECHANICAL
Duration: 74 Sessions = 148 Periods

Sub-discipline	Lesson	Session wise Contents
Hydraulics Lessons: 20 Sessions: 42	Lesson-I: Fundamentals	Session-1: Introduction, Pascal's Law, Bernoulli's Theorem, Advantages of Hydraulic system.
	Lesson-II: Hydraulic Symbols	Session-2: Hydraulic Symbols
	Lesson-III: Hydraulic Oil	Session-3: Functions and Properties.
	Lesson-IV: Hydraulic Tank	Session-4: Functions and Parts.
	Lesson-V: Hydraulic Filter	Session-5: Functions, Types, Filtering material, Contaminants Control, Importance of filtration.
	Lesson-VI: Hydraulic Hose and Fitting	Session-6: Functions, Types, Hose specification: DIN, SAE & EN standards, Hydraulic Fittings, Precautions during mounting Hydraulic Hoses and Fittings.
	Lesson-VII: Hydraulic Seal and 'O' Ring	Session-7: Functions, Types, Seals materials, Precautions during providing hydraulic Seals, Causes of Failure.
	Lesson-VIII: Hydraulic Pump	Session-8: Definition, Functions and Classification, Working and Construction of Vane pump & Gear pump.
		Session-9: Working and Construction of Axial Piston Pump.
		Session-10: Precautions during mounting, Troubleshooting, Aeration & Cavitation.
	Lesson-IX: Pressure Control Valve	Session-11: Working and Construction of Relief Valve & Unloader valve, Troubleshooting.
		Session-12: Working and Construction of Pressure reducing valve, Sequence valve, Trouble shooting.
LESSON-X Direction Control Valve	Session-13: Function and Types such as Spring centered valves; Spring offset valves, Check valve.	
	Session-14: Explanation of POC valve, Logic valve.	
	Session-15: Precautions during mounting, Troubleshooting.	
Lesson-XI: Proportional and Servo Valve	Session-16: Function and Troubleshooting of Proportional Valve.	
	Session-17: Function and Troubleshooting of Servo Valve.	
Lesson-XII: Flow Control Valve	Session-18: Function, Types and Troubleshooting.	

	Lesson-XIII: Accumulator	Session-19: Functions, Types, Working of Bladder & Diaphragm Type Accumulator, Charging.
	Lesson-XIV: Hydraulic Cylinder	Session-20: Function, Types and Parts.
	Lesson-XV: Hydraulic Motor	Session-21: Definition, Classification, Working of Vane motor and Gear motor.
		Session-22: Working of Axial Piston motor.
		Session-23: Mounting Precautions and Troubleshooting.
	Lesson-XVI: Heat Exchanger	Session-24: Function and Maintenance aspects.
	Lesson-XVII: Demonstration of Hydraulic Transparent Models	Session-25: Hydraulic motors, D.C. Valves, Cylinder, Accumulators, Pressure Gauge etc.
		Session-26: Pressure control valves, Flow control valves, Check Valve, Pilot Operated Check Valve etc.
	Lesson-XVII: Practical Disassembly & Assembly of Hydraulic Components in Model Room	Session-27: Vane pump and Vane motor.
		Session-28: Axial Piston pump.
		Session-29: Check valve and POC valve.
		Session-30: D.C. valves.
		Session-31: Proportional valve.
		Session-32: Servo valve.
		Session-33: Relief valve and Unloader valve.
		Session-34: Pressure reducing valve and Cylinder.
	Lesson-XIX: Hydraulic Circuits	Session-35: Constant pressure circuit of 3X and CSM.
		Session-36: Constant pressure circuit of Duomatic, Unimat and BCM.
		Session-37: Closed loop circuit of 3X and CSM.
		Session-38: Closed loop circuit of BCM, SBCM, BRM.
		Session-39: Regenerating circuit of Tamping Machines.
	Lesson-XX: Demonstration of Hydraulic Equipment Sets	Session-40: Intermittent circuit of Non-tampers.
		Session-41: Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.
	Session-42: Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.	
Pneumatics Lessons: 5 Sessions: 8	Lesson-I: Pneumatic Symbols	Session-1: Pneumatics symbols and Application of air on Track machines.
	Lesson-II: Pneumatic Components	Session-2: Working and maintenance of Single stage and Multi Stage Air Compressor, Cooling Coil, Safety valve, Air dryer.
		Session-3: Working and maintenance of Water separator, Air oiler, DC Valve, Cylinder and Pneumatic hoses.
	Lesson-III: Pneumatic Circuits	Session-4: Pneumatic Working circuits.
		Session-5: Pneumatic Brake circuits.
	Lesson-IV: Troubleshooting	Session-6: Failure Analysis and Troubleshooting of Pneumatic assemblies.
Lesson-V:	Session-7: Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.	

	Demonstration of Pneumatic Equipment Sets	Session-8: Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.
Mechanical Lessons: 14 Sessions: 24	Lesson-I: Power Transmission	Session-1: Block Diagram, Types of Power Transmission, Mechanical Transmission, 'V' belt, Chain, Pulley, Cardon Shaft.
	Lesson-II: Gear Box and Clutch Assembly in UNO/DUO	Session-2: Working, Construction and Maintenance practices of Main gear box and Clutch assembly.
		Session-3: Working, Construction and Maintenance practices of Reversing gear box and Six speed gear box.
	Lesson-III: Distributor Gear Box	Session-4: Working, Construction and Maintenance practices.
	Lesson-IV: Driving and Running Axle	Session-5: Function, Parts and Maintenance aspects, setting of crown & tail pinion.
	Lesson-V: Z. F. Hydro-dynamic Gear Box	Session-6: Function and Construction.
		Session-7: Precautions during working and Maintenance aspects.
		Session-8: Failure Analysis and Troubleshooting.
	Lesson-VI: Funk Gear Box	Session-9: Working, Construction and Maintenance practices.
	Lesson-VII: Reduction Gear Box	Session-10: Working, Construction and Maintenance practices.
	Lesson-VIII: Satellite Axle Gear Box	Session-11: Working, Construction and Maintenance practices.
		Session-12: Precautionary steps to avoid failure.
	Lesson-IX: Tamping Unit	Session-13: Function and Parts.
		Session-14: Precautions during working & repairing. Maintenance schedule.
		Session-15: Dimensions of different Parts and Tolerances, setting of bearings and spacers on vibration shaft.
		Session-16: Failure Analysis and Troubleshooting.
	Lesson-X: Lifting and Lining Unit	Session-17: Function, assembly and maintenance aspects.
	Lesson-XI: Bearings	Session-18: Functions, Types, Bearing Clearance and Maintenance aspects.
	Lesson-XII: BCM Assemblies	Session-19: Working, Construction and Maintenance practices of Excavation Chain.
Session-20: Working, Construction and Maintenance practices of Conveyor Belts and Screens.		
Lesson-XIII- Lubrication	Session-21: Oil and Lubricants used in different gear boxes, Tamping unit, Lifting unit, Screen - drum etc., types and their capacities.	
Lesson-XIV: Maintenance Schedules	Session-22: Maintenance Schedules of machines.	
	Session-23: Maintenance Schedules of machines.	
	Session-24: IOH/POH of machines.	

INDUCTION COURSE – INITIAL SE/JE-II
Course No. CE 26 **Module No. 26.3**

SUB: I.C. ENGINE & WORKSHOP TECHNOLOGY
Duration: 80 Sessions = 160 Periods

Sub-discipline	Lesson	Session wise Contents
I.C. Engine Lessons: 10 Sessions: 49	Lesson-I: General	Session-1: History and Development of Engine, I.C. and E.C. Engine, Advantages and disadvantages.
		Session-2: Classification of I.C. Engine and Main Systems of I.C. Engine.
	Lesson-II: Constructional Details of Engine	Session-3: Cylinder, Cylinder head, Piston and Piston rings.
		Session-4: Connecting rod, Crank shaft, Fly wheel, Cam shaft and Sump.
		Session-5: Inlet and Exhaust valve, Push rod, Rocker arm, Valve clearance, Valve operating mechanism.
		Session-6: Demonstration of Engine components in I.C. Engine Model Room.
	Lesson-III: Basic Terminology	Session-7: T.D.C., BDC, Swept volume, Clearance volume, Compression ratio, Stroke length, Cylinder bore.
	Lesson-IV: Working Principle of I.C. Engine	Session-8: Working Principle of 4 Stroke Diesel Engine (Diesel cycle).
		Session-9: Working Principle of 2 Stroke Diesel Engine and 2 & 4 Stroke Petrol Engine (Otto cycle).
		Session-10: Demonstration in I.C. Engine Model Room.
		Session-11: Combustion of fuel.
		Session-12: Actual Working cycle of 4 Stroke Diesel Engine.
		Session-13: Deviations between Actual Working cycle and Theoretical cycle.
		Session-14: Firing orders and VT diagram.
		Session-15: Power flow in Multi cylinder engine.
	Lesson-V: Air Supply system of Diesel Engine	Session-16: Requirement of Air, Types of Air cleaner.
		Session-17: Cleaning and checking of Dry type Air cleaner. Draw backs of choking of Air Cleaner.
		Session-18: Supercharging, Turbocharger and After cooler, Importance of After cooling.
		Session-19: Demonstration in I.C. Engine Model Room
	Lesson-VI: Fuel Supply system of Diesel Engine	Session-20: Functions and classification of Fuel supply system, Block diagram.
		Session-21: Fuel Injection Pumps, Injectors and Filters.
		Session-22: Mico Bosch and Cummins PT Fuel supply system. Difference between Mico Bosch and Cummins PT Fuel supply system.
		Session-23: Demonstration in I.C. Engine Model Room

		Session-24: Cetaine Number, Octane No., Delay Period and Knocking of fuel.
		Session-25: Drawbacks of keeping low HSD Oil level in tank, Removing of Air Lock.
Lesson-VII: Lubricating system of Diesel Engine	Session-26: Concept of lubrication and functions of Lubricating oil, Properties of Lubricant.	
	Session-27: Oil Additives, Viscosity rating and Lubricating circuit.	
	Session-28: Different types of Lubricating systems.	
	Session-29: Oil pump, Relief Valve, Filters, Oil Cooler, Strainer, Oil Pressure Gauge, Oil Pressure Indicating light.	
	Session-30: Blow by, Crank case ventilation, Reasons of Low lubricating oil pressure and high Oil consumption.	
	Session-31: Demonstration in I.C. Engine Model Room.	
	Lesson-VIII: Cooling system of Diesel Engine	Session-32: Necessity of Cooling, Different methods of Engine cooling, Air Cooling system.
	Session-33: Water Cooling system.	
	Session-34: Drawbacks of over cooling and reasons for over heating.	
	Session-35: Demonstration in I.C. Engine Model Room.	
Lesson-IX: Maintenance Schedule	Session-36: Maintenance Schedules of Cummins Engine.	
	Session-37: Maintenance Schedules of Duetz Engine.	
	Session-38: Maintenance Schedules of MWM Engine.	
Lesson-X: Maintenance Steps	Session-39: Maintenance Steps to improve Performance.	
	Session-40: Precautions in providing Piston ring on Piston and assembling in Cylinder liner.	
	Session-41: Adjustment of Valve (Tappet) clearance.	
	Session-42: Adjustment of Injection timing and testing of Nozzles.	
	Session-43: Inspection of Crankshaft.	
	Session-44: Troubleshooting of Cummins Engine.	
	Session-45: Trouble Shooting of Duetz & MWM Engine	
	Session-46: Setting of Torque wrenches, Tightening torque of different engine assemblies, clearance of moving parts.	
	Session-47-49: 1 day visit to TM Workshop, PD/MGS.	
Metallurgical & Chemical Training Lessons: 01 Sessions: 06	Lesson-I: M&C Training	Session-1: Manufacturing of Iron & Steel, Shaping of Metals & Alloys.
		Session-2: Classification of Steel on the basis of percentage of Carbon and Micro-constituents of Iron and Steel, Carbon Steel, Alloy Steel & Cast Iron.
		Session-3: Physical Metallurgy, Mechanical properties of Cast Iron, Steel & Non Ferrous Alloy.
		Session-4: Heat Treatment: Hardening, Tempering Annealing, Normalizing, Case Hardening, Nitriding.

		<p>Session-5: Inspection and testing of Materials for property evaluation.</p> <p>Session-6: Introduction to various standards: IRS, SAE, DIN, ISI, BS etc. and Acceptance Criteria.</p>
<p>Workshop Technology Lessons: 8 Sessions: 25</p>	<p>Lesson-I: Smithing and Forging</p>	<p>Session-1: Forging Materials, Heating Devices, Forging Temperatures, Smith Forging Operations.</p> <p>Session-2: Forging Processes: Hand Forging, Power Forging etc.</p>
	<p>Lesson-II: Welding and Related Processes</p>	<p>Session-3: Types of Welding and Metallurgy of Weld.</p> <p>Session-4: Gas Welding, Oxy-acetylene and Air-acetylene</p> <p>Session-5: Arc Welding and Resistance Welding</p> <p>Session-6: Related Processes: Soldering, Brazing etc.</p> <p>Session-7: Procedure for welding of tamping tool and defects in Tamping Tool welding.</p> <p>Session-8: Welding of BCM turret gears, main links, intermediate links and cutter bar and grinding operation.</p>
	<p>Lesson-III: Bench Work and Fitting</p>	<p>Session-9: Various Tools, their uses and Bench work.</p>
	<p>Lesson-IV: Measurement and Inspection</p>	<p>Session-10: Standards of Measurement, Classification of Measuring Instruments and Linear Measurement.</p> <p>Session-11: Comparators, Measuring Machines, Angular and Taper Measurements.</p> <p>Session-12: Demonstration in Model Room.</p>
	<p>Lesson-V: Limits, Fits and Surface Quality</p>	<p>Session-13: Interchangeability, Limits, Fits, Allowances, Tolerances and Surface finish.</p>
	<p>Lesson-VI: Workshop Machines</p>	<p>Session-14: Lathe Machines, Different Lathe Machines Operations.</p> <p>Session-15: Drilling and Boring Machines.</p> <p>Session-16: Shaper and Planner.</p> <p>Session-17: Slotting and Grinding Machines</p> <p>Session-18: Milling Machine and Gear Cutting.</p> <p>Session-19: Press, Jigs & Fixtures.</p> <p>Session-20: Broaching and Sawing Machine.</p> <p>Session-21-23: Workshop visit.</p>
	<p>Lesson-VII: Threads</p>	<p>Session-24: Different types of threads.</p>
	<p>Lesson-VIII: Quality Control</p>	<p>Session-25: Statistical Quality Control, Control Charts and their application.</p>

INDUCTION COURSE – INITIAL SE/JE-II
Course No. CE 26 Module No. 26.4

SUB: TRACK MACHINES & WORKING PRINCIPLES
Duration: 74 Sessions = 148 Periods

Sub-discipline	Lesson	Session wise Contents
Track Machines Lessons: 2 Sessions: 2	Lesson-I: History of Track Machines	Session-1: History of Mechanization on Indian Railways, Introduction of Track Machines in chronological order.
	Lesson-II: Types of Track Machines	Session-2: Different types of track machines on Indian Railways, their functions and output.
Tamping Machines Lessons: 6 Sessions: 18	Lesson-I: 08-Unomatic / Duomatic	Session-3: Main features, Technical Data, Main assemblies and components.
		Session-4: Working Principle and Power Transmission
		Session-5: Name of PCBs, their functions and Electrical System.
	Lesson-II: 09-32-CSM	Session-6: Main features, Technical Data, Main assemblies and components.
		Session-7: Working Principle and Power Transmission
		Session-8: Name of PCBs, their functions and Electrical System.
	Lesson-III: 08-275-2S UNIMAT	Session-9: Main features, Technical Data, Main assemblies and components.
		Session-10: Working Principle and Power Transmission
		Session-11: Name of PCBs, their functions and Electrical System.
	Lesson-IV: 08-275-3S UNIMAT & MPT	Session-12: Main features of machine, Technical Data, main assemblies and components.
		Session-13: Working Principle and Power Transmission
		Session-14: Name of PCBs, their functions and Electrical System. Difference between 2S & 3S Unimat.
	Lesson-V: 09-3x Tamping Express.	Session-15: Main features, Technical Data, Main assemblies and components.
		Session-16: Working Principle and Power Transmission
		Session-17: Name of PCBs, their functions and Electrical System.
	Lesson-VI: WST	Session-18: Main features, Technical Data, Main assemblies and components.
		Session-19: Working Principle and Power Transmission
		Session-20: Name of PCBs, their functions and Electrical System.
Ballast Handling Machines Lessons: 5 Sessions: 14	Lesson-I: BCM: RM-76	Session-21: Main features main units and their functions.
		Session-22: Power Transmission & Technical Data
		Session-23: Working Principle & Precaution during work
	Lesson-II: BCM: RM-80	Session-24: Main features main units and their functions.
		Session-25: Power Transmission & Technical Data
		Session-26: Working Principle & Precaution during work
	Lesson-III:	Session-27: Main features main units and their functions.

	FRM-80	Session-28: Power Transmission & Technical Data Session-29: Working Principle & Precaution during work		
	Lesson-IV: KSC-600	Session-30: Main features main units and their functions. Session-31: Power Transmission & Technical Data Session-32: Working Principle & Precaution during work		
	Lesson-V: B.R.M.	Session-33: Main features main units and their functions. Session-34: Power Transmission, Technical Data, Working Principle & Precaution during work.		
Track Laying Machines Lessons: 3 Sessions: 8	Lesson-I: PQRS	Session-35: Main features main units and their functions. Session-36: Yard Activities, Fabrication of Panels, Rake Formation, Amenities at Base Depot. Session-37: Working Principle, Auxilliary Track and Mode of working.		
		Lesson-II: TRT	Session-38: Main features main units and their functions. Session-39: Yard activities, Modified BRHs & Rake Formation Session-40: Working Principle & SRs after relaying.	
			Lesson-III: T-28	Session-41: Main features main units and their functions. Session-42: Power Transmission and Working Principle.
	Dynamic Track Stabilizer Lessons: 1 Sessions: 2	Lesson-I: DTS/DGS	Session-43: Main features main units and their functions, Technical Data. Session-44: Power Transmission, Name of PCB's and their function.	
			Quality Control Lessons: 3 Sessions: 4	Lesson-I: Tamping Machines, DTS
	Lesson-II: BCM, SBCM & BRM	Session-47: Pre-requisites, Operations prior to deployment, Operations during Traffic Block and Post Block Operations.		
Lesson-III: PQRS, TRT & T-28	Session-48: Pre-requisites, Operations prior to deployment, Operations during Traffic Block and Post Block Operations.			
Mainten-ance Schedule Lessons: 4 Sessions: 4	Lesson-I Tamping Machines	Session-49: Maintenance schedules of Tamping machines.		
	Lesson-II BCM & FRM	Session-50: Maintenance schedules of RM-76, RM-80, FRM-80, FRM-85 & KSC-600.		
	Lesson-III DTS & BRM	Session-51: Maintenance schedules of DTS & BRM.		
	Lesson-IV UNIMAT	Session-52: Maintenance schedule of 08-275 2S & 3S-Unimat.		
IRTMM Lessons: 1 Sessions: 3	Lesson-I Introduction to IRTMM and RDSO TM Reports	Session-53: Ch 1: Track Machine Organisation & Duties of AEN, SSE, Operator & Technician. Session-54: Ch 4 & 5: Rules for Movement & Working of Track Machines and Planning, Operation & Monitoring of Track Machines, Unit cost. Session-55: Brief on other Chapters of IRTMM and RDSO TM Reports.		
		Working	Lesson-I	Session-56: Principle of Lining, Single chord system, Type of lining i.e. 4 Point & 3 Point lining.

Lessons: 2 Sessions: 19	Lining	Session-57: Principle of 4 Point lining & Left over error.
		Session-58: Calculation of V_m value on Transition Curve, Direction of Toggle switch.
		Session-59: Calculation of V_m value for Reverse Curve & non-suitability of 4 Point lining on Straight.
		Session-60: Feeding method of V_m value at Reverse and Compound curve.
		Session-61: 3 Point lining & Left over error.
		Session-62: Calculation of 'V' value for each machine.
		Session-63: Method of feeding 'V' value.
		Session-64: Design lining, Laser lining and measuring run method.
	Session-65: Potentiometers & their calibration.	
	Lesson-II Leveling	Session-66: Types of leveling system, Double chord system.
		Session-67: General lift, ramp in & ramp out.
		Session-68: Criteria for selection of Base line.
		Session-69: Double chord follow up system & fixed chord system, Proportional leveling, Error reduction ratio.
		Session-70: Method of feeding of Cant on CSM.
		Session-71: Method of feeding of Cant on other machines.
Session-72: Method of Calculation of Correction value ('K' Value), Function of Pendulum- Front, Middle, Rear Pendulum & Twist correction.		
Session-73: Method of data feeding on Tamping Machines - Manually and by Computer (GVA&ALC)		
Session-74: Design leveling and feeding of target height.		

INDUCTION COURSE – INITIAL SE/JE-II
Course No. CE 26 Module No. 26.5

SUB: P.WAY, ESTABLISHMENT, ACCOUNTS, STORES & RAJBHASHA
Duration: 74 Sessions = 148 Periods

Sub-discipline	Lesson	Session wise Contents
Track Technology Lessons: 15 Sessions: 47	Lesson-I: Introduction to Railway Organization.	Session-1: History of Railways, Zonal Railways, Divisions, Production units.
		Session-2: TT Organization on Indian railways, Organization at headquarters and Divisional levels, CPOH and Bridge Workshop.
	Lesson-II: Railway Track	Session-3: Constituents of Railway Track. Requirements of Good Railway Track, Classification of Routes. Different Gauges.
	Lesson-III: Formation	Session-4: Formations in Embankment and Cutting.
	Lesson-IV: Rails	Session-5: Functions, Types & Standard Rail Section.
		Session-6: Standard length, Rolling marks & UTS.
	Lesson-V: Sleepers	Session-7: Functions, Types & Sleeper Density.
		Session-8: Requirements of PRC sleepers- their advantages and disadvantages.
	Lesson-VI: Fastenings	Session-9: Rail to Rail fastenings.
		Session-10: Rail to Sleeper fastenings.
	Lesson-VII: Ballast	Session-11: Functions & Specifications.
	Lesson-VIII: Points & Crossings	Session-12: Functions & Important terminology.
		Session-13: Constituents of Turnout.
		Session-14: Types of switches.
		Session-15: Switch Angle, Flange way clearance, Heel divergence, Throw of switch.
		Session-16: Types of Crossings, Crossing number & Main constituents of Built-up Crossing.
		Session-17: Standard Turnouts & permissible speed.
		Session-18: Position of Sleepers at Points & Xing
		Session-19: Yard Visit
	Lesson-IX: Welding of Rails	Session-20: Evil effects of Rail joints.
		Session-21: Different types of welding.
		Session-22: Development of Welded rails.
		Session-23: Welding Terminology.
		Session-24: Theory of Welded rails.
		Session-25: Thermal forces in LWR.
		Session-26: Permitted locations of LWR/CWR.
		Session-27: Different Temperature Zones.
	Session-28: De-stressing	
	Session-29: Yard visit	
	Lesson-X: Track Renewals	Session-30: Classification of Track Renewals.
		Session-31: Factors governing Renewals.
	Lesson-XI:	Session-32: General Instructions as contained in IRPWM.

	Maintenance of Track	Session-33: Provisions on Regular Track Maintenance as contained in IRPWM.
		Session-34: Provisions on Works incidental to Regular Track Maintenance with thrust on Deep Screening.
		Session-35: Provisions on Maintenance of Track in Track Circuited Areas as contained in IRPWM.
		Session-36: Provisions on Maintenance of Track in Electrified Areas as contained in IRPWM & Precautions during Machine working.
	Lesson-XII: Engineering Restrictions & Indicators	Session-37: Categories of Engineering Works, Engineering Fixed Signals/Indicators: Temporary and Permanent
		Session-38: Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals.
	Lesson-XIII: Curves	Session-39: Necessity of curves: their types, TTP, CTP & Transition lengths.
		Session-40: Radius, Degree, Versine & Field Measurement.
		Session-41: Super-elevation: Cant deficiency, Cant excess, Cant gradient, Equilibrium cant.
		Session-42: Negative Super-elevation, Gauge widening.
		Session-43: Safe Speed on Curves.
	Lesson-XIV: Track Tolerances	Session-44: Yard visit.
		Session-45: Different Track Parameters and their service tolerances.
	Lesson-XV: Schedule of Dimensions	Session-46: Different Track Parameters and their service tolerances.
		Session-47: Different Schedules, Standard Dimensions, Loading Gauge, ODC.
Establishment Lessons: 13 Sessions: 14	Lesson-XVI: Leave Rules	Session-48: Various types of Leaves, Eligibility etc.
	Lesson-XVII: Pass Rules	Session-49: Various types of passes, Eligibility etc.
	Lesson- XVIII: P.L. Bonus & GIS	Session-50: Terms of Payments PLB, GIS Monthly subscription, Payment at retirement.
	Lesson-XIX: Allowances & Overtime	Session-51: Various Types of Allowances & Eligibility
	Lesson-XX: P.F.	Session-52: Meaning, Rate, Withdrawal.
	Lesson-XXI: Pension Rules	Session-53: Pension Rules.
	Lesson-XXII: DCRG	Session-54: Amount of DCRG, Emoluments.
	Lesson-XXIII: D&A Rules	Session-55: Minor Penalties.
Session-56: Major Penalties.		

	Lesson-XXIV: Service Conduct Rules	Session-57: Explanation and understanding of different Conduct rules.
	Lesson-XXV:	Session-58: Manpower Planning & Training Welfare Measures in Railways, PNM, JCM & PREM.
	Lesson-XXVI: Objectives and understanding of Various Acts	Session-59: Minimum Wages Act, Factory Act, Industrial Dispute Act, Contractor Labour Act & Workmen Compensation Act.
	Lesson-XXVII: HOER	Session-60: Classification and Duty roster.
	Lesson- XXVIII: Awards	Session-61: Different Awards.
Accounts Lessons: 3 Sessions: 6	Lesson-XXIX: Estimates	Session-62: Definition & Necessity of Estimates.
		Session-63: Kinds of Estimates & their Vetting.
	Lesson-XXX: Tenders	Session-64: Different types of tenders.
		Session-65: Power for Invitation of tenders & NIT.
Lesson-XXXI: Railway Budget	Session-66: Parliamentary Control over Railway Finance, Public Accountability, Canons of financial Propriety.	
	Session-67: Railway Budget, Budgetary Terms, Budgetary Cycle, Demand of Grants, Expenditure classification, Works Programme.	
Store Lessons: 1 Sessions: 3	Lesson-XXXII: Introduction to Engg. Stores & Inventory Control	Session-68: Stock heads of Accounts, Disposal of released and surplus materials.
		Session-69: Indenting procedure, Issue note and Write-off statement.
		Session-70: Stock verification and Inventory Control Technique.
Medical Awareness Programme Lessons: 1 Sessions: 2	Lesson- XXXIII: Medical Awareness Programme	Session-71: Family Welfare, AIDS, Family Management & First Aid.
		Session-72: Stress Management & Disaster Management.
Rajbhasha Lessons: 1 Sessions: 2	Lesson- XXXIV: Rajbhasha	Session-73: Constitutional Provisions, Official Language Act 1963, Official Language Rules 1976.
		Session-74: Policy Guidelines & Instructions.

INDUCTION COURSE – INITIAL SE/JE II
Course No. CE 26 **Module No. 26.6**

SUB: GROUP INTER PERSONAL SKILL DEVELOPMENT (GIPSD)
Duration: 7 Sessions = 14 Periods

Sub-discipline	Lesson	Session wise Contents
GIPSD Lessons: 07 Sessions: 07	Lesson-I: Communication	Session-1: Communication Skills and Importance in Railway Organization.
	Lesson-II: Motivation	Session-2: Motivation Skills
	Lesson-III: Leadership	Session-3: Types of Leadership & Leadership Skills.
	Lesson-IV: Inter Personal Relations	Session-4: Need for Inter Personal Relations in Railway Organization.
	Lesson-V: Attitude Building	Session-5: Importance of Positive Attitude.
	Lesson-VI: Team Work	Session-6: Team Work and Team Building.
	Lesson-VII: Practical Workouts	Session-7: Exercise on Group Dynamics/other aspects related with development of managerial/work related skills.

INDUCTION COURSE – INITIAL SE/JE-II
Course No. CE 26 **Module No. 26.7**
SUB: COMPUTER
Duration: 24 Sessions = 48 Periods

Sub-discipline	Lesson	Session wise Contents
Computer Lessons: 05 Sessions: 23	Lesson-I: History	Session-1: History of Computer, Hardware and Software
	Lesson-II: Basics of Computer	Session-2: Parts of Computer and their functions. Session-3: Operating Systems of Computer Session-4: Window XP Session-5: Window XP
	Lesson-III: Microsoft Office	Session-6: MS Word Session-7: MS Word Session-8: MS Word Session-9: MS PowerPoint Session-10: MS PowerPoint Session-11: MS PowerPoint Session-12: MS Excell Session-13: MS Excell Session-14: MS Excell
	Lesson-IV: Internet & E-mail	Session-15: Internet & Web-surfing. Session-16: e-mail & demonstration for making e-mail ID
	Lesson-V: Automatic Guide Computer (ALC)	Session-17: Introduction to Automatic Guide Computer (ALC) & its Hardware. Session-18: Introduction to WinALC Software Session-19: Working in Geometry mode Session-20: Working in Geometry mode Session-21: Working in Measuring Run mode Session-22: Working in Measuring Run mode Session-23: Working in Design mode Session-24: Working in Design mode

COURSE MODULE

Course No. CE 27: PROMOTIONAL JE-II

Duration: 27 Weeks

Effective Days: 46

S. N.	CM No.	Subjects	Sessions	Periods
1	27.1	Electrical & Electronics	22	44
2	27.2	Hydraulics, Pneumatics & Mechanical	22	44
3	27.3	I.C. Engine & Workshop Technology	22	44
4	27.4	Track Machines & Working Principles	22	44
5	27.5	P.Way, Establishment, Stores & Rajbhasha	22	44
6	27.6	Computer	8	16
7		Technical Film Show	4	8
8		Library	4	8
9		Visit to CPOH & Track Machines Working Sites	7	14
10		Examination (Theory/Practical/Viva-voce) & Valediction	17	34
		Total	150	300

- Note:**
- 1. Eligibility: Promoted JE-II, who has some exposure of track machines working.**
 - 2. Medical Awareness Programme shall be covered under Module No. 27.5. 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.**
 - 5. 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-II
Course No. CE 27 **Module No. 27.1**

SUB: ELECTRICAL & ELECTRONICS SYSTEM
Duration: 22 Sessions = 44 Periods

Sub-discipline	Lesson	Session wise Contents
Electrical System: Lessons: 02 Sessions: 6	Lesson-I: Fundamentals of Electricity & Electrical Components	Session-1: Symbols, Basic Concept of voltage and current, Ohm's law, Power law, Resistor: Definition, Unit, Symbol, Power Rating, Tolerance, Types Session-2: Capacitor & Inductor: Definition, Unit, Symbol Types, Combinations, Application, Faults and Troubleshooting
	Lesson-II: Auto Electrical	Session-3: Battery: Definition of Cell & Battery, Types, Rating, Specific Gravity, Construction, Working of Lead-acid Cell & Battery. Maintenance, Testing by Hydrometer and Load tester
		Session-4: Alternator, Regulator & Self starter: Construction, Working, Maintenance and Troubleshooting
		Session-5: Relay: Definition, Construction, Operation, Types, Pin diagrams, Testing; Demonstration, checking and testing of Relays in Electronics Model Room.
		Session-6: Engine Circuit & Z.F. Circuit: Description, Functions, Types, Safety Components, Faults & Troubleshooting
Electronic System: Lessons: 10 Sessions: 16	Lesson-I: Fundamentals of Electronics	Session-1: Symbols, Nomenclatures, Fundamentals of Electronics & Applications, Active components & Passive components
	Lesson-II: Semiconductor Components	Session-2: 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
		Session-3: Transistor: Construction, Description of Terminals, NPN & PNP Transistor, Mode of Connections, Applications as Switch and Amplifier, Testing
		Session-4: Electronics model room for demonstration & checking of Electronic components
	Lesson-III: Transducer	Session-5: Definition, Principle, Classification, Types, Tamping Depth Transducer, Pendulum & Height Transducer.
		Session-6: Lining Transducer, Measuring Transducer, Satellite Transducer, Hook Transducer, Encoder: Function and Calibration
		Session-7: Electronics model room for demonstration, checking and calibration of Transducers.

	Lesson-IV: Operational Amplifier	Session-8: Definition, Symbol, Function of each terminal, Open loop, Close loop, +ve feed back, -ve feed back, Characteristics, Application of Operational Amplifier as Buffer, Inverter, Non Inverter, Adder, Subtractor, Integrator etc.
	Lesson-V: Power Supply	Session-9: Need, Types, DC to DC Converter & Regulator, Functional description of Power supply PCBs EK813SV, EK816SV, EK851SV, Calibration, Testing & Troubleshooting, Electronics Model Room for demonstration, checking and calibration of PCB EK813SV
	Lesson-VI: Programmer unit and Logic Plan	Session-10: Function and Description of Programmer Unit, Description of different PCBs of Programmer Unit i.e. EK 501P, EK553P, EK552P, EK554P, Multi-check PCB EK28V, Different Parts of Logic Plan. Session-11: Demonstration of Programmer unit & Logic Plan in Electronics Model Room
	Lesson-VII: Tamping Unit Control Circuit UNO/DUO/ CSM/3X /Unimat	Session-12: Functional Description of Tamping Unit Control Circuit, Different Positions of Tamping Unit & their Description, Current of Proportional valve, Calibration, Troubleshooting & Fault finding Session-13: Demonstration, of Tamping Unit Control Circuit in Electronics Model Room
	Lesson-VIII Front Input Circuit: UNO/DUO/ CSM/3X /Unimat	Session-14: Functional Description of Front Input Circuit, Front Input Potentiometer, Slew, Versine, General Lift etc. Basic idea of ALC, GVA and Laser Lining
	Lesson-IX: Lining Control Circuit, UNO/DUO/ CSM/3X /Unimat	Session-15: Functional Description of Lining Control Circuit & Lining PCBs, Basic concept of 3 Point Regulator / 3 Stage Regulator, calibration , troubleshooting & Fault finding.
	Lesson-X Leveling & Lifting Control Circuit of UNO/DUO/ CSM/3X /Unimat	Session-16: Functional Description of Leveling Control Circuit & Leveling PCBs, Basic concept of 3 Point Regulator / 3 Stage Regulator, calibration troubleshooting & Fault finding

PROMOTIONAL COURSE – PROMOTIONAL JE-II

Course No. CE 27

Module No. 27.2

SUB: HYDRAULICS, PNEUMATICS & MECHANICAL

Duration: 22 Sessions = 44 Periods

Sub-discipline	Lesson	Session wise Contents
Hydraulics Lessons: 11 Sessions: 12	Lesson-I: Fundamentals, Symbols, Oil, Tank and Filter	Session-1: Introduction, Hydraulic Symbols, Functions and Properties of Hydraulic oil, Functions and Parts of Hydraulic Tank, Functions and Types of filters, Importance of filtration.
	Lesson-II: Accumulator, Hydraulic Seal, 'O' Ring, Hose and Fitting	Session-2: Functions, Types, Working of Bladder Accumulator, Charging of Accumulator, Precautions during providing Hydraulic Seals, Causes of Failure, Hose specification: DIN, SAE & EN standards, Hydraulic Fittings, Precautions during mounting Hydraulic Hoses and Fittings.
	Lesson-III: Hydraulic Pump	Session-3: Definition, Functions, Classification, Working and Construction of Vane pump, Gear pump, Axial Piston Pump, Precautions during mounting, Troubleshooting, Aeration & Cavitation.
	Lesson-IV: Pressure Control Valve	Session-4: Working and Construction of Relief Valve, Unloader valve, Pressure Reducing valve, Trouble shooting.
	LESSON-V Direction Control Valve	Session-5: Function and Types such as Spring centered valves; Spring offset valves, Check valve, POC valve, Trouble shooting.
	Lesson-VI: Proportional Valve, Servo Valve and Flow Control Valve	Session-6: Function and Troubleshooting.
	Lesson-VII: Hydraulic Cylinder and Motor	Session-7: Function, Types and Parts, Working of Vane motor, Gear motor and. Axial Piston motor, Troubleshooting.
	Lesson-VIII: Hydraulic Transparent Models	Session-8: Demonstration of Hydraulic Motor, D.C. Valves, Cylinder, Accumulator, Pressure Gauge, Pressure control valves, Flow control valve, Check Valve, Pilot Operated Check Valve etc.
	Lesson-IX: Practical Disassembly & Assembly of Hydraulic Components in Model Room	Session-9: Vane pump & Axial Piston pump. Session-10: Proportional valve, Servo valve and Relief valve.

	Lesson-X: Hydraulic Circuits	Session-11: Constant pressure circuit, Closed loop circuit, Regenerating circuit of 3X, CSM, DUO, Unimat.
	Lesson-XI: Demonstration of Hydraulic Equipment Sets	Session-12: Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.
Pneumatics Lessons: 3 Sessions: 3	Lesson-I: Pneumatic Symbols and Pneumatic Components	Session-13: Pneumatics symbols and Application of air on Track machines, Working and maintenance of Air Compressor, Cooling Coil, Safety valve, Air dryer, Water separator, Air oiler, DC Valve, Cylinder and Pneumatic Hoses.
	Lesson-II: Pneumatic Circuits and Troubleshooting	Session-14: Pneumatic Working circuits and Brake circuits, Failure Analysis and Troubleshooting of Pneumatic Assemblies.
	Lesson-III: Demonstration of Pneumatic Equipment Sets	Session-15: Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.
Mechanical Lessons: 7 Sessions: 7	Lesson-I: Power Transmission	Session-16: Block Diagram, Types of Power Transmission, Mechanical Transmission, 'V' belt, Chain, Pulley, Cardon Shaft.
	Lesson-II: Gear Box and Clutch Assembly in UNO/DUO, Driving Axle	Session-17: Working, Construction and Maintenance practices of Main gear box, Clutch assembly, Reversing gear box, Six speed gear box and distributor Gear Box, setting of crown & tail pinion on Driving Axle.
	Lesson-III: Z. F. Hydro- dynamic Gear Box	Session-18: Function and Construction, Precautions during working and Maintenance aspects, Failure Analysis and Troubleshooting.
	Lesson-IV: Funk Gear Box, Reduction Gear Box and Satellite Axle Gear Box.	Session-19: Working, Construction and Maintenance practices.
	Lesson-V: Tamping Unit, Lifting and Lining Unit, Bearings.	Session-20: Function and Parts, Precautions during working & repairing, Maintenance schedule, Setting of bearings and spacers on vibration shaft, Failure Analysis and Troubleshooting.
	Lesson-VI- Lubrication	Session-21: Oil and Lubricants used in different Gear boxes, Tamping unit, Lifting unit, Screen Drum etc., types and their capacities.
	Lesson-VII: Maintenance Schedules	Session-22: Maintenance Schedules and IOH/POH of machines.

PROMOTIONAL COURSE – PROMOTIONAL JE-II

Course No. CE 27

Module No. 27.3

SUB: I.C. ENGINE & WORKSHOP TECHNOLOGY

Duration: 22 Sessions = 44 Periods

Sub-discipline	Lesson	Session wise Contents
I.C. Engine Lessons: 7 Sessions: 16	Lesson-I: General	Session-1: I.C. and E.C. Engine, Advantages and disadvantages, Classification of I.C. Engine and Main Systems of I.C. Engine.
	Lesson-II: Working Principle of I.C. Engine	Session-2: T.D.C., BDC, Swept volume, Clearance volume, Compression ratio, Stroke length, Cylinder bore, Working Principle of 4 Stroke Diesel Engine (Diesel cycle).
		Session-3: Working Principle of 2 Stroke Diesel Engine and 2 & 4 Stroke Petrol Engine (Otto cycle).
		Session-4: Demonstration in I.C. Engine Model Room
		Session-5: Combustion of fuel, Actual Working cycle of 4 Stroke Diesel Engine.
		Session-6: Deviations between Actual Working cycle and Theoretical cycle, Firing orders and VT diagram, Power flow in Multi cylinder engine.
	Lesson-III: Air Supply system of Diesel Engine	Session-7: 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.
	Lesson-IV: Fuel Supply system of Diesel Engine	Session-8: Functions and classification of Fuel supply system, Block diagram Fuel Injection Pumps, Injectors and Filters.
		Session-9: Mico Bosch and Cummins PT Fuel supply system and Difference between them.
		Session-10: Cetaine Number, Octane Number, Delay Period and Knocking of fuel, Drawbacks of keeping low HSD Oil level in tank, Removing of Air Lock.
	Lesson-V: Lubricating System of Diesel Engine.	Session-11: Different type of Lubricating system, Blow bye, Crank case ventilation, Reasons of Low lubricating oil pressure and high Oil consumption, Lubricating Circuit.
	Lesson-VI: Cooling system of Diesel Engine	Session-12: Air Cooling system, Water Cooling system Drawbacks of over cooling and reasons for over heating, Demonstration in I.C. Engine Model Room.
	Lesson-VII: Maintenance Steps and Maintenance schedule	Session-13: Maintenance steps & Maintenance schedule
		Session-14: Precautions in providing Piston ring on Piston and assembling in Cylinder liner, Adjustment of Valve (Tappet) clearance.
		Session-15: Adjustment of Injection timing, Inspection of Crankshaft, Troubleshooting.
		Session-16: Demonstration in Model Room.

Technology Lessons: 3 Sessions: 6	Lesson-I: Welding and Related Processes	Session-17: Types of Welding, Gas Welding, Arc Welding. Related Processes: Soldering, Brazing etc.
	Lesson-II: Bench Work and Fitting, Fits and Surface Quality	Session-18: Various Tools, their uses and Bench work, Interchangeability, Limits, Fits, Allowances, Tolerances and Surface finish and Measuring Instruments.
	Lesson-III: Workshop Machines	Session-19: Lathe Machines, Different Lathe Machines Operations.
		Session-20: Drilling and Boring Machines.
		Session-21: Shaper and Planner, Slotting.
		Session-22: Milling Machine and Gear Cutting Machines, Different types of threads.

Control Lessons: 1 Sessions: 1	Lesson-I: Tamping Machines and BCM	Session-17: Tamping Machines: Pre-tamping, Post Tamping, during tamping attention. BCM: Pre-requisites, Operations prior to deployment, Operations during Traffic Block and Post Block Operations.	
	Mainten-ance Schedule Lessons: 1 Sessions: 1	Lesson-I Tamping and Other Machines	Session-18: Maintenance schedules of Tamping and other machines.
	IRTMM Lessons: 1 Sessions: 1	Lesson-I Introduction to IRTMM and RDSO TM Reports	Session-19: Track Machine Organization & Duties of Operator & Technician, Rules for Movement & Working of Track Machines, Planning, Operation & Monitoring of Track Machines. RDSO TM Reports.
	Working Principle Lessons: 2 Sessions: 3	Lesson-I Lining	Session-20: Principle of Single chord lining, 4 Point lining & their Left over error.
	Lesson-II Leveling	Session-21: Calculation of V_m value, 3 Point lining & their left over error and Design lining.	
		Session-22: Double chord leveling system, Criteria of Base line selection, General lift, ramp & Design leveling.	

PROMOTIONAL COURSE – PROMOTIONAL JE-II

Course No. CE 27

Module No. 27.5

SUB: P.WAY, ESTABLISHMENT, STORES & RAJBHASHA

Duration: 22 Sessions = 44 Periods

Sub-discipline	Lesson	Session wise Contents
Track Technology Lessons: 12 Sessions: 15	Lesson-I: Introduction to Railway Organization	Session-1: History of Railways, Zonal Railways, Divisions, Production units, TT Organization on Indian railways.
	Lesson-II: Railway Track	Session-2: Constituents of Railway Track. Requirements of Good Railway Track, Classification of Routes. Different Gauges.
	Lesson-III: Rails	Session-3: Functions, Types & Standard Rail Section, Standard length, Rolling marks.
	Lesson-IV: Sleepers	Session-4: Functions, Types & Sleeper Density, Requirements of PRC sleepers- their advantages and disadvantages.
	Lesson-V: Fastenings & Ballast	Session-5: Rail to Rail fastenings, Rail to Sleeper fastenings, Functions & Specifications.
	Lesson-VI: Points & Crossings	Session-6: Functions & Important terminology, Constituents of Turnout.
		Session-7: Switch Angle, Flange way clearance, Heel divergence, Throw of switch, Types of Crossings, Crossing number & Main constituents of Built-up Crossing.
	Lesson-VII: Welding of Rails	Session-8: Evil effects of Rail joints, Different types of Weldings.
		Session-9: S.W.R/L.W.R/C.W.R , Theory of Welded rails.
	Lesson-VIII: Track Renewals	Session-10: Classification of Track Renewals.
	Lesson-IX: Maintenance of Track	Session-11: Provisions on Works incidental to Regular Track Maintenance with thrust on Deep Screening.
	Lesson-X: Engineering Restrictions & Indicators	Session-12: Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals.
Lesson-XI: Curves	Session-13: Necessity of curves: their types, TTP, CTP & Transition lengths, Radius, Degree, Versine & Field Measurement.	
	Session-14: Super-elevation: Cant deficiency, Cant excess, Cant gradient, Equilibrium cant, Negative Super-elevation, Gauge widening.	
Lesson-XII: Schedule of Dimensions	Session-15: Different Schedules, Standard Dimensions, Loading Gauge, ODC.	

ment Lessons: 3 Sessions: 3	Lesson-I: Leave Rules & Pass Rules	Session-1: Various types of Leaves, Eligibility & Various types of passes, Eligibility etc.
	Lesson-II: D&A and Conduct Rules	Session-2: Minor and Major Penalties, Important Provisions of Service Conduct Rules.
	Lesson-III: H O E R	Session-3: Classification and Duty roster.
Store Lessons: 1 Sessions: 2	Lesson-I: Introduction to Engg. Stores	Session-1: Stock heads of Accounts, Disposal of released and surplus materials.
		Session-2: Indenting procedure, Issue note and Write-off statement.
Medical Awareness Lessons: 1 Sessions: 1	Lesson-I: Medical Awareness Programme	Session-1: Family Welfare, AIDS, Family Management & First Aid.
Rajbhasha Lessons: 1 Sessions: 1	Lesson-II: Rajbhasha	Session-1: Constitutional Provisions, Official Language Act 1963, Official Language Rules 1976, Policy Guidelines & Instructions.

PROMOTIONAL COURSE – PROMOTIONAL JE-II

Course No. CE 27

Module No. 27.6

SUB: COMPUTER

Duration: 8 Sessions = 16 Periods

Sub-discipline	Lesson	Session wise Contents
Computer Lessons: 04 Sessions: 08	Lesson-I: History & Basics of Computer	Session-1: History of Computer, Hardware and Software, Parts of Computer and their functions, Operating Systems of Computer
	Lesson-II: Microsoft Office	Session-2: MS Word Session-3: MS Word Session-4: MS PowerPoint Session-5: MS Excell
	Lesson-III: Internet & E-mail	Session-6: Internet & Web-surfing, e-mail and demonstration for making e-mail ID
	Lesson-IV: Automatic Guide Computer/ALC	Session-7: Introduction of Automatic Guide Computer (ALC) & its Hardware. Session-8: Introduction of WinALC Software

COURSE MODULE

Course No. CE 28: Initial Technician-III

Duration: 13 Weeks

Effective Days: 75

S. N.	CM No.	Subjects	Sessions	Periods
1	28.1	Electrical & Electronics	36	72
2	28.2	Hydraulics, Pneumatics & Mechanical	36	72
3	28.3	I.C. Engine & Workshop Technology	36	72
4	28.4	Track Machines & Working Principles	36	72
5	28.5	P.Way, Establishment, Stores & Rajbhasha	36	72
6	28.6	Group Inter Personal Skill Development (GIPSD)	7	14
7	28.7	Computer	10	20
8		Technical Film Show	5	10
9		Library	5	10
10		Visit to CPOH & Track Machines Working Sites	20	40
11		Examination (Theory/Practical/Viva-voce) & Valediction	17	34
		Total	244	488

- Note:**
- 1. Eligibility: Directly Recruited Technician-III and such Promoted Technician-III, who has no exposure of track machines working.**
 - 2. Medical Awareness Programme shall be covered under Module No. 28.5. Faculty for this programme may be drawn from Medical Department.**
 - 3. Faculty for GIPSD may be drawn from CBWE, Min. of Labour & Employment or from Management Institutes.**
 - 4. Computer, Technical Film Show and Library periods shall be scheduled during the afternoon session.**
 - 5. To bridge the gap between theory and practical, fortnightly visit to CPOH for demonstration and giving hands-on training and monthly visit Track Machines Working Sites for proper understanding of machine working shall be arranged.**
 - 6. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.**

INDUCTION COURSE – INITIAL TECHNICIAN
Course No. CE 28 **Module No. 28.1**

SUB: ELECTRICAL & ELECTRONICS SYSTEM
Duration: 36 Sessions = 72 Periods

Sub-discipline	Lesson	Session wise Contents
Electrical System: Lessons: 03 Sessions:12	Lesson-I: Fundamentals of Electricity	Session-1: Symbols, Basic Concept of Voltage and Current, Ohm's law, Power law, Resistor: Definition, Unit, Symbol, Power Rating, Tolerance, Types
	Lesson-II: Electrical Components	Session-2: Resistor: Color coding, Combination, Application, Faults & Troubleshooting.
		Session-3: Capacitor: Definition, Unit, Symbol, Types, Combinations, Application, Faults and Troubleshooting
		Session-4: Inductor: Definition, Unit, Symbol Types, Combinations, Application, Faults and Troubleshooting
		Session-5: Demonstration, checking of Resistor, Capacitor and Inductor in Electronics Model Room
	Lesson-III: Auto Electrical	Session-6: Battery: Definition of Cell & Battery, Types, Rating, Specific Gravity, Construction
		Session-7: Working of Lead-acid Cell & Battery, Maintenance, Testing by Hydrometer and Load tester
		Session-8: Alternator, Regulator: Construction, Working, Maintenance and Troubleshooting
		Session-9: Self starter: Construction, Working, Maintenance and Troubleshooting
		Session-10: Relay: Definition, Construction & Operation, Types, Pin diagrams, Testing.
		Session-11: Demonstration, checking and testing of Relays in Electronics Model Room
		Session-12: Engine Circuit & Z.F. Circuit: Description, Functions, Types, Safety Components, Faults & Troubleshooting
Electronic System: Lessons:15 Sessions:24	Lesson-I: Fundamentals of Electronics	Session-1: Symbols, Nomenclatures, Fundamentals of Electronics and Applications, Active components & Passive components.
	Lesson-II: Semiconductor Theory	Session-2: Difference between Conductor, Semiconductor & Insulator, Properties of Semiconductor, Covalent Bonds, Energy Bands, Types of Semiconductor i.e. Intrinsic, Extrinsic- P Type & N Type
	Lesson-III: Semiconductor Diode:	Session-3: Semiconductor Diode: Construction, Working, Forward bias & Reverse bias, V-I Characteristics of P.N. Junction
		Session-4: Application as Rectifier - Half wave & Full wave Rectifiers- Centre Tap and Bridge Rectifier, Polarity, Protection Device

	Session-5: Types, Construction, Working, Application of Zener Diode, LED, Photo Diode.
Lesson-IV: Transistor	Session-6: Transistor: Construction, Description of Terminals, NPN & PNP Transistor, Mode of Connections, Amplifying function, Applications as Switch & Amplifier, Testing
	Session-7: Demonstration, checking and testing of Diodes and Transistors in Electronics Model Room
Lesson-V: Transducer	Session-8: Definition, Principle, Classification, Types, Tamping Depth Transducer, Pendulum, Height Transducer, Encoder: Function and Calibration
	Session-9: Lining Transducer, Measuring Transducer, Satellite Transducer, Hook Transducer: Function and Calibration
	Session-10: Demonstration, checking and calibration of Transducers in Electronics model room
Lesson-VI: Operational Amplifier	Session-11: Definition, Symbol, Function of each terminal, Open loop, Close loop, +ve feed back, -ve feed back, Characteristic, Application as Buffer, Inverter, Non Inverter, Adder, Sub-tractor, Integrator etc.
Lesson-VII: Digital Electronics	Session-12: Number system i.e. Binary, Decimal, Hexadecimal, Logic Gates, Basic Idea of Microprocessor
Lesson-VIII: Electronic Circuits and PCBs:	Session-13: Discrete Circuit & Integrated Circuit: Advantage & Disadvantage, PCBs used in different machines: Description, Name Quantity and Functions
Lesson-IX: Power Supply	Session-14: Need, Types, DC to DC Converter & Regulator, Functional description of Power supply PCBs EK813SV, EK816SV, EK851SV, Calibration, Testing & Troubleshooting
	Session-15: Demonstration, checking and calibration of PCB EK813SV in Electronics Model Room
Lesson-X: Programmer unit and Logic Plan	Session-16: Function and Description of Programmer Unit, Description of different PCBs of Programmer Unit i.e. EK 501P, EK553P, EK552P, EK554P, Different Parts of Logic Plan
	Session-17: Demonstration of Programmer unit & Logic Plan in Electronics Model Room
Lesson-XI: Multi-check/ Multiplexer PCB	Session-18: Description of Multi-check PCB EK28V and demonstration of measurements.
Lesson-XII: Tamping Unit Control Circuit UNO/DUO/ CSM/3X /Unimat	Session-19: Functional Description of Tamping Unit Control Circuit, Different Positions of Tamping Unit & their Description, Current of Proportional valve
	Session-20: Calibration, Troubleshooting & Fault finding

	Lesson-XIII Front Input Circuit: UNO/DUO/ CSM/3X /Unimat	Session-21: Functional Description of Front Input Circuit, Front Input Potentiometer, Slew, Versine, General Lift, Basic idea of ALC, GVA and Laser Lining etc.
	Lesson-XIV: Lining Control Circuit, UNO/DUO/ CSM/3X /Unimat	Session-22: Functional Description of Lining Control Circuit and Lining PCBs Session-23: Basic concept of 3 Point Regulator / 3 Stage Regulator, calibration, troubleshooting & Fault finding
	Lesson-XV Leveling & Lifting Control Circuit of UNO/DUO/ CSM/3X /Unimat	Session-24: Functional Description of Leveling Control Circuit and leveling PCBs, calibration troubleshooting & Fault finding

INDUCTION COURSE – INITIAL TECHNICIAN
Course No. CE 28 **Module No. 28.2**

SUB: HYDRAULICS, PNEUMATICS & MECHANICAL
Duration: 36 Sessions = 72 Periods

Sub-discipline	Lesson	Session wise Contents
Hydraulics Lessons: 16 Sessions: 21	Lesson-I: Fundamentals & Hydraulic Symbols	Session-1: Introduction, Advantages of Hydraulic system, Hydraulic Symbols
	Lesson-II: Hydraulic Oil, Hydraulic Tank	Session-2: Functions and Properties of Hydraulic oil, Functions and Parts of Hydraulic tank.
	Lesson-III: Hydraulic Filter and Hydraulic Cooler	Session-3: Functions, Types, Importance of filtration, function of Hydraulic Cooler, Maintenance aspects.
	Lesson-IV: Hydraulic Hose and Fitting	Session-4: Functions, Types, Hose specification: DIN, SAE & EN standards, Hydraulic Fittings, Precautions during mounting Hydraulic Hoses and Fittings.
	Lesson-V: Hydraulic Seal and 'O' Ring	Session-5: Functions, Types, Precautions during providing hydraulic Seals, Causes of Failure.
	Lesson-VI: Hydraulic Pump	Session-6: Definition, Functions and Classification, Working and Construction of Vane pump & Gear pump, Axial Piston Pump.
		Session-7: Precautions during mounting, Troubleshooting, Aeration & Cavitation
	Lesson-VII: Pressure Control Valve	Session-8: Working and Construction of Relief Valve & Unloader valve, Pressure reducing valve, Trouble shooting.
	LESSON-VIII Direction Control Valve	Session-9: Function and Types such as Spring centered valves; Spring offset valves, Check valve, POC valve, Trouble shooting.
	Lesson-IX: Proportional Valve, Servo Valve and Flow Control Valve	Session-10: Function and Troubleshooting.
	Lesson-X: Accumulator	Session-11: Functions, Types, Working of Bladder & Diaphragm Type Accumulator, Charging of Accumulator.
	Lesson-XI: Hydraulic Cylinder	Session-12: Function, Types and Parts.
Lesson-XII: Hydraulic Motor	Session-13: Definition, Working of Vane motor, Gear motor and. Axial Piston motor, Troubleshooting.	

	Lesson-XIII: Demonstration of Hydraulic Transparent Models	Session-14: Hydraulic motor, D.C. Valves, Cylinder, Accumulator, Pressure Gauge, Pressure control valves, Flow control valve, Check Valve, Pilot Operated Check Valve etc.
	Lesson-XIV: Practical Disassembly & Assembly of Hydraulic Components in Model Room	Session-15: Vane pump and Vane motor.
		Session-16: Axial Piston pump.
		Session-17: D.C. valve, Proportional valve, Servo valve.
		Session-18: Relief valve and Unloader valve.
	Lesson-XV: Hydraulic Circuits	Session-19: Constant pressure circuit, Closed loop circuit, Regenerating circuit of 3X, CSM, DUO, Unimat.
	Lesson-XVI: Demonstration of Hydraulic Equipment Sets	Session-20: Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.
		Session-21: Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.
Pneumatics Lessons: 4 Sessions: 5	Lesson-I: Pneumatic Symbols	Session-22: Pneumatics symbols and Application of air on Track machines.
	Lesson-II: Pneumatic Components	Session-23: Working and maintenance of Air Compressor, Cooling Coil, Safety valve, Air dryer, Water separator, Air oiler, DC Valve, Cylinder and Pneumatic hoses.
	Lesson-III: Pneumatic Circuits and Troubleshooting	Session-24: Pneumatic Working circuits and Brake circuits, Failure Analysis and Troubleshooting of Pneumatic assemblies.
	Lesson-IV: Demonstration of Pneumatic Equipment Sets	Session-25: Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.
Session-26: Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.		
Mechanical Lessons: 10 Sessions: 10	Lesson-I: Power Transmission	Session-27: Block Diagram, Types of Power Transmission, Mechanical Transmission, 'V' belt, Chain, Pulley, Cardon Shaft.
	Lesson-II: Gear Box and Clutch Assembly in UNO/DUO	Session-28: Working, Construction and Maintenance practices of Main gear box, Clutch assembly, Reversing gear box, Six speed gear box and distributor Gear Box..
	Lesson-III: Driving and Running Axle	Session-29: Function, Parts and Maintenance aspects, setting of crown & tail pinion.
	Lesson-IV: Z. F. Hydro-dynamic Gear Box	Session-30: Function and Construction, Precautions during working and Maintenance aspects, Failure Analysis and Troubleshooting.

	Lesson-V: Funk Gear Box, Reduction Gear Box and Satellite Axle Gear Box	Session-31: Working, Construction and Maintenance practices.
	Lesson-VI: Tamping Unit	Session-32: Function and Parts, Precautions during working & repairing. Maintenance schedule, setting of bearings and spacers on vibration shaft, Failure Analysis and Troubleshooting.
	Lesson-VII: Lifting and Lining Unit, Bearings	Session-33: Function, Assembly and Maintenance aspects.
	Lesson-VIII: BCM Assemblies	Session-34: Working, Construction and Maintenance practices of Excavation Chain, Conveyor Belts and Screens.
	Lesson-IX- Lubrication	Session-35: Oil and Lubricants used in different gear boxes, Tamping unit, Lifting unit, Screen - drum etc., types and their capacities.
	Lesson-X: Maintenance Schedules	Session-36: Maintenance Schedules and IOH/POH of machines.

INDUCTION COURSE – INITIAL TECHNICIAN
Course No. CE 28 **Module No. 28.3**

SUB: I.C. ENGINE & WORKSHOP TECHNOLOGY
Duration: 36 Sessions = 72 Periods

Sub-discipline	Lesson	Session wise Contents
I.C. Engine Lessons: 10 Sessions: 22	Lesson-I: General	Session-1: I.C. Engine & its classification and Main Systems of I.C. Engine.
	Lesson-II: Constructional Details of Engine	Session-2: Cylinder, Cylinder head, Piston and Piston rings, Connecting rod & Crank shaft.
		Session-3: Fly wheel, Cam shaft and Sump, Inlet and Exhaust valve, Push rod, Rocker arm, Valve clearance, Valve operating mechanism.
		Session-4: Demonstration of Engine components in I.C. Engine Model Room.
	Lesson-III: Basic Terminology & Working Principle of I.C. Engine	Session-5: T.D.C., BDC, Swept volume, Clearance volume, Compression ratio, Stroke length, Cylinder bore, Firing Order, Working Principle of 2 Stroke Diesel Engine
	Lesson-V: Air Supply system of Diesel Engine	Session-6: Requirement of Air, Types of Air cleaner, Cleaning and checking of Dry type Air cleaner. Draw backs of choking of Air Cleaner.
		Session-7: Supercharging, Turbocharger and After cooler, Importance of After cooling, Demonstration in I.C. Engine Model Room.
	Lesson-VI: Fuel Supply system of Diesel Engine	Session-8: Functions and classification of Fuel supply system, Block diagram, Fuel Injection Pumps, Injectors and Filters.
		Session-9: Mico Bosch and Cummins PT Fuel supply system. Difference between Mico Bosch and Cummins PT Fuel supply system, Air lock, Demonstration in I.C. Engine Model Room.
		Session-10: Demonstration in I.C. Engine Model Room.
	Lesson-VII: Lubricating system of Diesel Engine	Session-11: Concept of lubrication and functions of Lubricating oil, Properties of Lubricant and Lubricating circuit.
		Session-12: Different types of Lubricating systems, Oil pump, Relief Valve, Filters, Oil Cooler, Strainer, Oil Pressure Gauge, Oil Pressure Indicating light.
		Session-13: Blow bye, Crank case ventilation, Reasons of Low lubricating oil pressure and high Oil consumption. Demonstration in I.C. Engine Model Room.

	Lesson-VIII: Cooling system of Diesel Engine	Session-14: Necessity of Cooling, Different methods of Engine cooling, Air Cooling system, Water Cooling system.	
		Session-15: Drawbacks of over cooling and reasons for over heating, Demonstration in I.C. Engine Model Room.	
		Lesson-IX: Maintenance Steps	
		Session-16: Maintenance Schedules.	
		Session-17: Adjustment of Valve (Tappet) clearance.	
		Session-18: Adjustment of Injection timing and testing of Nozzles.	
		Session-19: Troubleshooting of Engines.	
	Session-20: 1 day visit to TM Workshop, PD/MGS.		
	Session-21: 1 day visit to TM Workshop, PD/MGS.		
	Session-22: 1 day visit to TM Workshop, PD/MGS.		
	Workshop Technology Lessons: 6 Sessions: 14	Lesson-I: Welding and Related Processes	Session-23: Types of Welding, Gas Welding, Arc Welding and Electrodes, Related Processes: Soldering, Brazing etc.
			Session-24: Procedure for welding of tamping tool and defects in Tamping Tool welding.
			Session-25: Welding of BCM turret gears, main links, intermediate links and cutter bar and grinding operation.
Lesson-II: Bench Work and Fitting		Session-26: Various Tools, their uses and Bench work.	
Lesson-III: Measurement and Inspection		Session-27: Standards of Measurement, Classification of Measuring Instruments and Linear Measurement.	
Lesson-IV: Limits, Fits and Surface Quality		Session-28: Interchangeability, Limits, Fits, Allowances, Tolerances and Surface finish.	
Lesson-V: Workshop Machines		Session-29: Lathe Machines, Different Lathe Machines Operations.	
		Session-30: Drilling and Boring Machines.	
		Session-31: Shaper and Planner.	
		Session-32: Milling Machine and Gear Cutting.	
	Session-33: Workshop visit to Plasser India.		
	Session-34: Workshop visit to Plasser India.		
Session-35: Workshop visit to Plasser India.			
Lesson-VI: Threads	Session-36: Different types of threads.		

INDUCTION COURSE – INITIAL TECHNICIAN
Course No. CE 28 **Module No. 28.4**

SUB: TRACK MACHINES & WORKING PRINCIPLES
Duration: 36 Sessions = 72 Periods

Sub-discipline	Lesson	Session wise Contents
Track Machines Lessons: 1 Sessions: 1	Lesson-I: History of Track Machine and their Types	Session-1: Introduction of Track Machines in chronological order, different types of track machines on Indian Railways, their functions and output.
Tamping Machines Lessons: 6 Sessions: 8	Lesson-I: 08-Unomatic / Duomatic	Session-2: Main features, Main assemblies and components, Working Principle and Power Transmission
	Lesson-II: 09-32-CSM	Session-3: Main features, Main assemblies & components. Session-4: Working Principle and Power Transmission.
	Lesson-III: 08-275-2S UNIMAT	Session-5: Main features, Main assemblies & components. Session-6: Working Principle and Power Transmission
	Lesson-IV: 08-275-3S UNIMAT	Session-7: Main features, Main assemblies & components, Working Principle and Power Transmission, Difference between 2S & 3S Unimat.
	Lesson-V: 09-3x Tamping Express.	Session-8: Main features, Main assemblies & components Working Principle.
	Lesson-VI: WST	Session-9: Main features, Main assemblies & components, Working Principle and Power Transmission.
Ballast Handling Machines Lessons: 4 Sessions: 4	Lesson-I: BCM: RM-76	Session-10: Main features main units and their functions, Working Principle.
	Lesson-II: BCM: RM-80	Session-11: Main features main units and their functions, Working Principle.
	Lesson-III: FRM-80	Session-12: Main features main units and their functions, Working Principle.
	Lesson-IV: B.R.M.	Session-13: Main features main units and their functions, Working Principle.
Track Laying Machines Lessons: 3 Sessions: 4	Lesson-I: PQRS	Session-14: Main features main units and their functions, Yard Activities, Fabrication of Panels, Rake Formation, Amenities at Base Depot. Session-15: Working Principle, Auxilliary Track and Mode of working.
	Lesson-II: TRT	Session-16: Main features main units and their functions, Yard activities, Modified BRHs & Rake Formation, Working Principle & SRs after relaying.
	Lesson-III: T-28	Session-17: Main features main units and their functions, Working Principle

Track Stabilizer Lessons: 1 Sessions: 1	Lesson-I: DTS/DGS	Session-18: Main features main units and their functions, Power Transmission
	Lesson-I: Tamping Machines	Session-19: Pre-requisites, Pre-tamping Operations, Operations during tamping and Post tamping Operations.
Quality Control Lessons: 3 Sessions: 3	Lesson-II: BCM	Session-20: Pre-requisites, Operations prior to deployment, Operations during Traffic Block and Post Block Operations.
	Lesson-III: PQRS, TRT & T-28	Session-21: Pre-requisites, Operations prior to deployment, Operations during Traffic Block and Post Block Operations.
	Lesson-I Tamping Machines	Session-22: Maintenance schedules of Tamping machines.
Maintenance Schedule Lessons: 4 Sessions: 4	Lesson-II BCM & FRM	Session-23: Maintenance schedules of RM-76, RM-80, FRM-80 and FRM-85.
	Lesson-III DTS & BRM	Session-24: Maintenance schedules of DTS & BRM.
	Lesson-IV UNIMAT	Session-25: Maintenance schedule of 2S & 3S-Unimat.
	Lesson-I Introduction to IRTMM and RDSO TM Reports	Session-26: Ch 1: Track Machine Organisation & Duties of AEN, SSE, Operator & Technician. Session-27: Ch 4 & 5: Rules for Movement & Working of Track Machines and Planning, Operation & Monitoring of Track Machines. Session-28: Brief on other Chapters of IRTMM and RDSO TM Reports.
Working Principle Lessons: 2 Sessions: 8	Lesson-I Lining	Session-29: Principle of Lining, Single chord system, Type of lining i.e. 4 Point & 3 Point lining.
		Session-30: Principle of 4 Point lining & Left over error.
		Session-31: Calculation of V_m value on Transition & Reverse Curve, Toggle switch Direction, Non-suitability of 4 Point lining on Straight, V_m value feeding at Reverse & Compound curve.
		Session-32: 3 Point lining & Left over error, Calculation of 'V' value, Method of feeding 'V' value.
	Lesson-II Leveling	Session-33: Design lining, Laser lining and measuring run method, Potentiometers & their calibration.
		Session-34: Types of leveling system, Double chord system, General lift, ramp in & ramp out, Criteria for selection of Base line.
		Session-35: Double chord follow up system & fixed chord system, Proportional leveling, Error reduction ratio, Method of feeding of Cant on CSM, Method of feeding of Cant on other machines
		Session-36: Function of Pendulum- Front, Middle, Rear Pendulum & Twist correction, Method of data feeding on Tamping Machines - Manually and by Computer (GVA&ALC)

INDUCTION COURSE – INITIAL TECHNICIAN
Course No. CE 28 **Module No. 28.5**

SUB: P.WAY, ESTABLISHMENT, STORES & RAJBHASHA
Duration: 36 Sessions = 72 Periods

Sub-discipline	Lesson	Session wise Contents
Track Technology Lessons: 13 Sessions: 26	Lesson-I: Introduction to Railway Organization.	Session-1: History of Railways, Zonal Railways, Divisions, Production units.
		Session-2: TT Organization on Indian railways, Organization at headquarters and Divisional levels, CPOH etc.
	Lesson-II: Railway Track	Session-3: Constituents of Railway Track. Requirements of Good Railway Track, Classification of Routes. Different Gauges.
	Lesson-III: Rails	Session-4: Functions, Types & Standard Rail Section, Standard length, Rolling marks & UTS.
	Lesson-IV: Sleepers	Session-5: Functions, Types & Sleeper Density, Requirements of PRC sleepers- their advantages and disadvantages.
	Lesson-V: Fastenings	Session-6: Rail to Rail fastenings, Rail to Sleeper fastenings.
	Lesson-VI: Points & Crossings	Session-7: Functions & Important terminology.
		Session-8: Constituents of Turnout.
		Session-9: Switch Angle, Flange way clearance, Heel divergence, Throw of switch.
		Session-10: Types of Crossings, Crossing number & Main constituents of Built-up Crossing.
		Session-11: Yard Visit
	Lesson-VII: Welding of Rails	Session-12: Evil effects of Rail joints.
		Session-13: Different types of welding.
		Session-14: Yard visit
	Lesson-VIII: Track Renewals	Session-15: Classification of Track Renewals.
	Lesson-IX: Maintenance of Track	Session-16: Provisions on Works incidental to Regular Track Maintenance with thrust on Deep Screening.
		Session-17: Provisions on Maintenance of Track in Track Circuited Areas as contained in IRPWM.
		Session-18: Provisions on Maintenance of Track in Electrified Areas as contained in IRPWM & Precautions during Machine working.
	Lesson-X: Engineering Restrictions & Indicators	Session-19: Categories of Engineering Works, Engineering Fixed Signals/Indicators: Temporary and Permanent
		Session-20: Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals.
	Lesson-IX:	Session-21: Necessity of curves: their types, TTP, CTP & Transition lengths.

	Railway Curves	Session-22: Radius, Degree, Versine and Field Measurement.
		Session-23: Super-elevation: Cant deficiency, Cant excess, Cant gradient, Equilibrium cant.
		Session-24: Yard visit.
	Lesson-XII: Track Tolerances	Session-25: Different Track Parameters and their service tolerances.
	Lesson-XIII: Schedule of Dimensions	Session-26: Different Schedules, Standard Dimensions, Loading Gauge, ODC.
Establishment Lessons: 4 Sessions: 4	Lesson-I: Leave Rules	Session-27: Various types of Leaves, Eligibility etc.
	Lesson-II: Pass Rules	Session-28: Various types of passes, Eligibility etc.
	Lesson-III: D&A Rules	Session-29: Minor & Major Penalties.
	Lesson-IV: HOER	Session-30: Classification and Duty roster.
Store Lessons: 1 Sessions: 3	Lesson-XXXII: Introduction to Engg. Stores & Inventory Control	Session-31: Stock heads of Accounts, Disposal of released and surplus materials.
		Session-32: Indenting procedure, Issue note and Write-off statement.
		Session-33: Stock verification and Inventory Control Technique.
Medical Awareness Lessons: 1 Sessions: 1	Lesson-I: Medical Awareness Programme	Session-34: Family Welfare, AIDS, Family Management & First Aid.
Rajbhasha Lessons: 1 Sessions: 2	Lesson-I: Rajbhasha	Session-35: Constitutional Provisions, Official Language Act 1963, Official Language Rules 1976.
		Session-36: Policy Guidelines & Instructions.

INDUCTION COURSE – INITIAL TECHNICIAN
Course No. CE 28 **Module No. 28.6**

SUB: GROUP INTER PERSONAL SKILL DEVELOPMENT (GIPSD)
Duration: 7 Sessions = 14 Periods

Sub-discipline	Lesson	Session wise Contents
GIPSD Lessons: 07 Sessions: 07	Lesson-I: Communication	Session-1: Communication Skills and Importance in Railway Organization.
	Lesson-II: Work Culture	Session-2: Work Culture.
	Lesson-III: Inter Personal Relations	Session-3: Need for Inter Personal Relations in Railway Organization.
	Lesson-IV: Motivation	Session-4: Motivation Skills.
	Lesson-V: Attitude Building	Session-5: Importance of Positive Attitude.
	Lesson-VI: Team Work	Session-6: Team Work and Team Building.
	Lesson-VII: Self Development	Session-7: Self Development.

INDUCTION COURSE – INITIAL TECHNICIAN
Course No. CE 28 **Module No. 28.7**
SUB: COMPUTER
Duration: 10 Sessions = 20 Periods

Sub-discipline	Lesson	Session wise Contents
Computer Lessons: 04 Sessions: 08	Lesson-I: History & Basics of Computer	Session-1: History of Computer, Hardware and Software, Parts of Computer and their functions, Operating Systems of Computer
	Lesson-II: Microsoft Office	Session-2: MS Word Session-3: MS Word Session-4: MS PowerPoint Session-5: MS PowerPoint Session-6: MS Excell Session-7: MS Excell
	Lesson-III: Internet & E-mail	Session-8: Internet & Web-surfing, e-mail and demonstration for making e-mail ID
	Lesson-IV: Automatic Guide Computer/ALC	Session-9: Introduction of Automatic Guide Computer (ALC) & its Hardware. Session-10: Introduction of WinALC Software

COURSE MODULE

Course No. CE 29: PROMOTIONAL TECHNICIAN-III

Duration: 08 Weeks

Effective Days: 35

S. N.	CM No.	Subjects	Sessions	Periods
1	29.1	Electrical & Electronics	16	32
2	29.2	Hydraulics, Pneumatics & Mechanical	16	32
3	29.3	I.C. Engine & Workshop Technology	16	32
4	29.4	Track Machines & Working Principles	16	32
5	29.5	P.Way, Establishment & Rajbhasha	16	32
6		Technical Film Show	4	8
7		Library	4	8
8		Visit to CPOH & Track Machines Working Sites	7	14
9		Examination (Theory/Practical/Viva-voce) & Valediction	17	34
		Total	112	224

- Note:**
- 1. Eligibility:** Promoted Technician-III from Gr.'D' Staff, who has some exposure of track machines working.
 - 6. Medical Awareness Programme** shall be covered under Module No. 29.5. Faculty for this programme may be drawn from Medical Department.
 - 7. 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.**
 - 8. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.**

ATIONAL COURSE – PROMOTIONAL TECHNICIAN-III

Course No. CE 29

Module No. 29.1

SUB: ELECTRICAL & ELECTRONICS SYSTEM

Duration: 16 Sessions = 32 Periods

Sub-discipline	Lesson	Session wise Contents
Electrical System: Lessons: 02 Sessions: 5	Lesson-I: Fundamentals of Electricity & Electrical Components	Session-1: Symbols, Basic Concept of Voltage and Current, Resistor: Definition, Unit, Symbol, Power Rating, Tolerance, Types, Capacitor & Inductor: Definition, Unit, Symbol, Types, Combinations, Application, Faults and Troubleshooting
	Lesson-II: Auto Electrical	Session-2: Battery: Definition of Cell & Battery, Types, Rating, Specific Gravity, Construction, Working of Lead-acid Cell & Battery, Maintenance, Testing by Hydrometer and Load tester
		Session-3: Alternator, Regulator & Self starter: Construction, Working, Maintenance and Troubleshooting
		Session-4: Relay: Definition, Construction & Operation, Types, Pin diagrams, Testing; Demonstration, checking and testing of Relays in Electronics Model Room
		Session-5: Engine Circuit & Z.F. Circuit: Description, Functions, Types, Safety Components, Faults & Troubleshooting
Electronic System: Lessons: 7 Sessions: 11	Lesson-I: Fundamentals of Electronics	Session-1: Symbols, Nomenclatures, Fundamentals of Electronics and Applications, Active components & Passive components
	Lesson-II: Semiconductor Components	Session-2: Semiconductor Diode: Construction, Working, Forward bias and Reverse bias, V-I Characteristics of P.N. Junction, Types of Diodes, Construction, Working Symbol and Application of Zener Diode, LED, Photo Diode
		Session-3: Transistor, Construction, Description of Terminals, NPN & PNP Transistor, Mode of Connections, Applications as Switch and Amplifier, Testing
	Lesson-III: Transducer	Session-4: Definition, Principle, Classification, Types, Tamping Depth Transducer, Pendulum, Height Transducer, Encoder: Function and Calibration
		Session-5: Lining Transducer, Measuring Transducer, Satellite Transducer, Hook Transducer:
		Session-6: Demonstration, checking and calibration of Transducers in Electronics model room

	Lesson-IV: Power Supply	Session-7: Need, Types, DC to DC Converter & Regulator, Functional description of Power supply PCBs EK813SV, EK816SV, EK851SV, Calibration, Testing & Troubleshooting
	Lesson-V: Programmer unit and Logic Plan. Multi-check/ Multiplexer PCB	Session-8: Function and Description of Programmer Unit, Description of different PCBs of Programmer Unit i.e. EK 501P, EK553P, EK552P, EK554P, Different Parts of Logic Plan, Multiplexer PCB Session-9: Demonstration of Programmer unit & Logic Plan, Multiplexer PCB in Electronics Model Room
	Lesson-VI: Tamping Unit Control Circuit	Session-10: Functional Description of Tamping Unit Control Circuit, Different Positions of Tamping Unit & their Description, Current of Proportional valve
	Lesson-VII: Lining & leveling Control Circuit.	Session-11: Functional Description of Lining & leveling Control Circuit and Lining & Leveling PCBs

SUB: HYDRAULICS, PNEUMATICS & MECHANICAL

Duration: 16 Sessions = 32 Periods

Sub-discipline	Lesson	Session wise Contents
Hydraulics Lessons: 8 Sessions: 9	Lesson-I: Fundamentals, Symbols, Oil, Tank, Filter & Accumulator	Session-1: Introduction, Hydraulic Symbols, Functions and Properties of Hydraulic oil, Functions and Parts of Hydraulic Tank, Functions and Types of filters, Importance of filtration, Functions, Types, Charging of Accumulator
	Lesson-II: Hydraulic Seal, 'O' Ring, Hose and Fitting, Hydraulic Cylinder	Session-2: Precautions during providing hydraulic Seals, Causes of Failure, Hydraulic Hose, Hydraulic Fittings, Precautions during mounting Hydraulic Hoses and Fittings, Functions and type of cylinder.
	Lesson-III: Hydraulic Pump and Motor	Session-3: Definition, Functions and Classification, Working and Construction of Vane pump, Axial Piston Pump, Functions and types of motor, Precautions during mounting, Troubleshooting, Aeration & Cavitation.
	Lesson-IV: Pressure Control Valve	Session-4: Working and Construction of Relief Valve & Unloader valve, Pressure reducing valve, Trouble shooting.
	LESSON-V Direction Control Valve, Proportional and Servo Valve	Session-5: Function and Types such as Spring centered valves; Spring offset valves, Check valve, POC valve, Function of Proportional & Servo Valve, Troubleshooting.
	Lesson-VI: Hydraulic Transparent Models	Session-6: Demonstration of Hydraulic motor, D.C. Valves, Cylinder, Accumulator, Pressure Gauge, Pressure control valves, Flow control valve, Check Valve, Pilot Operated Check Valve etc.
	Lesson-VII: Practical Disassembly & Assembly of Hydraulic Components in Model Room	Session-7: Vane pump, Axial Piston pump.
		Session-8: Proportional valve, Servo valve, Relief valve.
	Lesson-VIII: Demonstration of Hydraulic Equipment Sets	Session-9: Demonstration of Hydraulic circuits using FluidsimH Software & Work exercises.

Lessons: 2 Sessions: 2	Lesson-I: Pneumatic Symbols and Pneumatic Components	Session-10: Pneumatics symbols and Application of air on Track machines, Working and maintenance of Air Compressor, Cooling Coil, Safety valve, Air dryer, Water separator, Air Oiler, DC Valve, Cylinder and Pneumatic hoses.
	Lesson-II: Demonstration of Pneumatic Equipment Sets	Session-11: Demonstration of Pneumatic circuits using FluidsimP Software & Work exercises.
Mechanical Lessons: 5 Sessions: 5	Lesson-I: Power Transmission, Lubrication	Session-12: Block Diagram, Types of Power Transmission, Mechanical Transmission, 'V' belt, Chain, Pulley, Cardon Shaft, Oil and Lubricants used in different gear boxes, Tamping unit, Lifting unit, Screen Drum etc., types and their capacities.
	Lesson-II: Z. F. Hydro-dynamic Gear Box	Session-13: Function and Construction, Precautions during working and Maintenance aspects, Failure Analysis and Troubleshooting.
	Lesson-III: Distributor Gear Box, Funk Gear Box, Reduction Gear Box, Satellite Axle Gear Box, Driving Axle	Session-14: Working, Construction and Maintenance practices, setting of crown & tail pinion on Driving Axle
	Lesson-IV: Tamping Unit, Bearings.	Session-15: Function and Parts, Precautions during working & repairing. Maintenance schedule, setting of bearings and spacers on vibration shaft, Failure Analysis and Troubleshooting.
	Lesson-V: Maintenance Schedules	Session-16: Maintenance Schedules and IOH/POH of machines.

SUB: I.C. ENGINE & WORKSHOP TECHNOLOGY

Duration: 16 Sessions = 32 Periods

Sub-discipline	Lesson	Session wise Contents
I.C. Engine Lessons: 9 Sessions: 12	Lesson-I: General	Session-1: I.C. and E.C. Engine, Classification of I.C. Engine and Main Systems of I.C. Engine.
	Lesson-II: Constructional Details of Engine	Session-2: Cylinder, Cylinder head, Piston and Piston rings, Connecting rod, Crank shaft, Fly wheel, Cam shaft and Sump.
		Session-3: Inlet and Exhaust valve, Push rod, Rocker arm, Valve clearance, Valve operating mechanism. Demonstration of Engine components in I.C. Engine Model Room.
	Lesson-III: Basic Terminology	Session-4: T.D.C., BDC, Swept volume, Clearance volume, Compression ratio, Stroke length, Cylinder bore.
	Lesson-IV: Working Principle of I.C. Engine	Session-5: Working Principle of 4 Stroke Diesel Engine (Diesel cycle).
		Session-6: Demonstration in I.C. Engine Model Room.
		Session-7: Firing orders and VT diagram, Requirement of Air, Types of Air cleaner
	Lesson-V: Air Supply system of Diesel Engine	Session-8: Cleaning and checking of Dry type Air cleaner, Turbocharger and After cooler, Demonstration in I.C. Engine Model Room
	Lesson-VI: Fuel Supply system of Diesel Engine	Session-9: Functions and classification of Fuel supply system, Block diagram, Fuel Injection Pumps, Injectors and Filters.
	Lesson-VII: Lubricating system of Diesel Engine	Session-10: Functions of Lubricating oil, Oil pump, Relief Valve, Filters, Oil Cooler, Strainer, Oil Pressure Gauge, Oil Pressure Indicating light.
	Lesson-VIII: Cooling system of Diesel Engine	Session-11: Different methods of Engine cooling, Air Cooling system, Water Cooling system, reasons for over heating, Demonstration in I.C. Engine Model Room.
	Lesson-IX: Maintenance Schedule and Maintenance Steps	Session-12: Maintenance Schedules, Adjustment of Injection timing & Troubleshooting

Technology Lessons: 4 Sessions: 4	Lesson-I: Welding and Related Processes	Session-13: Types of Welding, Arc Welding, Related Processes: Soldering, Brazing etc., Procedure for welding of tamping tool and defects in Tamping Tool welding, Welding of BCM turret gears, main links, intermediate links and cutter bar and grinding operation.
	Lesson-II: Bench Work and Fitting	Session-14 Various Tools, their uses and Bench work.
	Lesson-III mits, Fits and Surface Quality	Session-15. Measuring Instruments.
	Lesson-IV: Threads	Session-16 Different types of threads.

SUB: TRACK MACHINES & WORKING PRINCIPLES

Duration: 16 Sessions = 32 Periods

Sub-discipline	Lesson	Session wise Contents
Track Machines Lessons: 1 Sessions: 1	Lesson-I: Types of Track Machines	Session-1: Introduction of Track Machines in chronological order their functions and output.
Tamping Machines Lessons: 4 Sessions: 4	Lesson-I: 08-Unomatic / Duomatic	Session-2: Main features, Main assemblies, Working Principle and Power Transmission.
	Lesson-II: 09-32-CSM	Session-3: Main features, Main assemblies, Working Principle and Power Transmission
	Lesson-III: 08-275-2S & 08-275-3S UNIMAT	Session-4: Main features, Main assemblies, Working Principle, Power Transmission and difference between UNI-2S & UNI-3S.
	Lesson-IV: 09-3x Tamping Express & WST	Session-5: Main features, Main assemblies, Working Principle, Power Transmission and difference between UNI-2S & UNI-3S.
Ballast Handling Machines Lessons: 1 Sessions: 4	Lesson-I: BCM: RM-76	Session-6: Main features main units and assemblies and working principle.
	Lesson-II: RM-80	Session-7: Main features main units and assemblies and working principle.
	Lesson-III: FRM-80	Session-8: Main features main units and assemblies and working principle.
	Lesson-IV: B.R.M/D.G.S.	Session-9: Main features main units and assemblies and working principle.
Track Laying Machines Lessons: 3 Sessions: 3	Lesson-I: PQRS	Session-10: Main features Fabrication of Panels, Rake Formation, Yard Activities, mode of working
	Lesson-II: TRT	Session-11: Main features Yard Activities, Modified BRHs & Rake formation mode of working.
	Lesson-III: T-28	Session-12: Main features Working Principle.
Quality Control Lessons: 1 Sessions: 1	Lesson-I: Quality Control	Session-13: Pre-tamping, Post tamping and during tamping attention, Maintenance Schedule of Tamping Machine & Non- tampers.
Working Principle Lessons: 2 Sessions: 3	Lesson-I Lining	Session-14: Principle of Single chord lining, 4 Point lining & left over error. Session-15: 3 point lining and left over error and concept of Design Lining.
	Lesson-II Leveling	Session-16: Double chord system, General left, ram in and out, selection of base line.

ATIONAL COURSE – PROMOTIONAL TECHNICIAN-III

Course No. CE 29

Module No. 29.5

SUB: P.WAY, ESTABLISHMENT & RAJBHASHA

Duration: 16 Sessions = 32 Periods

Sub-discipline	Lesson	Session wise Contents
Track Technology Lessons: 9 Sessions: 12	Lesson-I: Introduction to Railway Organization	Session-1: History of Railways, Zonal Railways, Divisions, TT Organization, CPOH.
	Lesson-II: Railway Track	Session-2: Constituents of Railway Track. Requirements of Good Railway Track, Classification of Routes. Different Gauges.
	Lesson-III: Rails	Session-3: Functions, Types & Standard Rail Section Standard length, Rolling marks & UTS.
	Lesson-IV: Sleepers	Session-4: Functions, Types & Sleeper Density, Requirements of PRC sleepers- their advantages and disadvantages.
	Lesson-V: Fastenings & Ballast	Session-5: Rail to Rail fastenings Rail to Sleeper fastenings Functions & Specifications
	Lesson-VI: Points & Crossings	Session-6: Functions & Important terminology Constituents of Turnout.
		Session-7: Switch Angle, Flange way clearance, Heel divergence, Throw of switch Types of Crossings, Crossing number & Main constituents of Built-up Crossing.
	Lesson-VII: Welding of Rails	Session-8: Evil effects of Rail joints, Different types of welding.
		Session-9: Development of Welded rails, Welding Terminology.
	Lesson-VIII: Engineering Restrictions & Indicators	Session-10: Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals.
Lesson-IX: Curves	Session-11: Necessity of curves: their types, TTP, CTP & Transition lengths, Radius, Degree, Versine & Field Measurement.	
	Session-12: Super-elevation: Cant deficiency, Cant excess, Cant gradient, Equilibrium cant.	
Establishment Lessons: 3 Sessions: 3	Lesson-X: Leave Rules	Session-13: Various types of Leaves, Eligibility etc.
	Lesson-XI: Pass Rules	Session-14: Various types of passes, Eligibility etc.
	Lesson-XII: D&A Rules	Session-15: Minor & Major Penalties
Rajbhasha Lessons: 1 Sessions: 1	Lesson-XIII: Rajbhasha	Session-16: Constitutional Provisions, Official Language Act 1963, Official Language Rules 1976. Policy Guidelines & Instructions.

COURSE MODULE

Course No. CE 30: Refresher Technician

Duration: 2 Weeks

Effective Days: 12

S. N.	CM No.	Subjects	Sessions	Periods
1	33.1	Electrical & Electronics: Session-1: Electrical Symbols, Electrical Components: Battery, Alternator, Self Starter, Relay. Session-2: Schematic Diagram of Engine & ZF Circuits and Troubleshooting. Session-3: Electronics Components & Transducers. Session-4: Power Supply PCBs. Session-5: Programmer Unit, Logic Plan & Multi-check. Session-6: Tamping Unit Control Circuit. Session-7: Lining Control Circuit & Leveling & Lifting Control Circuit.	7	14
2	33.2	Hydraulics, Pneumatics & Mechanical: Session-1: Hydraulic Components: Filter, Hoses & Fittings, Seal & O Ring, Pumps, Motors Cylinder, & Accumulators and Troubleshooting. Session-2: Pressue Control, Directional Control & Flow Control Valves and Troubleshooting. Session-3: Tamping Unit, Lifting & Lining Unit, Bushes & Bearings, Fast wearing mechanical parts and Troubleshooting. Session-4: Power Transmission: Types, Mechanical & ZF Hydro-dynamic Gear Box and other related Assemblies and Troubleshooting. Session-5: Pneumatic Components: Air Compressor, Cooling Coil, Safety valve, Air dryer Water separator, Air oiler, DC Valve, Cylinder and Troubleshooting. Session-6: Demonstration of Hydraulic & Pneumatic Models.	6	12
3	33.3	I.C. Engine: Session-1: Constructional Details of Engine. Session-2: Basic Terminology, Working Principle of 4 Stroke Diesel Engine (Diesel cycle), Firing orders. Session-3: Main Systems of I.C. Engine: Air Supply System & Fuel Supply System and Troubleshooting. Session-4: Main Systems of I.C. Engine: Lubricating System & Cooling System and Troubleshooting. Session-5: Maintenance Schedules of Cummins Engine, Adjustment of Injection timing & Removing of Air Lock	5	10
4	33.4	Track Machines & Working Principles: Session-1: Provisions of IRTMM, Basic features of Track Machines & Tamping Quality Control. Session-2: TM Reports and Machine Manufacture's/OEM's Literature and Operation & Main Assemblies of DGS. Session-3: Operation & Main Assemblies of 3X, CSM, Duomatic & Unimat, Troubleshooting. Session-4: Operation & Main Assemblies of BCM, SBCM &	7	14

		BRM, Troubleshooting		
		Session-5: Operation & Main Assemblies of PQRS, TRT & T-28, Troubleshooting. Session-6: Working Principles of Lining including Design Mode of working of Tamping Machines. Session-7: Working Principles of Leveling including Design Mode of working of Tamping Machines.		
5	33.5	P. Way, Establishment & Stores Session-1: Constituents of Railway Track, Points & Crossings, Curves. Session-2: Maintenance of Track in Track Circuited Areas & Electrified Areas & Precautions during Machine working in Electrified Areas. Session-3: Categories of Engineering Works, Engineering Fixed Signals/Indicators: Temporary and Permanent; Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals. Session-4: Leave, Pass, D&AR & Conduct Rules, Indenting procedure, Issue note.	4	8
6	33.6	Computer: Session-1: Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software. Session-2: Working in Geometry, Measuring Run & Design Mode.	2	4
7		Technical Film Show	2	4
8		Library	1	2
9		Visit to CPOH & Track Machines Working Site	4	8
		Examination & Valediction	1	2
		Total	39	78

- Note:**
1. Eligibility: Technician Gr. I/II/III.
 2. To bridge the gap between theory and practical, 1 visit to CPOH and 1 day visit to Track Machines Working Site shall be arranged for demonstration and proper understanding of machine working.
 3. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.

COURSE MODULE

Course No. CE 31: Refresher SSE/SE/JE

Duration: 2 Weeks

Effective Days: 12

S. N.	CM No.	Subjects	Sessions	Periods
1	31.1	Electrical & Electronics: Session-1: Electrical Components: Battery, Alternator, Self Starter, Relay; Engine & ZF Circuits and Troubleshooting. Session-2: Electronics Components: Transducers & OpAmp. Session-3: Power Supply PCBs. Session-4: Programmer Unit, Logic Plan & Multi-check. Session-5: Tamping Unit Control Circuit. Session-6: Lining Control Circuit. Session-7: Leveling & Lifting Control Circuit.	7	14
2	31.2	Hydraulics, Pneumatics & Mechanical: Session-1: Hydraulic Components: Pumps, Motors & Valves, and Troubleshooting. Session-2: Tamping Unit, Lifting & Lining Unit, Bushes & Bearings, Fast wearing mechanical parts and Troubleshooting. Session-3: Power Transmission: Types, Mechanical & ZF Hydro-dynamic Gear Box and other related Assemblies and Troubleshooting. Session-4: Hydraulic Circuits and their Demonstration using Models/FluidsimH Software and Work exercises. Session-5: Pneumatic Components & Circuits and their demonstration using Models/FluidsimP Software and Work exercises.	5	10
3	31.3	I.C. Engine: Session-1: Working Principle of 4 Stroke Diesel Engine (Diesel cycle), Deviations between Actual Working cycle and Theoretical cycle. Session-2: Main Systems of I.C. Engine: Air Supply System & Fuel Supply System and Troubleshooting. Session-3: Main Systems of I.C. Engine: Lubricating System & Cooling System and Troubleshooting. Session-4: Maintenance Steps to improve Performance & Maintenance Schedules of Cummins Engine. Session-5: Firing orders, VT diagram, Adjustment of Valve (Tappet) clearance & Injection timing.	5	10
4	31.4	Track Machines & Working Principles: Session-1: Provisions of IRTMM, Basic features of Track Machines & Tamping Quality Control. Session-2: TM Reports and Machine Manufacture's/OEM's Literature and Operation & Main Assemblies of DGS. Session-3: Operation & Main Assemblies of 3X, CSM, Duomatic & Unimat, Troubleshooting. Session-4: Operation & Main Assemblies of BCM, SBCM & BRM, Troubleshooting Session-5: Operation & Main Assemblies of PQRS, TRT &	7	14

		T-28, Troubleshooting. Session-6: Working Principles of Lining including Design Mode of working of Tamping Machines. Session-7: Working Principles of Leveling including Design Mode of working of Tamping Machines.		
5	31.5	P.Way, Establishment, Stores & Accounts Session-1: Constituents of Railway Track, Points & Crossings, Curves, IRPWM Provisions on Regular Track Maintenance. Session-2: IRPWM Provisions on Works incidental to Regular Track Maintenance, Maintenance of Track in Track Circuited Areas & Electrified Areas & Precautions during Machine working in Electrified Areas. Session-3: Categories of Engineering Works, Engineering Fixed Signals/Indicators: Temporary and Permanent; Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals. Session-4: HOER, Leave, Pass, D&AR & Conduct Rules. Session-5: Stock heads of Accounts, Disposal of released and surplus materials, Indenting procedure, Issue note and Write-off statement. Stock verification and Inventory Control Technique.	5	10
6	31.6	Computer: Session-1: Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software. Session-2: Working in Geometry, Measuring Run & Design Mode.	2	4
7		Technical Film Show	2	4
8		Library	1	2
9		Visit to CPOH & Track Machines Working Site	4	8
		Examination & Valediction	1	2
		Total	39	78

- Note:**
- 1. Eligibility: SSE/SE/JE.**
 - 2. To bridge the gap between theory and practical, 1 visit to CPOH and 1 day visit to Track Machines Working Site shall be arranged for demonstration and proper understanding of machine working.**
 - 3. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.**

COURSE MODULE

Course No. CE 33: Promotional SE

Duration: 2 Weeks

Effective Days: 12

S. N.	CM No.	Subjects Session wise Contents	Sessions	Periods
1	33.1	<p>Electrical & Electronics:</p> <p>Session-1:Electrical Components: Battery, Alternator, Self Starter, Relay; Engine & ZF Circuits and Troubleshooting.</p> <p>Session-2:Electronics Components: Transducers & OpAmp.</p> <p>Session-3:Power Supply PCBs.</p> <p>Session-4:Programmer Unit, Logic Plan & Multi-check.</p> <p>Session-5:Tamping Unit Control Circuit.</p> <p>Session-6:Lining Control Circuit.</p> <p>Session-7:Leveling & Lifting Control Circuit.</p>	7	14
2	33.2	<p>Hydraulics, Pneumatics & Mechanical:</p> <p>Session-1:Hydraulic Components: Pumps, Motors & Valves, and Troubleshooting.</p> <p>Session-2:Tamping Unit, Lifting & Lining Unit, Bushes & Bearings, Fast wearing mechanical parts and Troubleshooting.</p> <p>Session-3:Power Transmission: Types, Mechanical & ZF Hydro-dynamic Gear Box and other related Assemblies and Troubleshooting.</p> <p>Session-4:Hydraulic Circuits and their Demonstration using FluidsimH Software and Work exercises.</p> <p>Session-5:Pneumatic Components & Circuits and their demonstration using Models/FluidsimP Software and Work exercises.</p>	5	10
3	33.3	<p>I.C. Engine:</p> <p>Session-1:Working Principle of 4 Stroke Diesel Engine (Diesel cycle), Deviations between Actual Working cycle and Theoretical cycle.</p> <p>Session-2:Main Systems of I.C. Engine: Air Supply System & Fuel Supply System and Troubleshooting.</p> <p>Session-3:Main Systems of I.C. Engine: Lubricating System & Cooling System and Troubleshooting.</p> <p>Session-4:Maintenance Steps to improve Performance & Maintenance Schedules of Cummins Engine.</p> <p>Session-5:Firing orders, VT diagram, Adjustment of Valve (Tappet) clearance & Injection timing.</p>	5	10
4	33.4	<p>Track Machines & Working Principles:</p> <p>Session-1:Provisions of IRTMM including Infrastructure requirements & manpower planning for mechanized track maintenance, Tamping Quality Control and TM Reports.</p> <p>Session-2:Spares Management, Drawing & Specifications of Important Spares, Procurement & Inspection.</p> <p>Session-3:Operation & Main Assemblies of 3X, CSM, Duomatic & Unimat, Troubleshooting.</p> <p>Session-4:Operation & Main Assemblies of BCM, SBCM, BRM & DGS, Troubleshooting</p>	7	14

		<p>Session-5: Operation & Main Assemblies of PQRS, TRT & T-28, Troubleshooting.</p> <p>Session-6: Working Principles of Lining including Design Mode of working of Tamping Machines.</p> <p>Session-7: Working Principles of Leveling including Design Mode of working of Tamping Machines.</p>		
5	33.5	<p>P.Way, Establishment, Stores & Accounts</p> <p>Session-1: Constituents of Railway Track, Points & Crossings, Curves, IRPWM Provisions on Regular Track Maintenance.</p> <p>Session-2: IRPWM Provisions on Works incidental to Regular Track Maintenance, Maintenance of Track in Track Circuited Areas & Electrified Areas & Precautions during Machine working in Electrified Areas.</p> <p>Session-3: Categories of Engineering Works, Engineering Fixed Signals/Indicators: Temporary and Permanent; Emergency Protection of track: Single Line & Double Line, Detonators & Flare Signals.</p> <p>Session-4: HOER, Leave, Pass, D&AR & Conduct Rules.</p> <p>Session-5: Stock heads of Accounts, Disposal of released and surplus materials, Indenting procedure, Issue note and Write-off statement. Stock verification and Inventory Control Technique.</p>	5	10
6	33.6	<p>Computer:</p> <p>Session-1: Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software.</p> <p>Session-2: Working in Geometry, Measuring Run & Design Mode.</p>	2	4
7		Technical Film Show	2	4
8		Library	1	2
9		Visit to CPOH & Track Machines Working Site	4	8
		Examination & Valediction	1	2
		Total	39	78

- Note:**
1. Eligibility: Promoted SE from JE.
 2. To bridge the gap between theory and practical, 1 visit to CPOH and 1 day visit to Track Machines Working Site shall be arranged for demonstration and proper understanding of machine working.
 3. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.

COURSE MODULE

Course No. CE 34: Refresher Course for Track Machine JS/SS Officers .

Duration: 2 Week

Effective Days: 12

CM No.	Subjects Session wise Contents	Sessions	Periods
34.1	Electrical & Electronics: Session-1:Track Machine Electronics. Session-2:Electronics Components, Transducers & PCBs. Session-3:Power Supply PCBs, Programmer Unit, Logic Plan & Multi-check. (RKD) Session-4:Tamping Unit Control Circuit. (RKD) Session-5:Lining & Leveling Control Circuit. (RKD) Session-6:Demonstration of PLC in Model room(RKD)	6	12
34.2	Hydraulics, Pneumatics & Mechanical: Session-1:Basic Hydraulics & Components: Pumps, Motors, Valves, and Troubleshooting. Session-2:Demonstration of Transparent Models of Hydraulic Components in model room Session-3:Tamping Units. Session-4:Lifting & Lining Units, Session-5:Bushes & Bearings, Fast wearing mechanical parts and Troubleshooting. Session-6:Power Transmission: Types, Mechanical & ZF Hydro-dynamic Gear Box and other related Assemblies and Troubleshooting. Session-7:Hydraulic Circuits and their Demonstration using FluidsimH Software and Work exercises. Session-8:Pneumatic Components & Circuits and their demonstration using Models/FluidsimP Software and Work exercises.	8	16
34.3	I.C. Engine: Session-1:Engines used on Track machines. Working Principle of 4 Stroke Diesel Engine (Diesel cycle) . Session-2:Main Systems of I.C. Engine: Air Supply System & Fuel Supply System and Troubleshooting. Session-3:Main Systems of I.C. Engine: Lubricating System & Cooling System and Troubleshooting. Session-4:Firing orders, VT diagram, Adjustment of Valve (Tappet) clearance & Injection timing.Maintenance Steps & Maintenance Schedules of Engines. Session-5:Metallurgy and heat treatment by RDSO.	5	10
34.4	Track Machines & Working Principles: Session-1:Provisions of IRTMM including Infrastructure requirements & manpower planning for mechanized track maintenance, Session-2: Quality Control Session-3: RDSO TM Reports i.e.Maintenance Schedules, Checklist, Trouble shooting reports Session-4:Spares Management, Drawing & Specifications of Important Spares, Procurement & Inspection. Session-5:Operation & Main Assemblies of 3X, CSM, WST,Duomatic & Unomat, Troubleshooting.	11	22

	Operation & Main Assemblies of Unimat2S, Unimat3S Unimat4S, Troubleshooting. Session-7:Operation & Main Assemblies of BCM & SBCM, Troubleshooting Session-8:Operation & Main Assemblies of PQRS, TRT and Russian TRT Troubleshooting. Session-9:Operation & Main Assemblies of T-28,BRM & DGS, Troubleshooting Session-10:Working Principles of Lining including Design Mode of working of Tamping Machines. Session-11:Working Principles of Leveling including Design Mode of working of Tamping Machines.		
34.5	Computer: Session-1:Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software. Session-2:Working in Geometry, Measuring Run & Design Mode.	2	4
	Technical Film Show	2	4
	Library	2	4
	Visit to CPOH	2	4
	Examination & Valediction	1	2
	Total	39	78

- Note:**
1. 2 courses of 2 week duration every year for Track Machine JS/SS Officers with distribution of seat @ 1 per Railway Zone.
 2. To bridge the gap between theory and practical, 1 visit to CPOH shall be arranged .
 3. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.

COURSE MODULE

Course No. CE 35: Refresher for Track Machine JAG/SG Officers .

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
35.1	Electrical & Electronics: Session-1: Track Machine Electronics. Session-2: Electronics Components, Transducers, PCBs & Troubleshooting. Session-3: Demonstration of PLC in Model room	3	6
35.2	Hydraulics, Pneumatics & Mechanical: Session-1: Hydraulic components & system, Pneumatic components & system and Troubleshooting. Session-2: Demonstration of Transparent Models of Hydraulic Components in model room Session-3: Tamping Unit, Lifting & Lining Unit, Bushes & Bearings, Fast wearing mechanical parts & Troubleshooting. Session-4: Power Transmission: Types, Mechanical & ZF Hydrodynamic Gear Box and other related Assemblies and Troubleshooting. Session-5: Hydraulic Circuits and their Demonstration using FluidsimH Software and Work exercises.	5	10
35.3	I.C. Engine: Session-1: Main Systems of I.C. Engine & Troubleshooting.	1	2
35.4	Track Machines & Working Principles: Session-1: Provisions of IRTMM including Infrastructure requirements & manpower planning for mechanized track maintenance and TM Reports. Session-2: Spares Management, Drawing & Specifications of Important Spares, Procurement & Inspection. Session-3: Operation & Main Assemblies of 3X, CSM, Duomatic & Unimat, Troubleshooting. Session-4: Operation & Main Assemblies of BCM, SBCM, BRM & DGS, Troubleshooting Session-5: Operation & Main Assemblies of PQRS, TRT & T-28, Troubleshooting. Session-6: Working Principle of Lining including Design Mode of working of Tamping Machines. Session-7: Working Principle of Levelling including Design Mode of working of Tamping Machines.	7	14
35.5	Computer: Session-1: Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software. Working in Geometry & Measuring Run Mode.	1	2
	Technical Film Show	1/2	1
	Library	1/2	1
	Visit to CPOH	1	2
	Valediction	1/2	1
	Total	19 1/2	39

- Note:**
- 1 course of 1 week duration every year for Track Machine JAG/SG Officers with distribution of seat @ 1 per Railway Zone.
 - To bridge the gap between theory and practical, 1 visit to CPOH 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.

COURSE MODULE

Course No. CE 36: Special Course for SE/JE (P.Way)

Duration: 2 Weeks

Effective Days: 12

CM No.	Subjects Session wise Contents	Sessions	Periods
36.1	Electrical & Electronics: Session-1: Track Machine Electronics. Session-2: Electronics Components, Transducers & PCBs.	2	4
36.2	Hydraulics, Pneumatics & Mechanical: Session-1: Hydraulic components & system, Pneumatic components & system and Troubleshooting. Session-2: Tamping Unit, Lifting / Lining Unit, Bushes & Bearings. Session-3: Power Transmission: Types, Mechanical & ZF Hydrodynamic Gear Box and other related Assemblies and Troubleshooting.	3	6
36.3	I.C. Engine: Session-1: Working Principle, Construction & Main Systems. Session-2: Maintenance Schedule / Steps & Troubleshooting.	2	4
36.4	Track Machines & Working Principles: History of Mechanization, IRTMM Provisions & TM Reports: Session-1: History of Mechanization, Introduction to Track Machines on IR, their Functions and Output. Session-2: IRTMM Ch. 1 & 2: Track Machine Organisation & Duties of Staff and Salient features of Track Machines. Session-3: Ch. 3 & Ch. 7: Works Required before, during & after deployment of Machines & Duties of P.Way Staff. Session-4: Ch 4 & 5: Rules for Movement & Working of Track Machines and Planning, Operation & Monitoring of Track Machines, Unit cost and RDSO TM Reports. Tamping Machines: Session-1: Working Principles including Design Mode of working of Tamping Machines. Session-2: 08-Unomatic/Duomatic - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-3: WST - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-4: 08-275 Unimat 2S & 3S - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-5: 09-32 CSM - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-6: 09-3X Tamping Express - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-7: Multi-purpose Tamper - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles.	4	8
		7	14

	<p>Track Stabilizer: Session-1:DTS/DGS - Main features, Technical Data, Main assemblies & components, Power Transmission.</p>	1	2
	<p>Ballast Handling Machines: Session-1:BCM RM-76 - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precaution during work. Session-2:BCM RM-80/80U & KBC-600 - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precautions. Session-3:FRM-80 - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precautions. Session-4:FRM-85 & KSC-600 - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precaution during work. Session-5:BRM - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precaution during work.</p>	5	10
	<p>Track Laying Machines: Session-1:PQRS - Main features, main units & their functions, Yard Activities, Panels Fabrication, Rake Formation, Base Depot Amenities, Working Principle, Auxilliary Track and Mode of Working. Session-2:TRT - Main features, main units & their functions, Yard Activities, Modified BRHs, Rake Formation, Working Principle & SRs after relaying. Session-3:T-28 - Main features, main units & their functions, Power Transmission & Working Principle. Session-4:Sleeper Exchanger & Crane - Main features, main units & their functions, Power Transmission.</p>	4	8
	<p>Special Purpose Machines: Session-1:UTV, MFBWP, RGM, VM170.</p>	1	2
36.5	<p>Computer: Session-1:Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software. Session-2:Working in Geometry, Measuring Run & Design Mode.</p>	2	4
	Technical Film Show	2	4
	Library	1	2
	Visit to CPOH & Track Machines Working Sites	5	10
	Total	39	78

- Note:**
- 1. Eligibility: Directly Recruited SE/JE-II (P.Way).**
 - 2. Computer, Technical Film Show and Library periods shall be scheduled during the afternoon session.**
 - 3. To bridge the gap between theory and practical, 1 visit to CPOH and 1 day visit to Track Machines Working Site shall be arranged for demonstration and proper understanding of machine working.**
 - 4. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.**

COURSE MODULE

Course No. CE 37: Track M/c Interaction Course for P.Way & Machine Staff

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
37.1	Electrical & Electronics: Session-1: Track Machine Electronics. Session-2: Electronics Components, Transducers & PCBs.	2	4
37.2	Hydraulics, Pneumatics & Mechanical: Session-1: Hydraulic/Pneumatic components & systems, Tamping/Lifting/Lining Units, Bushes & Bearings. Session-2: Power Transmission: Types, Mechanical & ZF Hydro-dynamic Gear Box and other related Assemblies.	2	4
37.3	I.C. Engine: Session-1: Working Principle, Construction & Main Systems, Maintenance Schedule / Steps & Troubleshooting.	1	2
37.4	Track Machines & Working Principles: Session-1: History of Mechanization, Introduction to Track Machines on IR, their Functions and Output. Session-2: Provisions of IRTMM & TM Reports. Session-3: Working Principles including Design Mode of working. Session-4: 08-Unomatic/Duomatic/WST/MPT - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-5: 08-275 Unimat 2S & 3S - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-6: 09-32 CSM & 09-3X Tamping Express - Main features, Technical Data, Main assemblies & components, Power Transmission and Working Principles. Session-7: BCM RM-76/80/80U & KBC-600 - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precautions. Session-8: FRM-80/85& KSC-600 - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precautions during work. Session-9: DTS/DGS & BRM - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precaution during work. Session-10: PQRS - Main features, main units & their functions, Yard Activities, Panels Fabrication, Rake Formation, Working Principle, Auxiliary Track & Mode of Working. Session-11: TRT - Main features, main units & their functions, Yard Activities, Modified BRHs, Rake Formation & SRs. Session-12: T-28 & Sleeper Exchanger - Main features, main units, their functions, Power Transmission & Working Principle	12	24
37.5	Computer: Session-1: Introduction to ALC Hardware & WinALC Software.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	39

Note: Eligibility: P.Way & Machine Supervisors.

COURSE MODULE

Course No. CE 38: Special Course on 09 CSM & Tamping Express (3X)

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
38.1	<p>Electrical & Electronics: Session-1:Engine circuit, Z.F. Circuit and Troubleshooting. Session-2:Power Supply PCBs EK813SV, EK816SV, EK851SV, Calibration & Troubleshooting. Session-3:Tamping Unit Control Circuit, Depth selector, Transducers, PCBs, Calibration, Testing & Troubleshooting. Session-4:Lining Control Circuit, Input Potentiometer, PCBs, Calibration & Troubleshooting. Session-5:Leveling & Lifting Control Circuit, Transducers, Input Potentiometers, Calibration & Troubleshooting. Session-6:Satellite Control Circuit, Work Drive Control Circuit, Transducer, Encoder, PCBs, Calibration and Troubleshooting. Session-7:Programmer Unit, Logic Plan, Multicheck system.</p>	7	14
38.2	<p>Hydraulics, Pneumatics & Mechanical: Session-1:Vane pump, Axial Piston pump, Relief valve, Unloader valve & Troubleshooting. Session-2:Spring Centred valve, Spring Offset valve, Check valve, POC Valve, Proportional valve, Servo valve & Troubleshooting. Session-3:Hydraulic Circuits: Constant pressure circuit, Close loop circuit & Regenerating circuit. Session-4:Air compressor, Safety valve, Water separator, Air Oiler, Air dryer, Working circuit, Brake circuit Session-5:ZF & other Gear Boxes / related Assemblies - Maintenance aspects & Troubleshooting.</p>	5	10
38.3	<p>I.C. Engine: Session-1:Construction, Working Principle & Main Systems. Session-2:Maintenance Schedule / Steps & Troubleshooting.</p>	2	4
38.4	<p>Track Machines & Working Principles: Session-1:Operation & Main Assemblies of CSM & 3X. Session-2:Working Principles including Design Mode.</p>	2	4
38.5	<p>P.Way Session-1:Curves: Radius, Degree, Versine, Super elevation, Cant deficiency/excess/gradient, Transition length; Ballast: Properties & Cushion; Sleeper Density.</p>	1	2
38.6	<p>Computer: Session-1:Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software. Session-2:Working in Geometry, Measuring Run & Design Mode.</p>	2	4
	Technical Film Show	1/2	1
	Total	19 1/2	39

Note: 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.

COURSE MODULE

Course No. CE 39: Special Course on Unimat 2S/3S/4S & MPT

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
39.1	Electrical & Electronics: Session-1: Engine circuit, Z.F. Circuit and Troubleshooting. Session-2: Power Supply PCBs EK813 & EK812, Calibration & Troubleshooting. Session-3: Tamping Unit Control Circuit, Depth selector, Transducers, PCBs EK132V, EK176V, Calibration, Testing & Troubleshooting. Session-4: Front Input PCB & Front Input Potentiometers. Session-5: Lining Control Circuit, PCBs, Calibration & Troubleshooting. Session-6: Leveling & Lifting Control Circuit, Transducers, Calibration & Troubleshooting. Session-7: Programmer Unit, Logic Plan, Multicheck System.	7	14
39.2	Hydraulics, Pneumatics & Mechanical: Session-1: Vane pump, Axial Piston pump, Relief valve, Unloader valve & Troubleshooting. Session-2: Spring Centred valve, Spring Offset valve, Check valve, POC Valve, Logic Valve, Proportional valve, Servo valve & Troubleshooting. Session-3: Hydraulic Circuits: Constant pressure circuit & Regenerating circuit. Session-4: Air compressor, Safety valve, Water separator, Air Oiler, Air dryer, Working circuit, Brake circuit Session-5: Z.F. & other Gear Boxes / related Assemblies - Maintenance aspects & Troubleshooting.	5	10
39.3	I.C. Engine: Session-1: Construction, Working Principle & Main Systems. Session-2: Maintenance Schedule / Steps & Troubleshooting.	2	4
39.4	Track Machines & Working Principles: Session-1: Operation & Main Assemblies of Unimat & MPT. Session-2: Working Principles.	2	4
39.5	P.Way Session-1: Construction of Turnout, Standard Turnouts, Types of Switches and Crossings, Switch angle, Flange way clearance, Heel Diversions, Throw of switch, Main constituents of Built-up Crossing, Standard Dimensions.	1	2
39.6	Computer: Session-1: Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	39

- Note:**
- 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.**
 - 2. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.**

COURSE MODULE

Course No. CE 40: Special Course on Unomatic, Duomatic & WST

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
40.1	Electrical & Electronics: Session-1: Engine circuit, Z.F. Circuit and Troubleshooting. Session-2: Power Supply PCBs EK813SV & EK812SV, EK805S, Calibration & Troubleshooting. Session-3: Tamping Unit Control Circuit, Depth selector, Transducers, PCBs EK16V & EK176V, Calibration, Testing & Troubleshooting. Session-4: Front Input, PCBs & Front Input potentiometers Session-5: Lining Control Circuit, Input Potentiometer, PCBs, Calibration & Troubleshooting. Session-6: Leveling & Lifting Control Circuit, Transducers, Input Potentiometers, Calibration & Troubleshooting. Session-7: Programmer Unit, Logic Plan, Multicheck system.	7	14
40.2	Hydraulics, Pneumatics & Mechanical: Session-1: Vane pump, Relief valve, Unloader valve & Troubleshooting. Session-2: Spring Centred valve, Spring Offset valve, Check valve, POC Valve, Proportional valve, Servo valve & Troubleshooting. Session-3: Hydraulic Circuits: Constant pressure circuit & Regenerating circuit. Session-4: Air compressor, Safety valve, Water separator, Air Oiler, Air dryer, Working circuit, Brake circuit Session-5: Gear Boxes & related Assemblies - Maintenance aspects & Troubleshooting.	5	10
40.3	I.C. Engine: Session-1: Construction, Working Principle & Main Systems. Session-2: Maintenance Schedule / Steps & Troubleshooting.	2	4
40.4	Track Machines & Working Principles: Session-1: Operation & Main Assemblies of UNO/DUO & WST. Session-2: Working Principles including Design Mode.	2	4
40.5	P.Way Session-1: Curves: Radius, Degree, Versine, Super elevation, Cant deficiency/excess/gradient, Transition length; Ballast: Properties & Cushion; Sleeper Density.	1	2
40.6	Computer: Session-1: Basics of Computer, Windows XP, MS Word & Excell, Internet, e-mail & demonstration for making e-mail ID. Session-2: Introduction to ALC Hardware & WinALC Software, Working in Geometry, Measuring Run & Design Mode.	2	4
	Technical Film Show	1/2	1
	Total	19 1/2	39

- Note:**
- 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.**
 - 2. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.**

COURSE MODULE

Course No. CE 41: Special Course on BCM & SBCM			
Duration: 1 Week		Effective Days: 06	
CM No.	Subjects Session wise Contents	Sessions	Periods
41.1	Electrical & Electronics: Session-1:Engine circuit of BCM, SBCM & Troubleshooting. Session-2:PCBs of BCM & SBCM & Lifting Circuit of BCM. Session-3:Driving/Lighting/Intercom Circuits of BCM & SBCM.	3	6
41.2	Hydraulics, Pneumatics & Mechanical: Session-1:Pump layout, Axial piston pump, Pressure relief valve, Direction control valves & Troubleshooting. Session-2:Hydraulic Circuits of BCM - Traction Drive, Conveyor Drive, Vibration Screen, Lubrication, Chain Drive. Session-3:Hydraulic Circuits of SBCM- Traction Drive, Conveyor Drive, Vibration Screen, Lubrication, Chain Drive. Session-4:Pneumatic Circuits of BCM & SBCM - Working circuit, Brake circuit & Troubleshooting. Session-5:Power transmission of BCM & SBCM.	5	10
41.3	I.C. Engine: Session-1:Technical details of BCM & SBCM Engines, Constructional features, Injector/Cross head/Valve adjustment, Lubricating oil flow diagram. Session-2:Coolant flow diagram, Air flow diagram, Fuel flow diagram, Removal of Air lock & Troubleshooting.	2	4
41.4	Track Machines & Working Principles: Session-1:BCM - Main features, Excavating Unit, Screening unit, Conveyor units, Axle Clutches, Cutting chain materials, Wear plates, Conveyor Belt Drive, Dredger Drum. Session-2:BCM - Working Principle, Splicing & spot repair of conveyors, Good maintenance practices to increase life of Conveyors & Cutting chain, Precautions during work. Session-3:SBCM - Main features & Main Units viz Excavating Unit, Screening unit, Conveyor units, Axle Clutches Cutting chain materials, Wear plates, Conveyor Belt Drive station, Dredger station etc. Session-4:SBCM - Working Principle & Precautions during work. Session-5:Quality Control – to avoid cutting of formation & shifting of curve, to ensure uniform L.L., Pre-requisite, Pre, During & Post Block operations. Session-6:RDSO Maintenance schedules, Inspection check lists & Troubleshooting Guide on BCM & SBCM.	8	16
41.5	P.Way Session-1:Ballast profiles in embankment & Cutting, Deep Screening, Shallow Screening, Lifting, Slewing Precautions during working in Electrified area, Protection of track during working & emergencies.	1	2
41.6	Computer: Session-1:Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	39

Note: Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.

COURSE MODULE

Course No. CE 42: Special Course on Track Relaying M/c- PQRS, TRT, T-28

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
42.1	Electrical & Electronics: Session-1:Engine circuit of PQRS, TRT & T-28.	1	2
42.2	Hydraulics Session-1:Hydraulic System of PQRS & Troubleshooting. Session-2:Hydraulic System of TRT & Troubleshooting. Session-3:Hydraulic system of T-28 & Troubleshooting.	3	6
42.3	I.C. Engine: Session-1:Working Principle, main features and troubleshooting of PQRS Engine - HA694 and TRT Engine NTA-855. Session-2:Working Principle, main features and troubleshooting of Engines of T-28 - SUN 6105I & DIN 6271.	2	4
42.4	Track Machines & Working Principles: Session-1:PQRS - Main features, main units & their functions, General Data, Auxilliary Track. Session-2:PQRS - Yard Activities, Panels Fabrication, Rake Formation, Base Depot Amenities. Session-3:PQRS - Pre-requisites, Pre-relaying operations, Different methods of laying, Post-relaying operations. Session-4:TRT - Main features, main units viz. Beam Car, Handling Car, Power Car & their functions. Session-5:TRT - Operations prior to Deployment of Machine, Base Depot Activities, Modified BFRs, Rake Formation Session-6:TRT - Technical data, Manual operations during Block, Post Block operations, Precautions during work, Speed Restrictions after relaying with or without DTS. Session-7:T-28 - Main features, main units viz. Portal Crane, Trolleys, Jib Crane etc. & their functions. Session-8:T-28 - General data, Power Transmission. Session-9:T-28 - Pre-Block operations, Operations during Block Pre-Block operations & Miscellaneous guidelines. Session-10:RDSO Maintenance schedules, Inspection check lists & Troubleshooting Guide on PQRS, TRT & T-28.	10	20
42.5	P.Way Session-1:Classification of Track Renewals & Governing Factors, Theory of welded rails, Thermal forces in LWR, De-stressing, Standard Dimensions, Protection of track during working & emergencies.	1	2
42.6	Computer: Session-1:Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	39

- Note:**
1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.
 2. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.

COURSE MODULE

Course No. CE 43: Special Course on DGS, BRM & UTV
Duration: 1 Week **Effective Days: 06**

CM No.	Subjects Session wise Contents	Sessions	Periods
43.1	Electrical & Electronics: Session-1: Engine circuit of DGS & Troubleshooting. Session-2: ZF Gear Box Electronic Circuit & Troubleshooting. Session-3: PCBs EK2081, 2032, 2083 of DGS, Adjustments, Fault finding & Troubleshooting. Session-4: Engine circuit of BRM, UTV & Troubleshooting.	4	8
43.2	Hydraulics: Session-1: Working & Construction of Vane pump, Axial piston pump & Troubleshooting. Session-2: Working & Construction of Relief Valve, D.C. Valves - Spring Centred valve, Spring Offset valve & Troubleshooting. Session-3: Study of Hydraulic Circuit of DGS. Session-4: Study of Hydraulic Circuit of BRM & UTV.	4	8
43.3	I.C.Engine: Session-1: Construction, Working Principle, Main Systems & Troubleshooting. Session-2: Maintenance Schedule / Steps & Troubleshooting. Session-3: Injector, Crosshead and Valve adjustment, Lubricating oil flow diagram.	3	6
43.4	Working of DGS, BRM & UTV: Session-1: DGS - Main features, main units and their function, Technical data, Session-2: DGS – Working, Adjustment of Frequency and Preload, Power transmission, Precautions during work, Working Limitations. Session-3: BRM - Main features, main units viz. Wings, Centre Plough, Broom and their function, Power Transmission, Technical data, Precautions during work. Session-4: UTV - Main features, main units and their function, Technical data, Precautions during work.	4	8
43.5	P.Way Session-1: Formation, Theory of LWR/CWR, Provisions regarding consolidation of track as contained in LWR Manual. Session-2: Ballast profile on Straight & Curve, Different Schedules, Standard dimensions, Precautions in Electrified area.	2	4
43.6	Computer: Session-1: Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

- Note:**
- 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.**
 - 2. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.**

COURSE MODULE

Course No. CE 44: Special Course on Hydraulic Circuits

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
44.1	Hydraulics: Session-1: Introduction and Hydraulic Symbols. Session-2: Types of Hydraulic pumps, Working of Gear pump, Vane pump, Axial Piston pump. Session-3: Types of Pressure Control Valves such as Relief Valve, Unloader Valve, Reducer Valve etc. Session-4: Types of Directional Control valve, Flow Control Valves - Meter in, meter out Circuit etc. Session-5: Working Principles of Proportional valve, Servo valve and their troubleshooting. Session-6: Hydraulic circuits of 08 DUO & UNO. Session-7: Hydraulic circuits of 09-CSM & 09-3X. Session-8 Hydraulic circuits of 08-Unimat 2S & 3S. Session-9: Driving circuit, Cutting Chain Circuit, Belt drive Circuit, System circuit of RM-80. Session-10: Driving circuit, Clutch circuit, Belt drive circuit, System circuit of FRM-80 & FRM-85. Session-11: Hydraulic circuit of DGS. Session-12: Hydraulic circuit of BRM. Session-13: Hydraulic circuit of PQRS. Session-14: Hydraulic circuit of TRT. Session-15: Hydraulic circuit of T-28. Session-16: Demonstration of hydraulic circuits using Fluidsim software & Work exercises. Session-17: Failure analysis & Troubleshooting of Hydraulic circuits.	17	34
44.2	Computer: Session-1: Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

- Note:**
1. Eligibility: SSE/SE/JE/Technicians with Diploma/ITI.
 2. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.

COURSE MODULE

Course No. CE 45: Special Course on Maintenance Schedule of Track M/c
Duration: 1 Week **Effective Days: 06**

CM No.	Subjects Session wise Contents	Sessions	Periods
45.1	Electrical & Electronics: Session-1:Engine Circuit, Z.F. Circuit & Troubleshooting. Session-2:Electronic Circuit & Troubleshooting..	2	4
45.2	Hydraulics & Mechanical: Session-1:Maintenance of Hydraulic Assemblies & troubleshooting. Session-2:Maintenance of Gear Boxes & important Mechanical Assemblies & troubleshooting.	2	4
45.3	I.C.Engine: Session-1:Maintenance Schedule / Steps & Troubleshooting. Session-2:Injector, Crosshead and Valve adjustment, Lubricating oil flow diagram.	2	4
45.4	Maintenance Schedule of Track Machines: Session-1:Different methods of maintenance, Importance of Preventive maintenance vis-à-vis Failure (Breakdown) Maintenance, OEM & RDSO TM Reports. Session-2:UNO & DUO-Maintenance schedule & troubleshooting Session-3:WST - Maintenance schedule & troubleshooting. Session-4:09-CSM & 09-3X - Maintenance schedule & troubleshooting. Session-5:Unimat 2S & 3S - Maintenance schedule & troubleshooting. Session-6:MP & UTV-Maintenance schedule & troubleshooting. Session-7:BCM - Maintenance schedule & troubleshooting. Session-8:FRM-80 & FRM-85 - Maintenance schedule & troubleshooting. Session-9:BRM & DGS - Maintenance schedule & troubleshooting. Session-10:TRT - Maintenance schedule & troubleshooting. Session-11:PQRS & T-28 - Maintenance schedule & troubleshooting.	11	22
45.5	Computer: Session-1:Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

- Note:**
- 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.**
 - 2. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.**

COURSE MODULE

Course No. CE 46: Special Course on Overhauling of Tamping Unit

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
46.1	Electronics: Session-1: Tamping UP/DN Circuit of UNO, DUO, MP & Unimat. Session-2: Tamping UP/DN Circuit of WST, 09-CSM & 09-3X.	2	4
46.2	Hydraulics: Session-1: Tamping Circuit of UNO, DUO, MP & Unimat. Session-2: Tamping Circuit WST, 09-CSM & 09-3X.	2	4
46.3	Overhauling of Tamping Unit: Session-1: Assembly of Tamping Bank (Gear Case) - Cleaning of dent/burrs and holes, Size of Gear case bore, Fixing of Bearing NU2220 & 6220, Fixing of Oil seal, Tightening torque for bearing housing, Radial clearance of vibration shaft after fixing, Test run of vibration shaft, Mating of vibration shaft and plate guard centre & their tolerance. Session-2: Assembly of Tamping Arm (Pick Arm) - Size, tolerance & material composition of Top pin, Centre pin, Tool bore, Steel bushes, Squareness of bores. Session-3: Assembly of Squeezing Cylinder - I.D. of Squeezing cylinder, Assembly of Piston, Piston rod, Gland bush, Dia of Piston, Piston rod & their material composition, Tightening torque for cover plate bolts, Bearing bore & fitment of Bearings on squeezing cylinders. Session-4: Assembly of Vibration Shaft - Size of different steps & Bearings, Bearing clearance Installation of Inner races, Provision of spacers & distance pieces, Mounting of squeezing cylinder, fly wheels & vibration motor. Session-5: Tightening torques of nuts & bolts, Dimensions and tolerances of different spares used, Material composition of different spares viz Vibration shaft, Tamping Arm, Flywheel, Seal etc, Test run Parameters. Session-6: Precautions during Overhauling & working of Tamping Unit and troubleshooting. Session-7: Maintenance Schedule, checks & maintenance steps. Session-8: Tamping Unit of 09-3X - Special features, parts, Counter weight, Precautions during Overhauling. Session-9: Tamping Unit of Unimat & Russian tamper VPR16 - Special features, parts, Precautions during Overhauling. Session-10: Spares Management, Drawings, Specifications, Procurement, Inspection & Quality Control. Session-11, 12 & 13: Visit to CPOH in the afternoon session every alternate day for demo & hands-on training.	13	26
46.4	Computer: Session-1: Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

Note: 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.

COURSE MODULE

Course No. CE 47: Special Course on I. C. Engine

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
47.1	I. C. Engine: Session-1: Working principle of 4 Stroke Diesel Engine. Session-2: Deviations between actual working cycle and theoretical cycle. Session-3: Firing order, V.T. diagram, power flow in multi-cylinder engines. Session-4: Air supply system, Combustion of fuel, Air cleaners, Turbo charger, after cooler. Session-5: Fuel supply system. Session-6: Cooling system, Thermostat, Antifreeze, Pressure, Capacity. Session-7: Lubrication system, function, Filtrations. Session-8: Adjustment of Valve clearance. Session-9: Adjustment of Injection timing, Removing Air lock, testing of Injectors. Session-10: Crankshaft inspection, Tightening torque clearance of working parts. Session-11: Maintenance steps. Session-12: Maintenance schedule of Cummins Engine. Session-13: Maintenance schedule of Duetz Engine Session-14: Maintenance schedule of MWM Engine Session-15: Troubleshooting. Session-16: Battery, Alternator & Self starter. Session-17: Engine Safety Circuit - Description, Function, Types & Troubleshooting.	17	34
47.2	Computer: Session-1: Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

- Note:**
- 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.**
 - 2. Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required.**

COURSE MODULE

Course No. CE 48: Special Course on Overhauling of Gear Box

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
48.1	<p>Overhauling of Gear Box:</p> <p>Session-1:Introduction - Necessity of Gear Box, Gear ratio, Constituents of a Gear, Types of Gear Boxes.</p> <p>Session-2:Assembly & Disassembly of Main Gear Box - Assembly of main shaft, intermediate shaft, clutch shaft, drive shaft, bevel gears, engager body, Lubrication.</p> <p>Session-3:Assembly of Drive clutch & Directional Gear Box - Changeover mechanism, Actuation system, Lubrication.</p> <p>Session-4:Assembly of 6-speed Gear Box - Main shaft, lay shaft, Gears in constant mesh, Shifter fork & shifter rod assembly, Lubrication, Maintenance.</p> <p>Session-5:Distributor Gear Box - Working, parts, Lubrication.</p> <p>Session-6:Axle Gear Box - Working, Assembly of Housing, Assembly of Tail pinion, Bearings, Oil seal, Matching of crown gear & tail pinion, Axle bearing in bearing body, Lubrication, Maintenance.</p> <p>Session-7:Satellite Axle Gear Box - Working, Assembly of Spur gear on axle shaft, pinion, reduction gear box, mounting of motor, braking, Lubrication, Maintenance.</p> <p>Session-8:Z.F. Gear Box - Principle of Torque converter working, Converter clutch, Multi disc clutches, Planetary gear system, Shifter assembly, Solenoids, Different Clutch pressures, Lubrication pressure.</p> <p>Session-9:Z.F. Gear Box - Maintenance Schedule, Working in forward & reverse drive, Hydraulic circuit.</p> <p>Session-10:Z.F. Gear Box - Electric circuit.</p> <p>Session-11:Z.F.Gear Box-Operating instructions, Troubleshooting</p> <p>Session-12:Funk Gear Box - Working, Parts, Engage feature, Lubrication, Maintenance.</p> <p>Session-13:Reduction Gear Box - Working, Gear ratio, Parts, Mounting of Motor, Lubrication, Maintenance.</p> <p>Session-14:BCM Gear Boxes - Working & Assembly of Turret Gear Box, Main gear box, Screen drum, Lubrication, Maintenance.</p> <p>Session-15:BCM Axle Gear Box / Clutch - Operation during driving & working, Checking of Clutch pressure, Clutch filter , Mounting of Motor, Lubrication, Maintenance.</p> <p>Session-16 & 17:Visit to CPOH for demonstration & hands-on training of Z.F. & other Gear boxes Gear box.</p>	17	34
48.2	<p>Computer:</p> <p>Session-1:Basics of Computer, Windows XP, MS Word & Excell.</p>	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

Note: 1. Eligibility: SSE/SE/JE and Technicians preferably with Diploma/ITI or at least having working knowledge of English/Hindi.

COURSE MODULE			
Course No. CE 49: Special Course on Introduction to Track Machines			
Duration: 1 Week		Effective Days: 06	
CM No.	Subjects Session wise Contents	Sessions	Periods
49.1	Electrical & Electronics: Session-1:Track Machine Electronics, Electronic Components, Transducers & PCBs.	1	2
49.2	Hydraulics, Pneumatics & Mechanical: Session-1:Hydraulic / Pneumatic components & system, Tamping Unit, Lifting / Lining Unit, Bushes & Bearings. Session-2:Power Transmission: Types, Mechanical & ZF Hydro-dynamic Gear Box and other related Assemblies.	2	4
49.3	I.C. Engine: Session-1:Working Principle, Construction, & Main Systems.	1	2
49.4	Track Machines & Working Principles: Session-1:History of Mechanization, Introduction to Track Machines on IR, their Functions and Output. Important Provisions of IRTMM. Session-2 & 3:Working Principles including Design Mode of working of Tamping Machines Session-4:08-UNO, DUO & WST - Main features, Main assemblies, Power Transmission & Working Principles. Session-5:08-275 Unimat 2S & 3S - Main features, Main assemblies, Power Transmission & Working Principles. Session-6:09-32 CSM - Main features, Main assemblies, Power Transmission & Working Principles. Session-7:09-3X Tamping Express - Main features, Main assemblies, Power Transmission & Working Principles. Session-8:MPT & UTV - Main features, Main assemblies, Power Transmission & Working Principles. Session-9:DTS & BRM - Main features, Main assemblies, Power Transmission & Working Principles. Session-10:BCM - Main features, Main assemblies, Power Transmission & Working Principles & Precaution.. Session-11:SBCM - Main features, main units & their functions, Technical Data, Power Transmission, Working Principle & Precautions. Session-12:PQRS - Main features, main units & their functions, Yard Activities, Panels Fabrication, Rake Formation, Base Depot Amenities, Working Principle, Auxilliary Track and Mode of Working. Session-13:TRT & T-28 - Main features, main units & their functions, Yard Activities, Modified BRHs, Rake Formation, Working Principle & SRs after relaying.	2	4
49.5	Computer: Session-1:Basics of Computer, Windows XP, MS Word & Excell.	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

Note: 1. Eligibility: SSE/SE/JE (P.Way).

COURSE MODULE

Course No. CE 50: Special Course on Electronics

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
50.1	<p>Electronics:</p> <p>Session-1:Fundamentals of Electronics, Active & Passive components, Resistor, Capacitor, Inductor; Semiconductors – Properties, Covalent Bonds, Energy Bands, Types, i.e. Intrinsic, extrinsic, P-Type, N-Type.</p> <p>Session-2:Diodes – Types, Construction, Working Symbol and Application of Zenor Diode, LED, Photo Diode, Optocoupler; Transistors - Construction, Description of Terminals, NPN & PNP-Transistor.</p> <p>Session-3:Operational Amplifier - Definition, Symbol, Function of terminals, Open loop, Close loop, +ve feed back, -ve feed back, Characteristics, Application as Buffer, Inverter, Non Inverter, Adder, Subtractor, Integrator etc.</p> <p>Session-4:Operational Amplifier ICs and their Pin diagrams.</p> <p>Session-5:Transducers - Definition, Principle, Classification, Types, Tamping Depth Transducer, Lining Transducer, Measuring Transducer, Function and Calibration.</p> <p>Session-6:Pendulum, Height Transducer, Hook Transducer, Satellite Transducer, Encoder, Function and Calibration.</p> <p>Session-7:Relay - Definition, Types, Pin diagrams & Testing.</p> <p>Session-8:Engine Circuit - Description, Function, Types & Troubleshooting; Z.F.Circuit - Description, Working, Safety Components, Sensors, Faults & Troubleshooting.</p> <p>Session-9:Power supply PCB EK813SV, EK816SV, EK851SV - Calibration, Testing & Troubleshooting.</p> <p>Session-10:Functional Description of Tamping Unit Control Circuit, Function and Calibration of Depth Selector.</p> <p>Session-11:Tamping Unit control PCB EK16V, EK132V, EK176V, EK1AP7 - Calibration, Testing and Troubleshooting.</p> <p>Session-12:Functional Description of Front Input Circuit, Front Input Potentiometer, Slew, Versine, General Lift etc.</p> <p>Session-13:Principle of Lining and Functional Description of Lining Control Circuit, Calibration of Servo Valve.</p> <p>Session-14:Lining PCB EK349LV, EK335LV, EK2038, EK2173, Overslew PCB EK290LV, Calibration & Troubleshooting</p> <p>Session-15:Principle of Leveling and Functional Description of Leveling & Lifting Control Circuit.</p> <p>Session-16:Leveling & Lifting PCB EK347LV, EK346LV, EK2041LV, EK2042LV, Calibration & Troubleshooting</p> <p>Session-17:Programmer Unit, Logic Plan and Multicheck PCBs.</p>	17	34
50.2	<p>Computer:</p> <p>Session-1:Basics of Computer, Windows XP, MS Word & Excell.</p>	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Total	19 1/2	35

Note: 1. Eligibility: SSE/SE/JE/Technicians with Diploma/ITI.

COURSE MODULE

Course No. CE 52: Special Course for IRSE (P) & Gr. B Officers

Duration: 1 Week

Effective Days: 06

CM No.	Subjects Session wise Contents	Sessions	Periods
52.1	Electrical & Electronics: Session-1:Track Machine Electronics. Session-2:Electronics Components, Transducers & PCBs.	2	4
52.2	Hydraulics, Pneumatics & Mechanical: Session-1:Hydraulic components & system, Pneumatic components & system and Troubleshooting. Session-2:Tamping Unit, Lifting & Lining Unit, Bushes & Bearings. Session-3:Power Transmission: Types, Mechanical & ZF Hydrodynamic Gear Box and other related Assemblies and Troubleshooting.	3	6
52.3	I.C. Engine: Session-1:Main Systems of I.C. Engine & Troubleshooting.	1	2
52.4	Track Machines & Working Principles: Session-1:Provisions of IRTMM, Basic features of Track Machines & Tamping Quality Control. Session-2:TM Reports and Machine Manufacture's/OEM's Literature and Operation & Main Assemblies of DGS. Session-3:Operation & Main Assemblies of 3X, CSM, Duomatic & Unimat. Session-4:Operation & Main Assemblies of BCM, SBCM & BRM. Session-5:Operation & Main Assemblies of PQRS, TRT & T-28. Session-6:Working Principles including Design Mode of working of Tamping Machines	6	12
52.5	Computer: Session-1:Introduction to Automatic Guide Computer (ALC) Hardware & WinALC Software	1	2
	Technical Film Show	1	2
	Library	1/2	1
	Visit to CPOH & Track Machines Working Sites	4 1/2	9
	Examination & Valediction	1/2	1
	Total	19 1/2	39

- Note:**
1. **Eligibility: IRSE (P) and Gr. B Officers of Integrated Course of IRICEN, Pune.**
 2. **To bridge the gap between theory and practical, 1 visit to CPOH and 1 day visit to Track Machines Working Site shall be arranged for demonstration and proper understanding of machine working.**
 3. **Practical demonstration in Model rooms shall be given along with theoretical sessions as and when required besides Practical sessions specifically earmarked for Model Rooms.**