

Syllabus for Junior Instructor/STTC/MLY

General/Store/Establishments

1. Organization of Railways, Structure of S&T Department, Duties of staff Supervisor, Maintainer, Helpers, Clerks, HOER, WCA, P.W.ACT, Leave rules, Pass rules, Medical, Channel of promotion and promotion policies ,Labour Organization and PREM DA Rules & Conduct Rules Family Welfares, Maintenance of Stores, official language rules etc.
2. Stores and their accountal, procedure for procurement and checking of stores for maaintance and inprest and their recoupment procedure of non stock iteam and their local purchases etc.
3. Tools and plants their sanction and recoupment
4. Conduct trade tests and trainng of staff in various trades
5. Preparation of justification of works and various types of estimates required for works , work registers and progress reports of works etc.
6. Budget control over expenditure

Measuring Instruments

1. Working principle of various types of measuring instruments like Voltmeter, Ammeter, Analog & Digital Multimeter, Megger, Oscilloscope TMS Kit Attenuation Meter Splicing Machine OTDR - Optical Time - Domain Reflectometer VFL - Visual Fault Locator Optical Power Meter, LED,LASER Source, PIN & APD Fiber stripper, crimping tool, Cleaver, FDMS, KRONE tool, wrapping tool Cable fault locator, Cable Route tracer E1 Tester Psopho Meter LCR (Inductance, Capacitance & Resistance) Meter Power Meter Selective Level Meter DB Meter IC Tester Earth Measuring Meter
2. Use of hammer, chisel, wrench, spanner, box spanner, screw drivers and precautions while using them Use of Electric Drills, grinders, vacuum blowers, cleaners, principles of their working and adjustment. Soldering iron and soldering techniques

Power Plant

1. Types of primary and secondary cells, Construction of primary and secondary cells Testing and maintenance of primary and secondary cells Initial charging and installation of secondary cells Initial/Float/Boost/Trickle charging of secondary cells- Adjustment of charging rate Various defects in secondary cells and their prevention
2. Manual and Automatic chargers-Installation, Adjustment, Capacity- Trouble Shooting Study of different types of inverter, stabilizer- working principle, parameters, Capacity, usage, trouble shooting Uninterrupted Power Supply- working principle, parameters, capacity, usage
3. Trouble shooting Integrated Power Supply- working principle, parameters, capacity, usage, trouble shooting DC-DC Converter, AC-DC Converter- working principle, parameters, capacity, usage, trouble shooting

4. Typical power plant arrangement at Telephone Exchange, OFC HUT, UTS/PRS, MUX/STM VHF, LG Gates and at all Way side stations.
5. Types of DG set ,Working of Diesel engine, Types of ignition and working of fuel injection system, Starting procedure and remote starting, Recommended maintenance schedule/procedure ,Engine trouble shooting, air filtering fuel system, Alternator, excitation voltage control, Precautions/procedure for storing HSD and lubricating oil, Portable generators
6. Explanation about solar power, Construction of solar photo voltaic panel uses, Type of silicon used- advantages comparisons with other sources of supply, Solar panel- signal lighting- twilight switching, solar panel- for other signaling circuit Choice of batteries and capacity Installation, maintenance, precautions of solar panel

Basic Electricity and Magnetism

1. Idea about EMF, current, power, resistance, inductance, capacitance, power factor etc. and their measurements, Study of Ohms law and its application, series and parallel connections., Importance of insulation resistance,
2. Idea about magnetism and magnetic induction, Transformers- working principle, rectifier-working principle Fuses, surge protection devices and Lightning arrestors Measurement of loop and insulation resistance of cables and measurement of earth resistance AC and DC principles

Disaster Management,

1. Responsibility of S&T staff in case of disaster, Provision of PT set at accident site, Safety procedure, accident management, role of S&T staff, Maintenance of ART, communication arrangement at Accident sites. List of communications to be provided at accident site.
2. Mobile and portable VHF sets Use of magneto phones, selective calling telephones and field service cables Items used in breakdown (Communication). Latest Satellite Phone Remote subscriber unit (Extending auto telephone to accident site).
3. Basics of Satellite Communication, VSATs Role of Satellite Communication in Indian Railways for Disaster Management Communication with block Diagrams Advantages & Role of S & T department, Application,Requirements of data circuits and standard levels, System block diagrams

Computer Appreciation and Data Networking

1. Computer hardware and interconnections
2. Identification of CPU mother board, RAM and various computer peripherals like CD ROM, hard disk, key board, mouse, printer, monitor, interface cards, modem, scanners
3. Identification of interconnecting cables and interconnections- serial/parallel ports, monitor port, power supply connections, UPS connection, modem connection etc.
4. Operating system function(Window 10 or latest) installation

5. Starting of Windows, creating files & folders, running programs, copying files, using My computer Icon, Windows Explorer, Control panel and settings, Formatting, finding files, taking print outs, configuring modem adding/removing program etc
6. Software Package-MS Word, MS Excel & MS power point Basic menu driven commands and application
7. Basic concept of Networking, Networking Basics, Routing Basics, differences between Routing & Switching, Networking, Firewalls DO's and DON'T's while using networking devices
8. Introduction of Railnet over Indian Railways & basic components in Railnet Basic concept of Railnet with block Diagram in Indian Railways
9. Introduction of Wi-Fi System over Indian Railways & basic components in Wi-Fi System Implementation of Wi-Fi System in Trains & on Stations with block diagram Study of basic component used in Railnet & Wi-Fi System over Indian Railways Authentication of Wi-Fi security features
10. **PRS** : Advantages of computers, Role of S & T department, Reservations, Requirements of data circuits and standard levels, System block diagrams
11. **UTS**: Advantages of computers, Role of S & T department, Requirements of data circuits and standard levels, System block diagrams.
12. **FOIS** : Advantages & Role of S & T department, Applications, Requirements of data circuits and standard levels, System block diagrams

Telecom Cables & STM Equipments & MPLS:

1. Different cables used in S&T including OFC cable and cable laying procedure Cable jointing, protection in jointing / FDMS and connecting material Periodical tests on cables, faults, fault localization and rectification
2. Termination of S&T cables including OFC Color code scheme in telecom cables/OFC identifying pairs/ fibers Study of OFC, jelly filled cable, PCUT cables jointing. Normal joint, loading coil joint, capacitance joint, T joint, Splice closure and Joint practices.
3. Cables used in exchange inside/outside and their periodicals testing. OFC cable testing Soldering/ Splicing
4. Basic principles of optical fiber communication its applications and Advantages
5. Construction of optical fiber cable Important characteristics of the cable Fiber termination and underground joint closure. Splicing practices Testing, localization of fault and its rectification - usage of OTDR
6. OFC/Quad Cable Connectivity for
i) Block Circuit, ii) Data Logger, iii) SSDAC/MSDAC, iv) EI
7. Precaution during cable laying Functions of OLTE, optical source, line coding unit drop/insert MUX, supervisory and alarm circuits etc Various measurements during normal maintenance
8. Block Interface PDH / SDH Equipment all vendors

9. FABIO/MAPLE equipment working and its applications in Railways
10. MPLS Equipment and its architecture and Working
11. Why IP-MPLS, Advantages of IP-MPLS, MPLS components, MPLS Operations, MPLS Protocols
12. TAN guidelines for implementation of IP MPLS, MPLS VPN, Traffic Engineering, Concepts of converged communication

Passenger Amenities and surveillance system:

1. Principles of audio system. Micro phones, general and special types Loud speakers of all types. Impedance matching and voltage matching Amplifiers for PA system and troubleshooting Paging and talk back system Arrangement of PA system indoor, outdoor - precaution to be followed
2. P.C. based train announcement system (ARR/DEP) IP based PA System PIS, GPS Clocks & Tape recorders P C. based train display system (ARR/DEP) & IPIS. Remote paging
3. Applications of CCTV, Types of Camera Networking of CCTV & Study of block diagram of CCTV Integrated Security Systems Differences between monitor and TV receivers

Electronic Exchange and IP Exchange:

1. Basic knowledge of Telephone Exchange various types of exchanges like C-DOT, ISDN, SPC exchanges working and protocols.
2. VoIP Fundamentals & VoIP Protocols, Asterisk based VoIP exchange, Various modules of the exchange like IDF, MDF, Protections and termination of cables
3. NGN, NGN Protocol
4. Earthing - its importance - maintenance of earth resistance,
5. Common fault in Electronic telephone, exchanges and their rectification Telephone operator console for various Electronic exchanges and their working with Electronic exchange
6. Different types of instruments used in exchanges working principal construction like PBT, CLI Phones, DKT phones, soft phones, IP phones etc.
7. Trouble shooting & periodical maintenance of exchanges

Wireless communication:

1. Scenario of Mobile Train Radio Communication & LTE on Indian Railways,
2. VHF Mobile Radio Communication & Tetra Cellular Mobile Radio Communication System GSM-R/LTE4 G- Data Service, Wave propagation Frequency ranges Oscillators, Amplifiers, Modulators Demodulators Simplex and duplex system of communication Block diagram of Radio transmitter and receiver Types of Antennae and their installation

Transmission Line Fundamentals {Characteristic Impedance (Z_0), Voltage Standing Wave Ratio (VSWR), Impedance Matching etc.}

3. Types of power suppliers used for VHF sets Various applications of VHF Trans receivers Precautions while using the sets Trouble shooting

Train Traffic Control:

1. Knowledge of control working in Non-RE/RE area Headquarters equipment in Non-RE and RE area (DTMF type) Way station equipment in Non-RE/RE area (DTMF type)
2. Study of control telephone, portable telephone, emergency control circuit Various types of measurements and tests on control circuit with quad cable/OFC Study of Radio patching Control working from non RE to RE using 4-wire/2 -wire conversion
3. Equipment Maintenance and fault finding of HQ, Way station, Equalizer amplifier Repeater, VF Repeater, Cable hut and control medium. Brief description of line plant (Quad / OFC cable)
4. Extending auto phone to accident side over emergency control Study of cable hut, VF repeater, Equalizer amplifier repeater in RE and Non-RE section controls VoIP based Control Communication

Analog, Digital Electronic and Amplifiers:

1. Passive devices, resistors, capacitors, inductors. Semiconductor diode, its parameters, uses etc Zener diode and its applications Special types of diodes used in Wireless Transistors – FET, BJT, UJT testing and applications
2. Transistor - field effect and its uses SCR, Diacs, Triacs ICs analog and digital, precautions while handling and testing Regulated power supplies DC-DC converter and filter circuits
3. Amplifiers, class A.B & C Push pull and complimentary symmetry amplifiers Feedback - positive and negative Oscillators - Colpitts, Hartley, crystal & phase shift
4. Operational amplifiers Principles of modulation & demodulation - AM & FM Pulse Code Modulation
5. Numbers, codes & conversions Boolean Algebra, Gates & Flip flops. Arithmetic Circuits Registers and counters Encoders, decoders, multiplexers & de-multiplexers Memory circuits (RAM & ROM) Principles of digital clock Principles of digital switching Introduction to Microprocessor & Personal Computer

Kavach

1. Over view of Kavach
2. Radio communication backbone for Kavach, Radio survey, (Link budget calculation), Desktop RF planning survey
3. Details of communication modules needed in Kavach (UHF communication)
4. Frequency time slot arrangements
5. KMS & Authentication, NMS of Kavach