Sub Inspector(Radio) Basic Radio Technician(BRT) Course

Basic Technical Training- First Semester

Duration = 06 Months (720 Periods)

Theory Papers	Theory Paper Module Name	Unit Names	Syllabus Details	Total Marks	Total Classes (420)	Faculty/ Resource
1	Basic Electricals	(A) Basic Electricals & Networks	Basic Concepts (Review):- **A1. Basic Characteristics** {Charge, Current, Voltage, Power and Energy and its units} **A2. laws** {Ohms law, Kirchhoff's laws, KCL, KVL, circuit diagrams and symbols} **A3.** Introduction to signals, {Sines waves (Amp, Freq., Wave length, Pitch etc.) (Signal fidelity, loudness, damping.) **A4. Signal features measurements**, a note on sampling signals (Nyquist limit), signal experiments, measurements, Voltage, Voltmeters, Current (located in introductory lesson), Frequency, Resistance, Oscilloscopes, Circuits, **A5. An introduction to Circuit Analysis**, {Nodal Analysis, Mathematical Background, **Network theorems**: Super Position Theorem, Norton Theorem, Thevenin Theorem, Maximum Power Transfer Theorem.} **A6. Basic measurement of AC** {RMS, PEAK VALUE etc Electrical signals including 3 Phase also. Star Delta conversion, Power Factor, Power Losses.} **A7. Introduction to Specification terms** {dB, AHC of battery, Specific gravity of initial charge of battery, BPS (rate), Q of coil , Watts / KVA, R.M.S, PPM, KWH etc.	50	20	PRTS Faculty
		(B) Power supplies	**B1. Power Supply Circuits**, {Design 5Volt and 12 Volt DC supply. Protection devices in power units , Voltage Regulator, Voltage and Current Stabilizer, Invertors and Converter, Solar Panels Supply, SMPS: Its function and circuit details. **B2. Secondary Batteries:** {its Basic theory, its type, common faults in secondary batteries and remedy of it. Secondary Battery Charging Process, Mains Battery Chargers up to 72 Volts. Maintenance free battery VRLA, Tubular etc. Battery maintenance life and performance. Battery do's and don'ts} **B3. Power System** {Transients. Power system Protection Circuit Breakers. Relay, HDVC transmission} **B4. Basic knowledge of D.G. sets.**	50	20	PRTS Faculty
2	Basic Electronics	(C) Basic Electronics	**C1. Basic electronics** Structure properties of electronic materials , Conductors, Semiconductors and insulators, magnetic, ferroelectric, piezoelectric, ceramic , optical and superconducting materials. **C2. Semi Conductor Devices**: Introduction, Semiconductor materials (Ge, Si), extrinsic N-Type P-Type materials, Junction Diodes, V-I characteristics of diodes, Diode biasing. Schottky diodes, Tunnel Diodes, Light-Emitting Diodes, LASER Diodes, Photodiodes, Varactor diodes, Zener diode, DIAC, TRIAC and constant-current diodes. **C3. Application of Diodes** – Half wave/Full Wave Rectifiers, Filters, Radio demodulation. Over-Voltage Protection Diodes, Login Gates Diodes, Lonizing radiation detectors, temperature measurements, current steering, **C4. Bipolar Junction Transistor** – operation of PNP and NPN, transistor, CB-CE-CC configuration, alpha-beta relationship use of transistor manual. **Field effect transistor** – FET, construction and characteristic of DFET, MOSFET (Depletion-Enhancement Type). **C5 . Basics of Packaged building-block** login families TTL, CMOS, NMOS etc. importance of CMOS is present scenario. **Power Electronics**: Thyristor its basic with reference to SCR only. SCR'S industrial use and its importance	40	30	PRTS Faculty

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		(D) Basic Digital Electronics	**D1. Basic Digital Electronics** – Fundamental concepts: Number Systems and Code, 1's and 2's complements, Boolean algebra. Logic gates, **D2. Combinational Circuits**:- K-Map Representation, arithmetic operation, Adder, Substractor, Full adder, Half adder, Serial and Parallel Adder, Comparator, Multiplier, Multiplexer, Demultiplexer , Encoder, Decoder. **D3. Sequential Circuits**:- R-S flip-flop, D flip-flop, J-K flip-flop, J-K Master Slave flip-flop, Counter, Shift Resistor, A/D–D/A Converters. **D4. Microprocessor** :- Fundamental of Microprocessor, Block, pin diagram and its application.	30	30	PRTS Faculty
		(E) Amplifiers, Oscillators and Op-Amp	**E1. Amplifiers**, Multistage Amplifiers , its classification, Feedback amplifiers voltage amplifier, Current Amplifier Classification of Power amplifier, Classes A, B, C & AB. Working efficiency and its uses, push-pull amplifier, their merits and demerits, noise figure, distortion in amplifier , voltage and power gain in dB. Basics of RF amplifier. **E2. Oscillators**- Definition, Types of Oscillators, R-C, L-C , Phase Shift, Wein Bridge and Crystal Oscillators, frequency. Stability factors, Synthesizer, Multi-Vibrator. **E3. Integrates Circuits**: IC classification, advantage and limitations. **E4. Operational Amplifier and its application** : Circuit symbol, characteristics, Open loop configuration, Op-Amp with feedback, Inverting-non inverting Op-AMP.	30	30	PRTS Faculty
3	Basic Communi-cation	(F) Wave Propagation	**F1. Modes of Propagation** :- Electromagnetic Waves , ground, Sky and Space Wave. (Line of Sight Communication) Banding of Sky Waves Through Ionosphere, Critical Freq., M.U.F, Skip Distance, Skip Zone, Virtual Height, Selective and non-selective fading, Freq. and space diversity. Ionosphere, Sun Spot, Radio Horizon, Duct Propagation. Electric and Magnetic Fields. Gauss's law dielectrics, Conductors and magnetic materials. Plane–Wave Propagating in dielectric and conducting media.	10	20	PRTS Faculty
		(G) Antennas	**G1**. Antennas: Definition of antenna, Isotropic Radiator, Radiation Pattern, Antenna gain, Power gain, Directivity, Efficiency, Wave Length, Polarization, Radiation resistance, **G2**. Types of Antenna- Yagi, Helical, Whip, Parabolic Reflector, GP antenna, Folded dipole antenna, Grounded and ungrounded antenna, Arial Voltage and Current distribution **G3.** TX-Line. Resonant and non-resonant transmission lines SWR, matching , Quarter wave transformers, Construction of open wire line , CO-AXIAL, high frequency feeder cable. Different losses in transmission lines. Orientation of antenna in relation with coverage enhancement decibal unit detail. **G4.** Specification of commercial available T/X line and connectors.(Low loss cable) **G5.** Optical fiber as a transmission media - regulation and preparation of joints, advantages and economy of optical fiber networking.	10	25	
		(H) Modulation / Demodula tion	H1. Modulation/Demodulation:- definition, need of modulation, Type of Modulation, Amplitude Modulation (AM/DSB/SSB/VSB) Power Side Bands, Depth and Percentage of modulation and problems , Methods of AM generation and detection, Low and High level modulation, Frequency and Phase modulation, Freq. deviation, Modulation Index and sidebands in FM/PM, Methods of generation and in FM/PM and their circuits. Relative merits and demerits of AM, FM and PM, elementary idea of PCM (Sampling–Quantization-Encoding) and their applications.	20	20	PRTS Faculty

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		(I) Communication systems	I1. Basics of Communication System:- Block diagram of Basic Communication System. Mode of communication Simplex and Duplex, Full duplex etc. Fundamentals of repeaters and its present importance I2. Basic Building Blocks of Transmitter and Receiver. Channel noise, Types of noise associated with it Pre-emphasis, De-emphasis, Squelch Circuits, detection, Audio Filters, Multipliers, Tuners, limiters/clippers I3. Transmitter Characteristics: Tuning and Loading of Transmitters, Output Power , Harmonic Content and Stability, Spurious Radiation I4. Receiver Characteristics: Principal of Reception, Basic idea of Superhetrodyne Rx. Selection of IF, Sensitivity, Selectivity, Fidelity, Stability and Image Rejection.	20	15	PRTS Faculty
		(J) Measuring Instruments	J1. Measuring Parameters Radio Communication test set, Signal Generator, In circuit Analyzer, Chip Master, Multi Meter:- Digital, Sanwa, VSWR, Meter, RF output Meter, AF output Meter, SMD Station, Mili Volt Operation, J2. Auxiliary Tools ultra fast Micro Soldering Station, Micro fine Soldering Station, RF Field strength meter & Detection. Precautions And safety During Working.	20	10	PRTS Faculty
		(K) Channel Interference	K1. What is Interference , What are their Different types. How Interference Effects the communication in HF/VHF & UHF Network. K2. Study Different Interference Problems associated with VHF & HF Network. Frequency jumping at Repeater Station. 11.3 Role of Squelch & RX frequency in its remedies.	20	10	PRTS Faculty
4	Computer Communi-cation Networks	(L) Basics of Computers	L1. Basic Computer, Structure, Hardware, External memories, Its Storage, L2. Computer Operation MS Office, Basics of Data Base Management, Editing and Printing in MS Word documents and MS Excel sheets and Power Point Presentation Basic. L3. Typing Techniques (finger placement and movements) typing proficiency in Hindi/English on Remington and in script computer keyboard. L4. Internet Sending and Receiving E-mail and uploading and downloading files, configuring internet Using TCP/IP Properties. L5. Office Automation Tools Familiarity with commonly used printers, Trouble Shooting & fault finding operation and handling photo Copy, FAX, EPABX Phone, Satellite Phone, Mobile Phone.	20	60	Mr. Akashay Kumar Jadhav Mob. No. 8225959966 + PRTS Faculty
5	Radio Communication Network	(M) Commn. Network	M1. Communication Networks in MP Police Communication planning At Different Level i.e. PS Level, District Level, Range Level, Zone Level & State level.	10	03	SP (Commn. RHQ BPL / PRTS Faculty
			M2. E-mail Network : Basic Architecture in Madhya Pradesh Police Telecommunication Organization. Basics of setting up an New e-mail accounts, Out look etc.	10	02	
			M3. HF Network : Basic architecture for range, Zone, state & National Level. Handling of HF Radio Used In MP Police Telecom.	5	02	
			M4. Radio Trunking System: Basic Architecture, Operation Application, Advantage & Its Future. Basics of Its Features, Troubleshooting & Daily Maintenance. M5. Fleet Management For Big Cities. Importance of Call Sign An Overview.	10	04	
			M6. Communication In VIP Duties: Basic Importance, Procedural Functioning, Radio Procedures For VIP Duties. Necessary Guidelines/Norms Before VIP Program. Communication Security Measures. Feasibilty of communication, Channel Discipline, Privacy coded call sign of Protocol.	20	02	

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6	**Advance technological up gradation in police system**	**(N) Dial-100 :- Basic Operations**	(A) Define objective role of officer incharge Dial-100. 1. Dial-100 system operation- SPCR/DPCR/FRV functions. 2. Job description- Duties & responsibilities of working staff at every level of operation. 3. Working knowledge of SOP 1 & 2 of Dial-100. (B) Role in execution of Dial-100 1. Role & responsibilities of Radio District Incharge / Supervisor in Dial-100, FRV management in districts. 2. Control room Dial-100 management. 3. Staff training for Net viewer/Desk/FRV/ MDT- Use of MPS software. (C) GIS Mapping , Collection of P.O.I. in field & precautions during field data collection. (D) General Operations - 1. Complaint ticket, E-ticket generation, helpdesk operation & uses. 2. Data analysis & report generation. (E) Operation on dash board - Introduction of AWAYA phone system , I-call center & I-Dispatcher software of Dial-100 call center. (F) Feedback & public response , Cyber security precautions.	70	20	PRTS Faculty / BVG Company
		(O) CCTV	(A) City surveillance system – 1- CCTV System - introduction, network architecture, operation and uses. 2- CCTV System project implementation process. 3- Types of cameras- (used in cctv system) specifications field data handling (preservation of footage) and working control. 4- Familiraization -of CCTV field units /outdoor equipment, indoor equipments/Control room equipment handling & maintenance. 5- Distt./City CCTV police control room working. 6- SCMRC control room monitoring and working. 7- Use of system softwares -VMS, NMS, Command & Control, Helpdesk working, CCTV Networking basics and SOP. 8- ANPR system - Operational uses of ANPR camera & its data. 9- Precautions during system installation- Location, Equipment and system etc. checking before & after installation of CCTV system, Fault detection. 10- RLVD system - Operational command & control. 11- Mobile surveillance vehicle viewing and retrieving video. (B) PS CCTV System – system features, network architecture, working and operation.	40	20	PRTS Faculty / Honeywell Company
		(P) Video Conferencing (VC)	1. Introduction , Term Definitions 2. Parts(division & components), Equipments & their specifications 3. Modes of video conferencing 4. Component functions 5. Remote control button & there use 6. Installation procedure of video conferencing 7. Benefits of video conferencing.	05	04	PRTS Fac / Honeyv Compa
		(Q) Unmanned Aerial Vehicle (UAV)	1. General Overview & advantages of UAV 2. Main features of (DRONE) Dynamic Remotely Operated Navigation Equipment 3. Performance parameters, General Specifications & brief software introduction 4. Surveillance tools & parts of UAV 5. Application areas 6.	10	05	DSP(R) Kum Sirothi PRTS F

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			Deployment method 7. Handling of UAV precautions before, after & during UAV flight 8. Government regulations regarding UAV flight.			
		(R) Biometric Attendance System (BAS)	1. Overview 2. Working Procedure , Functional requirements for BAS uses. 3. Advantages of BAS in organisations. 4. Registration method, change of nominated registration (on transfer and other cases) 5. Types of reports, report prepration and analysis. 6. Precautions in installation of BAS Machine	05	03	PRTS Faculty
7	Modern technology in police commn.	(S) Modern technology in police commn.	**S1.** IDT System: Basic Architecture For Range, Zone & State Level. Operation of IDT System, Maintenance. Of integral parts of the system and basic Trouble Shooting's Repairing of MODEM & CPU.		05	PRTS Faculty
			S2. Upcoming Technologies Like Radio Mobile Software, Circuit Designers, Software Define Radio's, Basic Concepts & Its usefulness. 19.3 Technology upgrade in Police HHMD, DFMD, Bio–Scanners, Close circuit Camera Networking, GPRS Systems, LAN and WAN at Police Stations Automation & Networking computer assistance in traffic Data Base, Traffic Electronic Equipments (Traffic Signalling, Speed Check Laser Gun. Digital Breath Analysers.) Training simulators for shooting & driving criminal Data recording and Sharing Procedures, Inventory management in Police Lines.		03	PRTS Faculty
			S3. Communication In VIP Duties: Basic Importance, Procedural Functioning, Radio Procedures For VIP Duties. Necessary Guidelines/Norms Before VIP Program. Communication Security Measures. Feasibility of communication, Channel Discipline, Privacy coded call sign of Protocol.	20	03	PRTS Faculty
8	Radio Operating Theory & Procedure	(T) Radio Operating	1. PRC management and familiarity with different modes of transmission. 2. Radio Procedure Complete new procedure (D.C.P.W. addition) Duties of OIC (R) watch and S.S.O., Signal security, P.W.C.C. and Procedure. 3. Communication security - Handling of C.S.D. / Cipher document. 4. Operating rules, Radio log, Recording of message, Handing and taking over charge the watch. 5.Out message, In message, Through message, N.R slip, delay memo. 6. Call and call sign, preliminary calling and answering, establishing communication, discipline to be exercised when calling and answering, offering message. 7. Transmitting message, Reception of message. Identification, Checks, Repetitions and correction check, Repetition and correction of group count, Control working break in working .Time signal, Emergency silence, Authentication. 8. Basic knowledge of communication security, PWCC.		30	PRTS Faculty
		(U) Handling of Cipher documents and commn.	Introduction & definition of security, Types of message, Security destruction maintenance of records etc. General idea of wireless operating license procedure, scrabbling techniques, communication breaches, cypher software.		05	PRTS Faculty
9	Organiza-tions Functiona-lity	(V) Organization Details With job profile	**V1.** Introduction of MP Police Telecom Organization: Role Functions & Duties of RHQ. Introductions of RHQ sections (Commn. PLG, STR, PRC, ADMN, Workshop Etc.) Frequency Organizational Branches Of M.P. Police Telecom Org. (Zones, District Level, Control Room Operation, At PSS). Role of DCPW, CPRTI & Cipher Wing	20	03	PRTS Faculty

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			In Organization. Coordination Process Among Neighbouring States. Administration & Monitoring of Communication by government Organization.			
			V2. Personnel Administration and discipline Welfare leave, Service records, Job appraisals, Work Appreciations/Recommendations Mode. Organizational Enquiries: PE, DE, Store Enquiries, Disciplinary Actions . **V3.** G.O.P. & Telecom Manual, Inspections, Physical Verification of Radios, Loss of set, **V4.** Licensing Process of Radios, Communication Breech and Communication Monitoring Stations. Detection of Unauthorized stations / Transmitters. Illegal Transmission Detection (Naxal Operation)	20	10	RHQ / PRTS Faculty
10	**Behavioral Training**	**(W) Behavioral Training**	1 Motivation , Communication and Leadership, Protocol and Liaison with Local Authorities. Interpersonal communication with other units/ branches.	20	04	Mr. Gourav Rawal Mob. No. 9926260023
11	**Technical Exposures Visit**	**(X) Technical Exposures**	1. Visit to RRCAT, Rajendra Nagar Indore . 2. State Control room Dial-100 Bhopal 3. CCTV Control Room Indore 4. Police Trunking system Indore	-	-	-
12	**Communication Skills**		Brief media reporting , Social Media - Brief messaging and event report writing.	01	02	Mr. Akashay Kumar Jadhav Mob. No. 8225959966 + PRTS Faculty
13	**Physical Fitness**	**Physical Fitness Measures**	Physical fitness , Yoga , Outdoor P.T.	50	132	PRTS Faculty

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PRACTICAL TRAINING SYLLABUS FOR S.I. (RADIO) TECH.

S. No.	Practical list for basic training program	Total Classes (300)	Faculty/ Resource
1	Cold testing of Resistance, Diode, Capacitor, Inductors, Basic TTL IC's and Transistors, including determination of value of RCL, Identification of Anode, Cathode, Emitter, Base, Collector etc.	06	PRTS Faculty
2	Fabrication of RC coupled amplifier and study the frequency response of circuit with gain.	10	
3	Study the various types of Transformers and Coils.	06	
4	Fabrication of half and full wave rectifiers, fabrication of 5 Volt Power Supply, Study of basics SMPS circuitry.	08	
5	Circuit study of difference SMPS being used in department and circuit tracing as per service manuals .	08	
6	Fault diagnosis of 6 to 72 Volt secondary battery chargers and its repairing methodology.	10	
7	Study of different measuring instruments multi meter , SWR meter, SG meter , CRO, RF test meter.	12	
8	Use and operation of Radio Test Set as per user manual .	10	
9	Circuit tracing and study of different sections of Motorola GM 300 Radio Set as from service manuals.	25	
10	Circuit tracing and study of different sections of Motorola GM 338 radio set as from service manuals.	25	
11	Circuit tracing and study of different sections of GP 328/338 Radios.	25	
12	Physical identification of different types of antennas and its basic tuning.	08	
13	Installations of 60/80 feet mast for vhf antenna with identification of its total accessories and use of derrick, pulley, base rope, laying and erection with safety precautions.	12	
14	Installation of HF antennas including antenna matching unit and alignments of direction with the help of GPS and compass.	12	
15	Installation of temporary VHF/HF Radio Station in a view to V.V.I.P. Duties	06	
16	Fabrication of repeaters (Patch,1-D,2-D) using Universal Patch Repeater Chord.	20	
17	Measurement of squelch and sensitivity voltages and its tuning and adjustment as per requirement of communications.	15	
18	Radio programming of different radios.(VHF/Radio Trunking)	20	
19	Use of Radio Mobile Software in radio coverage calculation and LOS problems analysis	20	
20	Installation of POLNET, IDT, Radio Mobile Software in computer and its basic configuration.	15	
21	Repeater programming of GM 300/338 , enabling PTT, CSQ and auto on features of radio	12	
22	Auto PCB cut switch fabrication and use in Solar Panel and power supply	10	
23	Multimode charge controller for Solar System.	05	

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Field training

Theory paper	Unit name	Syllabus details	Total marks	Total classes
1	Work profile: in charge radio district	In charge radio overview:field attachment with incharge radio district (6 week) distt . Bhopal , control room (except R.H.Q.) , indore , gwalior ,jabalpur , ujjain, sagar , hoshangabad , rewa , balaghat , jhabua , chindwara , khargone , murena , guna and dhar . special visit to indore and bhopal control room for all trainees.	50	30
2	Work profile : incharge radio section	Incharge section officer overview : field attachment with section in charge in telecommunication hq Bhopal , purchases, planning , workshop ,fitter , admin+m.t. and prc	50	30
3	Overview of store working	Understanding of state headquarter stores working	25	15
4	Overview of main	Understanding of main office : ta,medical , src , leave , building and pay . technical visit to ind/bpl control room.	25	15
		total	150	90
		प्रोजेक्ट वर्क	150	
		तकनीकी साक्षात्कार	50	
		निदेशक के अंक	50	
		कुल अंक	250	

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