Skill India
कौशल भारत-कुशल भारत

Directorate General of Training

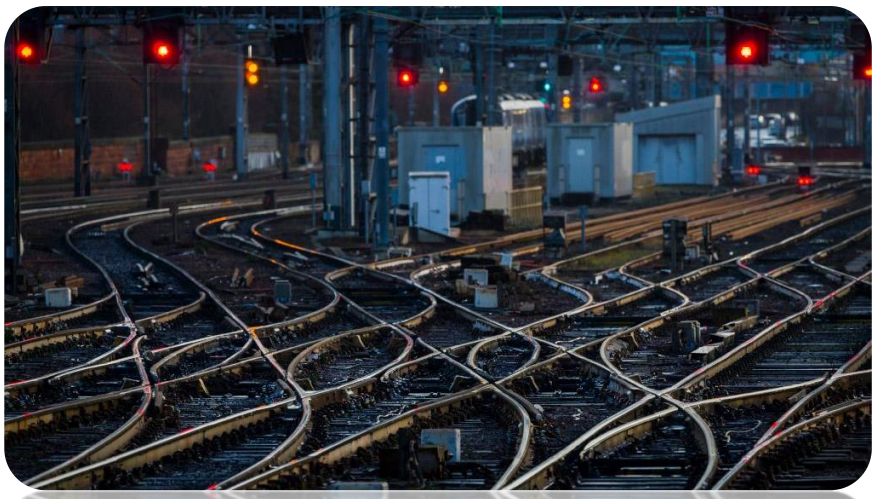
सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

CERTIFICATE COURSE ON

RAILWAY SIGNALLING



NSQF LEVEL- 4

SECTOR – Electronics & Hardware

RAILWAY SIGNALLING

Duration: 390 Hours

NSQF LEVEL- 4

(Version: 1.0)

Designed in 2026

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

&

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,

Kolkata – 700 091

CONTENTS

1. COURSE INFORMATION

1.1 GENERAL

This course has been developed for CTS/CITS trainees to take up as optional courses during course of study for technical and behavioural upgradation of trainees to meet industry related job roles. During the 390 hours duration of Railway Signalling course, a candidate is trained on professional skills & knowledge related to job role. The Broad components covered during the course are given below:

During the course, trainee will learn about the railway Signalling, safety systems, electrification, interlocking, and advanced technologies like, Kavach, enabling them to design, operate, maintain, and troubleshoot railway Signalling and safety installations with confidence.

1.2 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of 6 weeks: -

S No.	Course Element	Notional Training Hours
1.	Professional Skill (Trade Practical)	60
2.	Professional Knowledge (Trade Theory)	180
3.	On Job-Training	150
	Total	**390**

1.3 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through assessment at the end of the course through skill testing at Training Center & CBT through examination conducted by DGT.

The minimum pass percentage for skill test is 60% and for theory will be 33% as in main CTS examination.

2. JOB ROLE

Brief description of Job roles:

Railway Signalling and safety systems cover a range of technical roles that ensure trains run safely and efficiently. Signal maintainers and technicians handle the installation, testing, and upkeep of equipment such as track circuits, point machines, and color light signals, while also troubleshooting faults to keep operations reliable.

Specialized roles like interlocking engineers, telecom technicians, and Kavach specialists focus on advanced technologies including electronic interlocking, automatic block Signalling, and train protection systems. They design circuits, configure RFID and communication systems, and perform system testing. Supporting them are safety inspectors and electrification engineers, who enforce safety practices and ensure integration with electrified networks.

Together, these professionals combine traditional Signalling expertise with modern digital solutions, maintaining safe and dependable railway operations.

Reference NCO-2015: 3114.9900 – Electronics and Telecommunications Engineering Technicians, Other

3. GENERAL INFORMATION

Name of the Trade	**RAILWAY SIGNALLING**
NSQF Level	4
Reference NCO- 2015	3114.9900
Duration of Craftsmen Training	390 Hours (240 hours + 150 hours OJT)
Entry Qualification	Pursuing and passed out CTS/CITS of Electronics Mechanic, Electrician and Wireman.
Unit Strength (No. of Student), Space & Power Norms	Same as Electronics Mechanic /Electrician / Wireman under CTS.
Instructors Qualification	B.Voc/Degree in Electrical & Electronics / Electronics and Telecommunication/ Electronics and communication Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Electrical & Electronics / Electronics and telecommunication/ Electronics and communication from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field **OR** NTC/NAC passed in the Trade of "Electronics Mechanic, Electrician and Wireman" with "Railway Signalling" as ad-on course (240 hrs.) with three years' experience in the relevant field. **<u>Essential Qualification</u>:** Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT. **NOTE: Out of two Instructors required for the unit of 2 (1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.**
List of Tools and Equipment	As per Annexure – I

4. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

4.1 LEARNING OUTCOMES

1. Apply railway knowledge, safety practices, PPE, first aid, and health guidelines for safe, efficient industrial and trackside work.
2. Develop knowledge of cells, batteries, power supply, earthing, and protection devices used in railway signalling power installations.
3. Perform train operation safety, Signalling concepts, and telecom systems to ensure reliable and secure railway operations.
4. Execute inter-slotting and Electrical Key Transmitters to design, test, maintain, and troubleshoot safe railway Signalling circuits.
5. Demonstrate relays, cables, and earth leakage detectors to install, test, maintain, and troubleshoot railway Signalling systems safely and effectively.
6. Install, test, maintain, and troubleshoot track circuits and train detection devices to ensure safe and reliable railway operations.
7. Install, operate, maintain and troubleshoot multiple aspect colour light signals.
8. Install, adjust, maintain and troubleshoot point machines and associated control circuits.
9. Perform Single Section Digital Axle Counter (SSDAC) to ensure safe and efficient railway operations.
10. Apply principles of Railway Electrification (RE) and Automatic Block Signalling (ABS) to design, operate, and maintain safe and reliable signalling systems.
11. Maintain Level Crossing (LC) gate.
12. Understand Interlocking and electronic interlocking systems.
13. Apply Kavach architecture, communication, RFID, and radio systems to operate, maintain, and troubleshoot railway safety systems effectively.

5. SYLLABUS

SYLLABUS – RAILWAY SIGNALLING			
Duration: 240 Hours			
Duration	**Reference Learning outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional skills 10 Hrs. Professional Knowledge 05 Hrs.	1. Apply railway knowledge, safety practices, PPE, first aid, and health guidelines for safe, efficient industrial and trackside work.	1. Identify the organizational structure of Railways and locate the role of Signalling and Telecommunication (S&T) department. 2. Interpret abbreviations and symbols used in railway signalling diagrams and documents. 3. Follow safety precautions while working on the field to prevent accidents. 4. Wear appropriate PPEs (helmets, gloves, safety shoes, reflective jackets) during all practical activities. 5. Administer basic first aid, including CPR, in case of minor injuries or emergencies. 6. Maintain safe distance and vigilance when working near railway tracks. 7. Apply special safety precautions while handling equipment in Railway Electrification (RE) areas. 8. Respond effectively to emergencies such as power failures, fire incidents, or system breakdowns. 9. Practice good housekeeping and shop floor discipline to ensure a	• Introduction to Railway Organization • Abbreviations & Symbols used in Railway signalling system. • Importance of safety and precautions to be taken in the industry/shop floor/field. • Introduction to PPEs. • Introduction to First Aid. • Safety Precautions to be followed while working in the vicinity of Railway track. • Safety precautions in RE area. • Response to emergencies e.g., power failure, fire, and system failure. • Importance of housekeeping & good practices at workplaces. • Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable.

		safe and organized work environment.	
Professional skills 10 Hrs. Professional Knowledge 05 Hrs.	2. Develop knowledge of cells, batteries, power supply, earthing, and protection devices used in railway signalling power installations.	10. Identify different types of secondary cells and their construction features. 11. Adjust charging rates for initial, float, boost, and trickle charging of batteries. 12. Install and test secondary cells, ensuring proper maintenance and defect prevention. 13. Measure depth of discharge and conduct capacity tests on batteries. 14. Operate chargers, stabilizers, transformers, UPS, DC-DC converters, SMPS chargers, and inverters safely. 15. Demonstrate the working principle of Integrated Power Supply (IPS) using block diagrams and schematics. 16. Perform pre-commissioning checks and maintenance adjustments on IPS modules. 17. Apply Research Design and Standards Organisation (RDSO) guidelines for earthing practices in signalling installations. 18. Inspect and maintain lightning and surge protection devices as per Technical Advisory Note of RDSO.	**Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge protection devices and earthing** • Secondary cells – Types, Construction features, Initial / Float / Boost / Trickle charging - Adjustment of charging rate, Installation, testing and maintenance, Various defects and their prevention, Depth of Discharge, Capacity test • Sources of power supply for Signalling systems • Brief introduction to power supply equipment - chargers, stabilizers, transformers, UPS, DC-DC Converter, SMPS Charger, Inverter • Integrated Power Supply - Block diagram, Working Principle, Redundancy/Standby features, Ratings of modules, Adjustments & Maintenance, Power supply schematics for typical installations, Potential free contacts for data logger, Pre-commissioning check list • Troubleshooting • Earthing practices as per RDSO guidelines • Lightning and Surge protection devices and TAN of RDSO • Working, maintenance and trouble-shooting of DG set • Working, maintenance and trouble-shooting of

			solar based power supply systems
Professional skills 10 Hrs. Professional Knowledge 05 Hrs.	3. Perform train operation safety, signalling concepts, and telecom systems to ensure reliable and secure railway operations.	19. Inspect work sites and implement protection measures to ensure safe train operations. 20. Measure and verify schedule of dimensions applicable to S&T gears during installation. 21. Identify different types of railway signals and explain their fail-safe features. 22. Locate signals correctly on track layouts according to sighting distance and braking requirements. 23. Maintain subsidiary signals, markers, boards, and repeater signals as per standards. 24. Demonstrate simultaneous reception and dispatch of trains using proper interlocking arrangements. 25. Test 6-Quad cables / signal cables / power cables / optical fiber cables (OFC) used in train control communication systems (physical & characteristics).	**Safety in train operations, Schedule of dimensions** • Protection of work site • Need of schedule of dimensions • Schedule of dimensions applicable to S&T gears **Basic Concepts of Railway Signalling** • Knowledge and necessity of signals - Fail safe feature of Signalling system • Definition of Signalling terms as given in G&SR • Concept of colour light Signalling • Location of signals • Subsidiary signals • Markers, Boards, Signs etc. • Repeater Signals • Overlaps, braking distance, sighting distance • Isolation, slip siding, catch siding • Simultaneous reception and dispatch of trains • Classification of Stations - Minimum signalling equipment required at each class of station • Standards of Interlocking • Placements of Signals to protect level crossing gates • Methods of block working, control of outlying sidings • Essentials of interlocking • Engineering Scale Plan • Signal Interlocking Plan • Table of control

			• Station working rules • Systems of train working **Telecom basics for Signalling** • 6 Quad cable • OFC • Train Control Communication Systems • Computer Networking • Communication medium for Signalling Systems
Professional skills 10 Hrs. Professional Knowledge 05 Hrs.	4. Execute inter-slotting and Electrical Key Transmitters to design, test, maintain, and troubleshoot safe railway Signalling circuits.	26. Demonstrate one slot–one train feature of inter-slotting. 27. Construct inter-slotting circuitry and verify cross protection and double cutting arrangements. 28. Test inter-slot circuits and perform fault localization using standard procedures. 29. Connect an Electrical Key Transmitter pair using correct wiring methods. 30. Measure coil parameters such as voltage, resistance, and current to ensure proper functioning. 31. Perform maintenance, testing, and troubleshooting of EKT mechanical and electrical parts.	**Inter-slotting, Electrical Key Transmitter** • Inter-slotting: i. Explanation of inter-slot - one slot one train feature ii. Purpose, various methods, circuitry explanation iii. Cross protection, double cutting iv. Testing of inter-slot and fault localization • Electrical Key Transmitter: i. Principle of working and usage ii. Construction features iii. Method of connection iv. Coil used, voltage, resistance, current v. Mode of connecting a pair and wiring vi. Maintenance, testing, trouble-shooting and rectification of Mechanical and Electrical parts vii. Safety checks
Professional skills 10 Hrs. Professional Knowledge 05 Hrs.	5. Demonstrate relays, cables, and earth leakage detectors to install, test, maintain, and troubleshoot railway Signalling	32. Test relay parameters and characteristics, including AC immunized DC neutral relays, electronic timers, and flasher relays. 33. Test & verify heavy-duty contact relays (QBCA1).	**Relays, Cables and Earth Leakage Detector** • Relays: i. DC Neutral relays, plug in type - Principle of working, usage ii. Track and line relays

	systems safely and effectively.	34. Perform relay fixing, wiring practices, documentation, and painting particulars as per standards. 35. Prepare cable route plans, distribution plans, and termination particulars with proper documentation. 36. Lay signalling cables following correct termination practices and verify electrical characteristics. 37. Detect and rectify cable faults using cable route tracers and fault locators effectively. 38. Operate earth leakage detectors by setting references, performing pre-commissioning checks, and ensuring maintenance activities.	iii. Parameters/characteristics of all types of relays iv. Polarized relays - Principle of working v. Plug in type relays - types of relays used vi. Metal to carbon, Metal to Metal relays vii. Identification of relays, their contacts and relay contact analysis viii. AC immunized DC neutral relays ix. Electronic timer x. Flasher relay xi. Heavy duty contacts relays (QBCA1, Siemens point contactor relays) xii. Periodicity of overhauling, sealing xiii. Relay fixing & wiring practices xiv. Documentation & painting particulars xv. Testing of relay circuits xvi. Maintenance activities & Safety checks xvii. Typical failures and trouble-shooting • Cables i. Different types of cables used in Signalling, their usage and construction features ii. Cable laying and termination practices iii. Electrical characteristics iv. Testing of cables v. Maintenance practices, fault

			localization and rectification vi. Use of Cable route tracer and Cable fault locator vii. Cable route plan viii. Cable distribution plan ix. Cable termination particulars - Documentation and painting x. Safety checks • Earth Leakage Detector i. Working principles ii. Uses iii. Setting references iv. Pre-commissioning check lists v. Maintenance activities vi. Potential free contacts for data logger
Professional skills 10 Hrs. Professional Knowledge 05 Hrs.	6. Install, test, maintain, and troubleshoot track circuits and train detection devices to ensure safe and reliable railway operations.	39. Install DC single rail and double rail track circuits following standard procedures. 40. Measure key track circuit parameters to ensure proper functioning and reliability. 41. Identify various components of track circuits and adjust track circuits for fail-safe and failure-free operation. 42. Test Pre-stressed concrete (PSC) sleepers and verify insulation fittings used in track circuits. 43. Inspect glued joints for integrity and confirm compliance with safety standards. 44. Conduct measurements of rail resistance, ballast	**Train Detection Devices –** • Track Circuits DC single rail/double rail track circuits • Track circuit parameters • Various components of track circuits • Fail safe and failure free adjustment • Length of track circuit with PSC sleepers, insulation fittings for PSC sleepers • Testing of PSC sleepers • Checking of glued joints • Measurement of rail resistance, ballast resistance, train shunt resistance • Bonding diagram (series and parallel), cut section, track circuit impedance, traction bonding

		resistance, and train shunt resistance. 45. Draw bonding diagrams (series and parallel) and calculate track circuit impedance with traction bonding. 46. Perform track drilling, bonding, and connection of feed and relay ends accurately.	• Track drilling, bonding and connecting feed and relay ends • Permanent way requirements • Co-ordination with P. way and Electrical (TRD) departments • Maintenance activities and safety checks
Professional skills 23 Hrs. (On Job-training) Professional Knowledge 22 Hrs.	7. Install, operate, maintain and troubleshoot multiple aspect colour light signals.	47. Assemble the parts of 2-aspect, 3-aspect, and 4-aspect colour light signals. 48. Connect aspect control and repeating circuits to demonstrate correct signal functioning. 49. Implement cutting-in arrangements for signals during commissioning or maintenance. 50. Test red lamp protection circuits to ensure fail-safe operation. 51. Configure aspect control in single distant and double distant territories. 52. Install LED signals and verify their performance under different operating conditions. 53. Operate signals in blanking and non-blanking modes to understand visibility requirements. 54. Inspect lamp proving relays, perform maintenance activities, troubleshoot faults, and carry out safety checks.	**Multiple Aspect Colour Light Signals (MACLS)** • Advantages of colour light signals • Parts of 2 Aspect / 3 Aspect/ 4 Aspect CLS • Aspect control and repeating circuits • Cutting in arrangements • Red lamp protection • Aspect control in single distant and double distant territories • LED signals • Blanking and non-blanking mode • Local and Remote feeding of signals • Signal visibility and Signal sighting committee • Lamp proving relays • Maintenance activities and trouble-shooting • Safety checks
Professional skills 10 Hrs. (On Job-training)	8. Install, adjust, maintain and troubleshoot point machines and	55. Identify construction features of both IRS conventional and TWS point machines.	**Point Machines- IRS conventional and High Thrust Clamp (TWS) Types** • IRS Conventional Point Machine:

Professional Knowledge 20 Hrs.	associated control circuits.	56. Install point machines, connect ground connections properly to ensure safe and reliable functioning of point machines with correct wiring practices. 57. Test point machines and perform safety checks during commissioning and maintenance. 58. Adjust point machines, including spring setting device (SSD) parameters, for smooth operation. 59. Troubleshoot failures in point machines and carry out restoration procedures effectively. 60. Operate point control circuits using QBCA1 relays. 61. Use crank handle grouping and cut-out configuration during point failures, ensuring precautions in train operations.	i. Principle of working ii. Construction features iii. Ground connections iv. Installation and wiring practices v. Permanent way requirements vi. Testing and safety checks Maintenance activities vii. Adjustment of point machine viii. Joint inspection with Permanent Way wing ix. Trouble-shooting and failure restoration • 220mm TWS & High thrust clamp type Point Machine: i. Principle of working ii. Construction features iii. Ground connections iv. Installation and wiring practices o Spring setting device (SSD), its parameters and maintenance v. Permanent way requirements vi. Testing and safety checks vii. Maintenance activities viii. Adjustment of point machine ix. Joint inspection with Permanent Way wing x. Trouble-shooting and failure restoration • Point control circuits (Using Siemens point group and QBCA1) • Crank handle grouping and cut out configuration • Failure of point - Use of crank handle,

			Precautions in train operations
Professional skills 23 Hrs. (On Job-training) Professional Knowledge 22 Hrs.	9. Perform Single Section Digital Axle Counter (SSDAC) to ensure safe and efficient railway operations.	62. Identify and describe the components of Single Section Digital Axle Counter (SSDAC) / Multi Section Digital Axle Counter (MSDAC). 63. Verify power supply and communication medium requirements for proper SSDAC/MSDAC functioning. 64. Perform resetting procedures of SSDAC/MSDAC as per policy guidelines and Station Working Rules (SWR) provisions. 65. Interface SSDAC/MSDAC with Electronic Interlocking (EI) and check for proper functioning. 66. Install SSDAC/MSDAC equipment following standard practices and complete the pre-commissioning checklist. 67. Test SSDAC /MSDAC circuits and carry out safety checks, including Block Proving Axle Counter (BPAC) working and dual detection features. 68. Conduct maintenance, troubleshooting, diagnostic checks, and rectify failures in SSDAC /MSDAC systems. 69. Implement protection of track devices during engineering works and enable remote monitoring of SSDAC/MSDAC.	**SSDAC** Note: SSDAC of makes of the choice of Zonal Railways can be considered for training purpose. • SSDAC: i. Principle of working ii. Components of the system and their purpose iii. Power supply and communication medium requirements iv. Address setting v. Resetting procedure vi. Interface with El vii. Installation practices and pre-commissioning check list viii. Maintenance, trouble-shooting, diagnostic features and failure rectification ix. Testing and safety checks x. BPAC working using SSDAC xi. Dual detection SSDAC xii. HASSDAC • Protection of track devices during Engineering works • Provisions of SWR regarding SSDAC working • Remote monitoring • Policy guidelines on resetting of axle counters

Professional skills 25 Hrs. (On Job-training) Professional Knowledge 20 Hrs.	10. Apply principles of Railway Electrification (RE) and Automatic Block Signalling (ABS) to design, operate, and maintain safe and reliable signalling systems.	70. Measure the induced voltage from 25 kV AC traction lines on signalling equipment using a multi-meter. 71. Test the presence of stray currents on rails with a clamp meter and analyze their effect on track circuits. 72. Check the functioning of block instruments and circuits under RE interference conditions. 73. Lay signalling cables in an RE area following prescribed depth, spacing, and protective conduit standards. 74. Operate automatic block signalling circuits using track circuits/axle counters and verify aspect control sequence.	**Signalling in RE Area** • Introduction to OHE System in RE area • Effects of 25KV AC in Signalling • Stray currents on Rails • Modifications to Track Circuits in RE Area • Block Instruments and Circuits • Revised Design of Signalling system • Laying of Signalling Cables in RE area • Earthing Arrangements in RE Area • Protection of operating and S&T staff • Personnel safety in RE Area **Automatic Block Signalling, (ABS)** • Automatic Signalling i. Control circuits of ABS using track circuits / axle counters and Aspect control sequence ii. Cascading / Cutting in arrangements iii. Red lamp protection iv. Automatic and semi-automatic signals and King knob control v. A marker, AG marker and G marker - Provisions of G&SR vi. Modified Mid-Section Automatic Signalling vii. LC gate control in Automatic Signalling territory, Approach warning viii. Power supply requirements for Automatic signalling

			ix. Automatic working on Single line and 3rd line sections x. ABS using MSDAC xi. Resetting procedures including auto reset and manual reset xii. Lightning and surge protection systems and Earthing requirements for ABS xiii. Exception report to monitor mismatch in dual digital axle counter system xiv. Precautions before and during maintenance of digital axle counters / signals / LC gates xv. Duties of Look Out person during failure and maintenance in block section.
Professional skills 23 Hrs. (On Job-training) Professional Knowledge 22 Hrs.	11. Maintain Level Crossing (LC) gate.	75. Verify power supply and cabling requirements for EOLB installation using standard railway specifications. 76. Perform installation of LC gate interlocking equipment as per the pre-commissioning checklist. 77. Identify the functions of different parts of an EOLB and record their operational roles. 78. Trace the sequence of relay operations in LC gate interlocking circuits during gate closing and opening. 79. Demonstrate aspect control in LC gate interlocking during gate open/close conditions. 80. Conduct maintenance activities on LC gate	**LC gate interlocking** • Aspect control in interlocking of LC Gates • EOLB i. Principle of working (of a specific make of EOLB) ii. Functions of different parts iii. Sequence of relay operations iv. Power supply & cabling requirements v. Installation practices vi. Pre-commissioning checklists vii. Maintenance activities including safety checks viii. Trouble shooting & failure restoration

		interlocking systems, including safety checks for reliable operation. 81. Troubleshoot common failures in EOLB and demonstrate restoration procedures under controlled conditions. 82. Observe the working of sliding boom and its circuits. 83. Demonstrate the Electronic Interlocking System	
Professional skills 23 Hrs. (On Job-training) Professional Knowledge 22 Hrs.	12. Understand Interlocking and electronic interlocking systems.	84. Install the Electronic Interlocking hardware modules (central processing unit, input/output cards, and communication interfaces) as per OEM and railway standards. 85. Configure the application and executive software to define station layouts, signal aspects, and route logic. 86. Connect interface circuits between EI equipment and field devices (signals, points, track circuits, axle counters) ensuring proper isolation and surge protection. 87. Convert relay-based Boolean logic into software-based truth tables and compile them for execution in the EI system. 88. Verify system integrity using CRC and checksum routines during compilation to detect errors in configuration files.	**Basics of Electronic Inter Locking (EI)** • Need for Electronic Interlocking • Comparison between EI (Electronic Interlocking) and Route relay interlocking/Panel interlocking • Block diagram of EI and principle of working • Configurations of EI • Application and Executive software's • Interface circuits • Relay circuit - Boolean Logic conversion • Compilation • CRC and checksum • FAT & SAT • Power supply requirements • Earthing • Lightning & Surge protection arrangements • Pre-commissioning check lists • TSAA • Specifics about a particular OEM make EI on hard ware, software, installation &

		89. Conduct Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) to validate functionality before commissioning. 90. Implement power supply, earthing, and lightning/surge protection arrangements to ensure reliable and safe operation of EI equipment.	maintenance practices and trouble-shooting (as per Zonal Railway's requirements) • VDU, Interface requirements and Operations
Professional skills 23 Hrs. (On Job-training) Professional Knowledge 22 Hrs.	13. Apply Kavach architecture, communication, RFID, and radio systems to operate, maintain, and troubleshoot railway safety systems effectively.	91. Demonstrate the modes of operation of onboard Loco Kavach and record train position and movement authority. 92. Verify communication between Station Kavach and Loco Kavach using test signals. 93. Identify different types of RFID tags and program them for Kavach applications. 94. Fix RFID tags on track and troubleshoot common installation issues. 95. Perform maintenance for radio tower substructures as per standards. 96. Conduct a site survey and collect design inputs for Kavach system deployment. 97. Troubleshoot the Kavach for different makes.	**Kavach** • Introduction, Architecture & Overview of KAVACH (ATP), SM's unit, Station KAVACH, RIU & OFC Connectivity • Basics of onboard Kavach (Loco KAVACH), Various Modes of Operations, Train position, Movement Authority, Target Distance • Overview of communication between Station and Loco Kavach • Introduction of RFID Tags, Types of RFID, RFID Data RFID/TIN Layout, Programming of RFID, RFID fixing and Trouble-Shooting, • Overview of Kavach TOC & Track Profile Table, FAT, SAT, NMS and FRCAS • Radio Tower Design-Sub/Super structures, Tests & Maintenance Practices • Site Survey and Design Inputs to the Kavach System • Overview of Kavach Documentation

			• Kavach Communication Arrangements, Radio Tower Survey, NMS & KMS • RSSI Survey • Troubleshooting of different makes of Kavach

6. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
1. Apply railway knowledge, safety practices, PPE, first aid, and health guidelines for safe, efficient industrial and trackside work.	Demonstrate correct usage of personal protective equipment (PPE) during industrial and trackside activities.
	Apply railway organizational safety practices to routine and emergency work situations.
	Perform first aid procedures effectively in simulated workplace incidents.
	Inspect work environments for compliance with occupational health and safety guidelines.
	Evaluate risks associated with industrial and trackside operations and propose preventive measures.
	Maintain safe and efficient work practices by adhering to railway organizational standards and protocols.
2. Develop knowledge of cells, batteries, power supply, earthing, and protection devices used in railway signalling power installations.	Identify different types of cells, batteries, and power supply systems used in railway Signalling.
	Inspect earthing arrangements and protection devices to ensure compliance with safety standards.
	Operate Signalling power installations following prescribed procedures and safety practices.
	Maintain batteries, power supply systems, and protection devices to ensure reliable performance.
	Troubleshoot faults in Signalling power installations and restore functionality effectively.
	Apply occupational health and safety guidelines while working with electrical Signalling equipment.
3. Perform train operation safety, Signalling concepts, and telecom systems to ensure reliable and secure railway operations.	Demonstrate safe train operation practices in accordance with railway safety standards and procedures.
	Apply Signalling concepts to manage train movements and prevent operational conflicts.
	Operate telecom systems effectively to ensure reliable communication during railway operations.
	Inspect Signalling and telecom equipment for compliance with operational and safety requirements.
	Troubleshoot faults in Signalling and telecom systems to restore secure railway operations.
	Evaluate the integration of train safety, Signalling, and telecom systems for overall reliability.
4. Execute inter-slotting and	Design safe railway Signalling circuits incorporating inter-slotting and Electrical Key Transmitters.

Electrical Key Transmitters to design, test, maintain, and troubleshoot safe railway Signalling circuits.	Test the functionality of inter-slotting arrangements and EKT circuits under simulated operating conditions.
	Inspect wiring, connections, and relay operations to ensure compliance with Signalling standards.
	Maintain inter-slotting and EKT systems through routine checks and preventive practices.
	Troubleshoot faults in Signalling circuits involving EKT and restore them to safe working condition.
	Verify safety protocols and operational reliability of inter-slotting and EKT circuits during commissioning.
5. Demonstrate relays, cables, and earth leakage detectors to install, test, maintain, and troubleshoot railway Signalling systems safely and effectively.	Identify different types of relays, cables, and earth leakage detectors used in railway Signalling systems.
	Install relays, cables, and detectors following prescribed railway standards and safety practices.
	Test the functionality of relays, cable connections, and earth leakage detectors under operational conditions.
	Maintain Signalling equipment through routine inspections, preventive measures, and corrective actions.
	Troubleshoot faults in relays, cables, and detectors to restore safe and effective system operation.
	Apply occupational health and safety guidelines while working with electrical Signalling installations.
6. Install, test, maintain, and troubleshoot track circuits and train detection devices to ensure safe and reliable railway operations.	Install track circuits and train detection devices according to railway standards and safety procedures.
	Test the functionality of track circuits and detection devices under different operating conditions.
	Inspect wiring, connections, and equipment to verify compliance with Signalling specifications.
	Maintain track circuits and detection devices through routine servicing and preventive checks.
	Troubleshoot faults in track circuits and detection systems to restore safe railway operations.
	Apply safety practices and operational guidelines while working with train detection equipment.
7. Install, operate, maintain, and troubleshoot multiple aspect colour light signals.	Install multiple aspect colour light signals according to railway standards and safety procedures.
	Operate colour light signals correctly to manage train movements and ensure safe operations.
	Test the functionality of signal aspects, control circuits, and lamp units under different conditions.
	Inspect wiring, lenses, and signal posts to verify compliance with technical specifications.
	Maintain colour light signals through routine servicing, cleaning,

	and preventive checks.
	Troubleshoot faults in colour light signals and restore them to safe and reliable working condition.
8. Install, adjust, maintain, and troubleshoot point machines and associated control circuits.	Install point machines and associated control circuits according to railway standards and safety procedures.
	Adjust point machine settings to ensure correct alignment and smooth operation of switches.
	Test the functionality of point machines and control circuits under different operating conditions.
	Inspect wiring, connections, and mechanical components to verify compliance with technical specifications.
	Maintain point machines and circuits through routine servicing, lubrication, and preventive checks.
	Troubleshoot faults in point machines and control circuits to restore safe and reliable railway operations.
9. Perform SSDAC to ensure safe and efficient railway operations.	Install SSDAC equipment and associated circuits according to railway standards and safety procedures.
	Configure SSDAC systems to accurately detect train movement and occupancy of track sections.
	Test SSDAC functionality under different operating conditions to ensure reliability and safety.
	Inspect wiring, sensors, and connections for compliance with technical specifications and operational requirements.
	Maintain SSDAC systems through routine servicing, calibration, and preventive checks.
	Troubleshoot faults in SSDAC installations and restore them to safe and efficient working condition.
10. Apply principles of Railway Electrification (RE) and Automatic Block Signalling (ABS) to design, operate, and maintain safe and reliable signalling systems.	Design signalling systems incorporating RE and ABS principles to ensure safety and reliability.
	Operate automatic block signalling equipment effectively under railway electrification conditions.
	Test signalling circuits and components to verify performance in RE areas.
	Inspect installations for compliance with railway electrification and signalling standards.
	Maintain RE and ABS systems through routine servicing and preventive practices.
	Troubleshoot faults in electrified signalling systems and restore safe operations promptly.
11. Maintain Level Crossing (LC) gate.	Design LC gate and electronic interlocking circuits in compliance with railway Signalling standards.
	Test the functionality of LC gate interlocking and EI circuits under

	simulated and live conditions.
	Inspect wiring, relays, and interface circuits to verify proper installation and performance.
	Maintain interlocking systems through routine servicing, preventive checks, and safety practices.
	Troubleshoot faults in LC gate and electronic interlocking systems to restore safe and reliable operations.
12. Understand Interlocking and electronic interlocking systems.	Operate interlocking systems effectively to ensure safe train movements and gate control.
	Evaluate the correctness of route logic conversion from relay circuits into Boolean expressions and software truth tables.
	Verify the integrity of compiled application software using CRC and checksum to ensure error-free execution.
	Inspect the installation of interface circuits, power supply arrangements, earthing, and surge protection for compliance with standards.
	Test the EI system through FAT (Factory Acceptance Test) and SAT (Site Acceptance Test) to validate operational reliability before commissioning.
	Review OEM-specific hardware, software, installation, and maintenance practices against Zonal Railway requirements for safety and performance.
13. Apply Kavach architecture, communication, RFID, and radio systems to operate, maintain, and troubleshoot railway safety systems effectively.	Explain the architecture and communication flow of Kavach systems including station and loco units.
	Configure RFID tags and radio systems to support accurate train detection and safe operations.
	Test Kavach communication links, RFID programming, and radio connectivity under different operating conditions.
	Inspect Kavach installations such as RIU, OFC connectivity, and radio towers for compliance with standards.
	Maintain Kavach equipment through routine servicing, calibration, and preventive safety checks.
	Troubleshoot faults in Kavach communication, RFID, and radio systems to restore reliable railway safety operations.

ANNEXURE-I

LIST OF TOOLS & EQUIPMENT			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
Same as Electronics Mechanic/Wireman under CTS OR Electronics Mechanic under CITS.			

ANNEXURE-II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts and all others who contributed in designing/ revising the curriculum. Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

List of members attended the Trade Committee Meeting for designing of Railway Signalling syllabus under Short Term Courses held on 23.12.2025 at IRISET, Secunderabad

Sl. No.	Name and Designation (Shri/Smt./Kumari)	Organization with Address	Remarks
1.	C. S. S. SUBRAHMAY, Professor-Signal-2	IRISET, Secunderabad	Chairman
2.	K. RAMESH CHANDRA, Asst. Secretary	DG/IRISET/SC	Coordinator
3.	T. RAGULAN, Director	CSTARI, Kolkata	Member
4.	N. R. AR AVINDAN, Director, CD Section	DGT, MSDE, New Delhi	Member
5.	RAJNISH KR. JHA, JOINT DIRECTOR	CSTARI, Kolkata	Member
6.	V. V. SATEESH REDDY, TRAINING OFFICER	RDSDE (TS), NSTI(R) Campus, Hyderabad	Member
7.	SK. ALTAF HOSSAIN, Assistant Director	CSTARI, Kolkata	Member
8.	DR. ARSHIA AJAM, Associate Professor	Maulana Azad National Urdu University	Member
9.	K. MALLESHAM, Scientist-D	ETDC, STQC, Hyderabad	Member
10.	NP BANNIBAGI, Deputy Director	NSTI-R, Hyderabad	Member
11.	DR. MAHESH D, Training Officer	NSTI-R, Hyderabad	Member
12.	V. V. SAILAJA, Training Officer	NSTI-R, Hyderabad	Member
13.	MD. RAHAMATHULLA, Retd. Sr. Instructor	Telecom	Member
14.	VIJAY SINGH KUSHWAH,	Accura Tequipment, Hyderabad	Member
15.	B. SHARANAPPA, Asst. Director	NSTI-R, Hyderabad	Member
16.	Ch. BHASKAR, Sr. Manager, R & D	Medha Servo Drives Pvt Ltd, Hyderabad	Member
17.	P. APPALA RAJU, Sr. Manager- HR	Medha Servo Drives Pvt Ltd, Hyderabad	Member

18.	O. S. SASTRY, Sr. Manager-VEV	Medha Servo Drives Pvt Ltd, Hyderabad	Member
19.	MOHAMMAD AMEER, Instructor	Moulana Azad National Urdu University	Member
20.	RAVI TEJA, ASST. Training Officer	Govt. ITI, Ratanchura, Becramgudu, Hyderabad	Member
21.	CHAND PASHA. SHAIB, Asst. Training Officer	Govt. ITI, Mallepally	Member
22.	Ch. B. S. SRINIVAS KUMAR, Instructor	DG/IRISET/ SC	Member
23.	NARENDRA ALANALKAR	Multitech Systems	Member
24.	SREEDHAR NUNE	TG SPDCL	Member
25.	DR SRINIVASA RAO PERLA	CYIENT LIMITED	Member
26.	PROFULLA KUMAR BAIRAGI, Training Officer	CSTARI, Kolkata	Member
27.	SHAIK MUNAT QURESHI	World Community Services, (Tumley Solution), Mehdipatham	Member
28.	SALEEM AHAMED	World Community Services, Hyderabad	Member