EASTERN RAILWAY
(Personnel Department)
17, N.S. Road, Kolkata - 700001

Serial Circular No. 121/2025

No. E.740/2/Misc/Pt. X

Kolkata, dated 09/10/2025

ALL CONCERNED
(as per standard list)

Sub: Revised Training Modules of Non- Gazetted Staff of Signal and Telecommunication Department.

****

A copy of Ministry of Railways (Railway Board) letter bearing File no. 2024/E(Trg.)/41/7 dated 24/09/2025 **(RBE No.99/2025)** on the above cited subject is circulated herewith for information and further necessary action. A copy of Board's earlier letter dated 05/06/2020 **(RBE No. 42/2020)** mentioned therein was circulated under this office serial no. 49/2020 dated 10/06/2020.

DA: As above.

09.10.25

(Md. Tarique)
Dy.Chief Personnel Officer (HQ)
for Pr. Chief Personnel Officer
Phone No. 24122 (Rly.)
Email Id:tarique.mohammed@gov.in

RBE No.99/2025

भारत सरकार / **GOVERNMENT OF INDIA**
रेल मंत्रालय / **MINISTRY OF RAILWAYS**
(रेलवे बोर्ड / **RAILWAY BOARD**)

2024/E(Trg.)/41/7 **New Delhi, Dated: As signed**

The General Managers,
All Indian Railways & PUs.

The Director Generals/Director
All Centralized Training Institutes,
RDSO/Lucknow.

Sub:- Revised Training Modules for Non Gazetted Staff of Signal and Telecommunication Department.

Vide Board's letter no. E(MPP)/2019/3/50 dtd. 05.06.2020 (RBE No. 42/2020) training modules for Non-Gazetted Staff of Signal and Telecommunication Department. were circulated to all Zonal Railways/ PUs etc.

2. IRISET has now submitted the revised training modules for training of Non Gazetted Staff of Signal & Telecommunication Department, which have been reviewed in Board's Office and approved by the Board (Member/Infrastructure).

3. Accordingly, the revised combined training module for Non Gazetted Staff of Signal and Telecommunication Department has been scanned and uploaded under **Non Gazetted Training Circulars** on 'Indian Railways' website and can be viewed or downloaded from railnet.

Kindly acknowledge receipt.

D.A.:As Above.

Digitally signed by
Neelam Sharma
Date: 24-09-2025
10:38:07

(Neelam Sharma)
Dy.Director-II, Estt. (Training)
Railway Board.
Ph No. 011-23047105
Email: ngtraining2024@gmail.com

2024/E(Trg.)/41/7 **New Delhi, dated: As Signed**

Copy to:

1) The General Secretary, NFIR, 3 Chelmsford Road, New Delhi for information (Copy may be downloaded from Non-Gazetted Training Circulars/Railnet/Internet).

2) The General Secretary, AIRF, 4 State Entry Road, New Delhi for information (Copy may be downloaded from Non-Gazetted Training Circulars/Railnet/Internet).

3) The Secretary General, FROA, R.No.256-A, Rail Bhavan, New Delhi for information (Copy may be downloaded from Non-Gazetted Training Circulars/Railnet/Internet).

4) The Secretary General, IRPOF, R.No.268, Rail Bhavan, New Delhi for information (Copy may be downloaded from Non-Gazetted Training Circulars/Railnet/Internet).

5) All Members, Department Council & Secretary Staff side National Council 13-C, Feroz shah Road, New Delhi (Copy may be downloaded from Non-Gazetted Training Circulars/Railnet/Internet).

6) The Secretary General, AIRPF Association, Room No.256-D, Rail Bhavan, New Delhi (Copy may be downloaded from Non-Gazetted Training Circulars/Railnet/Internet).

7) General Secretary, All India SC & ST Railway Employees Association, 171/B-3, Basant Lane Railway Colony, New Delhi (Copy may be downloaded from Non-Gazetted Training Circulars/Railnet/Internet).

Digitally signed by
Sadhna Aggarwal
Date: 24-09-2025
11:01:39

For Principal Executive Director (IR) /Railway Board

Copy to:

i) PS & ED(PG) to MR, MoSR (S) & MoSR (R)

ii) PSO/Sr.PPS to CRB, MF, M(Infra.), M(TRS), M(O&BD), DG(HR), DG(RHS) & DG(RPF)

iii) Sr.PPS/PPS/PS to AM(Budget), AM(CE), AM(C&IS), AM(Comml.), AM(E&HM), AM(Fin), AM(HR), AM(L&A), AM(Mech.), AM(Plg.), AM(Project), AM(PU), AM(RS), AM(Sig.), AM(Staff), AM(Traction), AM(T&C), AM(Tele), AM(TT), AM(Works), PED(Vig.), PED(Safety), PED(Coaching), LA,

iv) ED(Plg.), ED(Accts.), EDCE(B&S), EDCE(G), EDCE(Plg.), ED(CHG), ED(CC), ED(C&IS), ED(E&R), EDEE(Dev), EDEE(G), EDEE(M), EDEE(RS), EDE, ED(RRB), PEDE(N), EDE(Res), EDF, EDF(B), EDF(X)I, EDF(X)II, ED(H), JS(C), EDME(Chg.), EDME(Fr.), EDME(PU&W), ED(PC)I, ED(PC)II, EDRE, ED(Safety), ED(Safety)-II, IG./RPF(Hqs), ED(Sig.), ED(SP), EDRS(G), EDRS(S), ED(TD), EDTC(R), EDCE(P), ED(PM), ED(FM), EDPG, EDTT(F), EDTT(S), EDV(E), EDV(Elect), EDV(T), EDVE(S), ED(W).

v) Chief Commissioner of Railway Safety, 3rd Floor, TA Office, State Entry Road, New Delhi-55.

vi) E(NG)I, E(NG)II, E(G), F(E)I, F(E)II, F(E)III, E(SCT)I, E(SCT)II branches of Railway Board.

Training Modules for Group C & D Staff of S&T Department

Indian Railways Institute of Signal Engineering & Telecommunications
Secunderabad

August 2025

Training Modules of Gr-C & D Staff of S&T Department

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Summary Sheet
(Training Modules for JE/SSE at IRISET)

Sl. No.	Course Description	Course Code	Duration (in weeks)					Marks				
			Phase I	Phase II	Total	Zonal Railways	Grand Total	Phase I	Phase II	Total	Zonal Railways	Grand Total
1	Initial Course for App. JE (Signal)	ISJE	14	14	28	24	52	1000	1000	2000	1000	3000
2	Initial Course for App. JE/SSE (Design)	IDSJE	9	9	18	34	52	1000	1000	2000	1000	3000
3	Initial Course for Promoted JE (Signal)(Intermediate)	ISPE	8	9	17	17	34	900	1000	1900	600	2500
4	Refresher Course for JE/SSE (Signal & Design)	RSSJE	4		4	-	4	120		120	-	120
5	Initial Course for App. JE (Telecom)	ITJE	14	14	28	24	52	1000	1000	2000	1000	3000
6	Initial Course for Promoted JE(Telecom) (Intermediate	ITPE	8	9	17	17	34	900	1000	1900	600	2500
7	Refresher Course for JE/SSE(Telecom)	RTSJE	4	4	-	4	4	120		120	-	120

Summary Sheet
(Training Modules for S&T Technicians and Helpers at STTCs)

S. No.	Course Description	Course code	Duration (in weeks)					Marks				
			Phase I	Phase II	Total	Zonal Railways	Grand Total	Phase I	Phase II	Total	Zonal Railways	Grand Total
1	Initial course for Apprentice Technician(Signal) Grade -I	SNT2A	12	10	22	56	78	800	600	1400	600	2000
2	Initial course for Apprentice Technician(Signal) Grade -III	SNT2B	12	10	22	30	52	800	600	1400	400	1800
3	Foundation course for Promotee Technician (Signal) Grade-III	SNT9	10		10	0	10	600		600	0	600
4	Refresher course for Technician (Signal)	SNT4	4		4	0	4	200		200	0	200
5	Refresher course for Helpers (Signal)	SNT6A	2		2	0	2	200		200	0	200
6	Induction to Unskilled Helpers - Signal & Telecom	SNT1	4		4	0	4	200		200	0	200
7	Initial course for Apprentice Technician(Telecom) Grade -III	SNT3	8	9	17	35	52	450	450	900	500	1400
8	Refresher course for Technician (Telecom)	SNT5	4		4	0	4	200		200	0	200
9	Foundation course for Promotee Technician (Telecom) Grade-III	SNT10	8		8	0	8	450		450	0	450
10	Refresher course for Helpers (Telecom)	SNT6B	2		2	0	2	200		200	0	200

Signalling Courses

Courses for JE/SSE (Signal & Design)

Initial Course for App.JE/SSE (Signal) (Course code – ISJE)

Nature of Training	Training at	Duration	Marks
Institutional training	IRISET	Phase I : 14 Weeks Phase II: 14 Weeks (Sub-Total): 28 weeks	2000
Field training	Zonal Railways	24 Weeks	1000
Total		**52 Weeks**	**3000**

Overview of Phase I

A. Course Programme - 14 weeks

Item	Details	Hours
1	Briefing, Registration & Open house discussion	03
2	Theory	240
3	Theory Examination	15
4	Practical	130
5	Practical examination	16
6	Miscellaneous (Project Allotment)	04
7	CD Spare/Holidays	12
Total		**420**

B. Summary of Evaluation

Sl No.	Topic	Hours	Marks
1	Theory examination	15	500
2	Practical Examination	16	400
3	Project Allotment	04	----
4	CD's assessment	_	100
Total		**35**	**1000**

C. Theory

Sl. No.	Sub Code	Subject	Hours	Marks
1	G1(A)	Etiquette & Conduct	2	-
	G1 (B)	Gender Sensitization	2	-
	G1 (C)	Ethics in working , Personal Safety, Development of Leadership skills & Motivation, Decision making, communication & Effective Technical writing skills, stress Management, Inter-departmental coordination	8	-
2	S1	Basics of Signal Engineering	22	60
3	S2	Principles of Interlocking, Selection Circuits and Control Tables	12	40

Sl. No.	Sub Code	Subject	Hours	Marks
4	S-10	Colour Light and Automatic Signalling	16	25
5	S12	Relay Interlocking - Metal to Carbon Relays (British)	30	60
6	S-13	Circuit Practices-British	26	40
7	S18	Electronic Interlocking	26	100
8	S19	Signalling Relays and Cables	14	40
9	S-20	Slot Circuits, Lifting Barriers & Key Transmitter	12	10
10	S-21	Electric Point Machine	18	30
11	S-22	Block working: Single Line –Push button PTJ Type and SGE double line Block Instruments	20	35
12	S-23	Tokenless Block Instrument for Single Line-FM Diado	08	15
13	S-25	Train Detection Systems-I (DC Track Circuits, Coded AFTC and SSDAC)	24	45
		Total	**240**	**500**

D. Theory examinations (Subjective-60% & Objective-40%)

Sl. No.	Exam	Exam Sub Code	Hours	Marks
1	Exam - 1	S1 & S19	3	100
2	Exam - 2	S2 ,S23 & S25	3	100
3	Exam – 3	S10,S20, S21 & S22	3	100
4	Exam - 4	S12 &S13 (Subjective Only)	3	100
5	Exam - 5	S18	3	100
		Total	**15**	**500**

E. Practicals

Sl. No.	Name of Lab	Hours
1	Outdoor Signalling lab	38
2	Electrical Signalling Lab	50
3	Block Lab	22
4	Train Detection Lab	14
5	E- Learning	02
6	Moodle Training	02
7	Computer Lab (AutoCAD)	02
	Total	**130**

F. Practical Examinations

Sl. No.	Exam	Name of the Lab	Exam Pattern	Hours	Marks
1	P. Exam 1	Outdoor Signalling Lab	Record Sheet (20%), Experiment (50%) & Viva-Voce (30%)	4	100
2	P. Exam 2	Electrical Signalling Lab		4	100
3	P. Exam 3	Block Lab		4	100
4	P. Exam 4	Train Detection Lab		4	100
	Total			**16**	**400**

G. Others

Sl.No.	Name of Lab	Hours
1	Project work Allotment	04
Total		

Overview of Phase II

A. Course Programme - 14 weeks

Item	Details	Hours
1	Briefing, Registration & Open house discussion	03
2	Theory	262
3	Theory Examination	15
4	Practical	88
5	Practical Examination	20
6	Miscellaneous (Study Tour- Optional & Project Presentation)	14
7	Local visit	10
8	CD Spare/Holidays	08
Total		**420**

B. Summary of Evaluation

Sl No.	Topic	Hours	Marks
1	Theory Examination	15	500
2	Practical Examination	20	300
3	Project Presentation	08	100
4	CD's assessment	_	100
Total			**1000**

C. Theory

Sl.No.	Sub Code	Subject	Hours	Marks
1	S7	Signalling in 25 KV AC Electrified Section	06	20
2	S8	Signalling General	22	50
		Rolling Block programme	02	
3	S9	Power Supply for Signalling, Earthing and Lightning & Surge protection arrangements	16	20
4	S11	Data Logger & RDPMS	08	15
5	S14	Relay Interlocking - Metal to Metal Relays (Siemens)	06	20
6	S16	RRI Siemens	14	60
7	S17	Circuit Practice-Siemens	04	20
8	S18A	Electronic Interlocking Design	36	25+30 (Practice)
		Standardized typical circuits for Electronic Interlocking	04	
		Generation of RCC through SigDATE	02	
9	S24	Intermediate Block Signalling, Block Proving Axle Counters & UFSBI ,SSBPAC	14	40

Sl.No.	Sub Code	Subject	Hours	Marks
10	S26	Train Detection Systems-II (MSDAC)	10	40
		Automatic Block Signalling With MSDAC	08	
11	S27	Signalling Safety	06	15
12	S28	Kavach: Indian Rly Automatic Train Protection System	30	30
13	S29	Railway Signalling - Installation and Quality Practices	08	15
14		Signalling Maintenance Management System (SMMS)	04	
15	TS1	Telecom for Signalling	12	20
16	G2	Rajbhasha	02	0
17	G3	Disaster Management, Accident Communication & Joint Findings of Accident Inquiry	04	0
18	G4	Establishment & DAR	10	25
19	G5	Accounts & Stores	10	25
20	G6	Tenders and Contracts	8	20
21	G7	Vigilance	02	0
22	G8	Quality and Reliability Standards	04	10
23	EL	Extension Lectures (P-Way, C&W, First Aid & Fire Fighting, OHE)	10	0
		Total	**262**	**500**

D. Theory Examinations

Sl. No.	Exam	Exam Sub Code	Hours	Marks
1	Exam – 1	S9,S24 & S26	3	100
2	Exam – 2	S14,S16 &S17	3	100
3	Exam – 3	S18A, S28,& S11	3	100
4	Exam – 4	S7,S8, S27,& S29	3	100
5	Exam – 5	TS1,G4, G5,G6 &G8	3	100
	Total		**15**	**500**

E. Practicals

Sl. No.	Name of Lab	Hours	Marks
1	Outdoor Signalling lab	14	60
2	Electrical Signalling Lab	26	60
3	Block Lab	18	60
4	Train Detection Lab	14	60
5	Kavach Lab	08	60
5	Optical Fiber Cable Lab	04	-
6	Outdoor Telecom lab	02	-
7	Control Lab	02	-
	TOTAL	**88**	**300**

F. Practical Examination

Sl.No.	Exam	Name of the Lab	Type	Hours	Marks
1	P.Exam 1	Outdoor Signalling Lab	Record Sheet(20%), Experiment (50%)& Viva-Voce (30%)	4	60
2	P.Exam 2	Electrical Signalling Lab		4	60
3	P. Exam 3	Block Lab		4	60
4	P. Exam 4	Train Detection Lab		4	60
5	P. Exam 5	Kavach Lab		4	60
	Total			**20**	**300**

G. Others

Sl.No.	Name of Lab	Hours
1	Study Tour (Optional)	6
2	Project Presentation	8
3	Local visit to Station Kavach Installation, Kavach NMS and FRACAS, Loco Kavach Footplate etc.	10
Total		**24**

Initial Course for Apprentice SSE/JE (Design) (Course code – IDSJE)

Name of training	Training at	Duration	Marks
Institutional training	IRISET	Phase I - 9 weeks	**2000**
		Phase II – 9 weeks	
		Sub-total - 18 weeks	
Field training	Zonal Railways	34 weeks	**1000**
Total		52 weeks	**3000**

Overview of Phase – I

A. Course Program – 9 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	03
2.	Theory	176
3.	Theory Examination	15
4.	Practicals	52
5.	Practicals Examination	10
6.	Miscellaneous (Project work allotment)	02
7.	CD spare	12
	Total	**270**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	15	500
2.	Practicals	10	400
3.	CD's evaluation	-	100
	Total	**25**	**1000**

C. Theory

S. No.	Code	Subject	Hours	Marks
1	G1	Etiquette, Conduct, Ethics, Gender Sensitization, Personal Safety, Personality Development & Communication skills	04	0
2	S1	Basics of Signaling Engineering	16	60
3	S2	Principles of Interlocking, Selection Circuits and Control Tables	12	50
4	S10	Colour Light and Automatic Signaling.	08	30
5	S12	Relay Interlocking - Metal to Carbon Relays (British)	30	60
6	S13	Circuit Practices – British	22	40
7	S18	Electronic Interlocking	20	40
8	S18A	Electronic Interlocking Design	24	*60
9	S19	Signalling Relays and Cables	06	25
10	S20	Slot Circuit, Lifting Barriers & Key Transmitter	04	15
11	S21	Electric Point Machine	04	20
12	S22	Block working: Single Line –Push button PTJ Type and SGE double line Block Instruments	10	40
13	S23	Token-less Block Instrument for Single Line-FM Diado	08	30
14	S25	Train Detection Systems-I (DC Track Circuits, Coded AFTC and SSDAC)	08	30
		Total	**176**	**500**

D. Theory Examinations (Subjective-60% & Objective-40%)

S. No.	Examination	Subjects	Hours	Marks
1	Exam - 1	S1, S19, S20	3	100
2	Exam - 2	S2, S21, S25	3	100
3	Exam - 3	S10, S22, S23	3	100
4	Exam - 4	S12, S13 (Only subjective)	3	100
5	Exam - 5	S18 & S18A (Theory)	2	70
		S 18A (Practice)	1	30
		Total	**15**	**500**

E. Practicals

S. No.	Practicals	Hours
1	Outdoor Signalling Lab	10
2	Electrical Signalling Lab	16
3	Block Signalling Lab	06
4	Train Detection Lab	06
5	Design Lab(AutoCAD)	10
6	E- Learning	02
7	Moodle Training	02
	Total	**52**

F. Practical Examinations

S. No	Name of the Lab	Type	Hours	Marks
1	Outdoor signalling lab	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	2	100
2	Electrical Signalling Lab		2	100
3	Block Lab		2	50
4	Train detection Lab		2	50
5	Design Lab		2	100
		Total	**10**	**400**

G. Others

S. No.	Item	Hours
1	Project work allotment	2

Overview of Phase – II

A. Course Program – 9 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	02
2.	Theory	170
3.	Theory Examination	15
4.	Practicals	54
5.	Practicals Examination	10
6.	Miscellaneous (Study tour – optional)	13
7.	CD spare	06
	Total	**270**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	15	500
2.	Practicals	10	300
	Project presentation	-	100
3.	CD's evaluation	-	100
	Total	**25**	**1000**

C. Theory

S. No.	Code	Subject	Hours	Marks
1	S7	Signalling in 25KV AC Electrified Section	04	30
2	S8	Signalling General	13	40
		Rolling Block programme	01	
3	S9	Power Supply for Signalling, Earthing and Lightning & Surge protection arrangements	04	30
4	S11	Data Logger &RDPMS	04	20
5	S14	Relay Interlocking - Metal to Metal Relays (Siemens)	06	30
6	S16	RRI Siemens	12	40
7	S17	Circuit Practice-Siemens	8	30
8	S18 A	Electronic Interlocking Design	24	100
		Standardized typical circuits for Electronic Interlocking	04	
		Generation of RCC through SigDATE	02	
9	S-24	Intermediate Block Signalling, Block Proving Axle Counters & UFSBI, SSBPAC	06	30
10	S-26	Train Detection Devices - II(MSDAC)	06	50
		Automatic Block Signalling With MSDAC	04	
11	S-27	Signalling Safety	02	0
12	S-28	Kavach: Indian Rly Automatic Train Protection System	36	100
13	S-29	Railway Signalling Installation and Quality Practices	04	0
		Signalling Maintenance Management System (SMMS)	02	
14	TS1	Telecom for Signalling	04	0

S. No.	Code	Subject	Hours	Marks
15	G2	Rajbhasha	02	0
16	G3	Disaster Management, Accident Communication & Joint findings of Accident inquiry	02	0
17	G4	Establishment & DAR	04	0
18	G5	Accounts & Stores	03	0
19	G6	Tenders and Contracts	03	0
20	G7	Vigilance	02	0
21	G8	Quality and Reliability Standards	02	0
22	EL	Extension Lecture (P-Way, C & W, Fire Fighting & First Aid)	06	0
		Total	**170**	**500**

D. Theory Examinations (60% - Subjective & 40% -Objective)

S. No.	Examination	Subjects	Hours	Marks
1	Exam – 1	S7, S8 & S9	3	100
2	Exam – 2	S11, S24, S26	3	100
3	Exam - 3	S14, S16 & S17 (Only Subjective)	3	100
4	Exam - 4	S28	3	100
5	Exam - 5	S18A	3	100
		Total	**15**	**500**

E. Practicals

S. No.	Practicals	Hours
1	Outdoor Signalling Lab	04
2	Electrical Signalling Lab	10
3	Block Lab	04
4	Train Detection Lab	04
5	Kavach Lab	14
6	Train Traffic Control Lab	02
7	Transmission Systems Lab (OFC)	02
8	Design Lab (Including AutoCAD, SigDATE, e-DAS, Documentation)	14
	Total	**54**

F. Practical Examinations

S. No.	Labs	Type	Hours	Marks
1	Outdoor Signalling Lab	Record sheets (20%) Experiments (50%) viva-voce (30%)	2	60
2	Electrical Signalling Lab		2	60
3	Block Lab		2	60
4	Train Detection Lab		2	60
5	Kavach Lab		2	60
6	**Total**		**10**	**300**

G. Others

S. No.	Item	Hours
1	Study tour (Optional)	13

Initial Course for Promoted JE/SSE (Signal)(Course code – ISPE)

Note: The initial training of JE(Signal) promoted under 20% LDCE quota is held at IRISET. The initial training of JE(Signal) promoted under promotional quota is conducted at Zonal Training Centres with the same training module given below.

Nature of Training	Training at	Duration	Marks
Institutional training	IRISET	Phase I : 8 Weeks Phase II: 9 Weeks (Sub-Total): 17 weeks	1900
Field training	Zonal Railways	17 Weeks	600
Total		**34 Weeks**	**2500**

Overview of Phase I

A. Course Programme – 8 weeks

Item	Details	Hours
1	Briefing, Registration & Open House Discussion	03
2	Theory	132
3	Practical	62
4	Theory Examination	15
5	Practical examination	12
6	Miscellaneous (Project Allotment)	04
7	CD Spare/Holidays	12
Total		**240**

B. Summary of Evaluation

Sl. No.	Topic	Hours	Marks
1	Theory examination	15	500
2	Practical Examination	12	300
3	Project Allotment	04	--
4	CD's assessment	_	100
	Total	**31**	**900**

C. Theory

Sl.No.	Sub Code	Subject	Hours	Marks
1	S1	Basics of Signal Engineering	10	40
2	S2	Principle of Interlocking, Selection Circuits and Control Tables	8	40
3	S10	Colour Light and Automatic Signalling	10	40
4	S12	Relay Interlocking - Metal to Carbon Relays (British)	20	60
5	S13	Circuit Practices – British	14	40
6	S18	Electronic Interlocking	26	100
7	S19	Signalling Relays and Cables	03	20
8	S20	Slot Circuit, Lifting Barriers & Key Transmitter.	03	20
9	S21	Electric Point Machine	10	40
10	S22	Block working: Single Line –Push button PTJ Type and SGE double line Block Instruments)	12	40
11	S23	Tokenless Block Instrument for Single Line-FM Diado	6	20
12	S25	Train Detection Systems -I (DC Track Circuits, Coded AFTC and SSDAC)	10	40
		Total	**132**	**500**

D. Theory Examinations (Subjective - 60% & Objective - 40%)

Sl. No.	Exam	Exam Sub Code	Hours	Marks
1	Exam – 1	S1, S10, S19	3	100
2	Exam - 2	S2,S20, S25	3	100
3	Exam – 3	S21, S22 & S23	3	100
4	Exam – 4	S12, S13(subjective only)	3	100
5	Exam - 5	S18	3	100
		Total	**15**	**500**

E. Practicals

Sl. No.	Name of Lab	Hours
1	Outdoor Signalling lab	10
2	Electrical Signalling Lab.	22
3	Block Lab	10
4	Train Detection Lab	18
5	E- Learning	02
	Total	**62**

F. Practical Examinations

Sl.No.	Exam	Name of the Lab	Exam Pattern	Hours	Marks
1	P.Exam 1	Outdoor Signalling Lab	Record Sheet (20%), Experiment (50%) & Viva-Voce (30%)	3	75
2	P.Exam 2	Electrical Signalling Lab		3	75
3	P.Exam 3	Block Lab		3	75
4	P.Exam 4	Train Detection Lab		3	75
	Total			**12**	**300**

G. Others

Sl.No.	Name of the Lab	Hours
1	Project work Allotment	04
Total		**04**

Overview of Phase II

A. Course Programme – 9 weeks

Item	Details	Hours
A	Briefing, Registration & Open House	03
B	Theory	180
C	Theory Examination	15
D	Practical	42
E	Practical examination	15
F	Miscellaneous (Study Tour- Optional &Project Presentation)	09
G	CD Spare/Holidays	06
Total		**270**

B. Summary of Evaluation

Sl No.	Topic	Hours	Marks
1	Theory examination	15	500
2	Practical Examination	15	300
3	Project Presentation	5	100
4	CD's assessment	_	100
	Total	**35**	**1000**

C. Theory

Sl.No.	Sub Code	Subject	Hours	Marks
1	S7	Signalling in 25KV AC Electrified Section Section	3	20
2	S8	Signalling General	8	40
		Rolling Block programme	2	
3	S9	Power Supply for Signalling, Earthing and Lightening & Surge protection arrangements	8	40
4	S11	Data Logger & RDPMS	7	20
5	S14	Relay Interlocking- Metal to Metal Relays (Siemens)	6	30
6	S16	RRI Siemens	6	30
7	S18A	Electronic Interlocking Design	22	50
		Standardized typical circuits for Electronic Interlocking	2	
		Generation of RCC through SigDATE	02	
8	S24	Intermediate Block Signalling, Block Proving Axle Counters, UFSBI & SSBPAC	10	40

Sl.No.	Sub Code	Subject	Hours	Marks
9	S26	Train Detection Systems-II (MSDAC)	6	40
		Automatic Block Signalling With MSDAC	6	
10	S27	Signaling Safety	4	20
11	S28	Kavach - Indian Railways Automatic Train Protection System	30	50
12	S29	Railway Signalling - Installation and Quality Practice	6	20
		Signalling Maintenance Management System (SMMS)	4	
13	TS1	Telecom for Signalling	10	40
14	G1	Personality Development, Stress Management & Gender Sensitization	6	-
15	G2	Rajbhasha	2	-
16	G3	Disaster Management, Accident Communication & Joint Findings of Accident Inquiry	4	-
17	G4	Establishment & DAR	6	20
18	G5	Accounts & Stores	4	20
19	G6	Tenders and Contracts	4	20
20	G7	Vigilance	2	-
21	G8	Quality and Reliability Standards	2	-
22	EL	Extension Lectures (P-Way, C & W, First Aid & Fire Fighting)	8	-
		Total	**180**	**500**

D. Theory Examinations (Subjective-60%& Objective-40%)

Sl. No.	Exam	Exam Sub Code	Hours	Marks
1	Exam -1	S7,S8&S9	3	100
2	Exam - 2	S11 ,S24 & S26	3	100
3	Exam - 3	S14 ,S16,S27&S29	3	100
4	Exam - 4	S18A,S28	3	100
5	Exam - 5	TS1, G4,G5 &G6	3	100
	Total		**15**	**500**

E. Practicals

Sl. No.	Name of the Lab	Hours
1	Outdoor Signalling lab	04
2	Electrical Signalling Lab.	12
3	Block Lab	04
4	Train Detection Lab	08
5	Kavach Lab	14
	Total	**42**

F. Practical Examinations

Sl.No.	Exam	Name of the Lab	Hours	Marks
1	P.Exam1	Outdoor Signalling Lab	3	60
2	P.Exam2	Electrical Signalling Lab	3	60
3	P.Exam 3	Block Lab	3	60
4	P.Exam 4	Train Detection Lab	3	60
5	P.Exam 5	Kavach Lab	3	60
	Total		**15**	**300**

G. Others

Sl.No.	Name of Lab	Hours
1	Study Tour (Optional)	6
2	Project Presentation	3
Total		**9**

Refresher Course for SSE/JE (Signal & Design) (Course code – RSSJE)

Name of training	Training at	Duration	Marks
Institutional training	IRISET	4 weeks	120

A. Course Program – 4 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	02
2.	Theory	68
3.	Theory Examination	02
4.	Practicals	30
6.	Local visits	12
7.	CD spare	06
	Total	**120**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	3	100
2.	CD's evaluation	-	20
	Total	**3**	**120**

C. Theory

S. No.	Code	Subject	Hours	Marks
1	S-7	Signalling in 25KVAC Electrified Section	1	2
2	S-8	Signalling General	2	6
		Rolling Block programme	1	
3	S-9	Power Supply for Signalling, Earthing and Lightning & Surge protection arrangements	1	2
4	S-10	Colour Light and Automatic Signalling	1	2
5	S-11	Data Logger & RDPMS	1	2
6	S-12/ S14	Relay Interlocking-Metal To Carbon Relays (British) **OR** Relay Interlocking- Metal toMetal Relays (Siemens)	5	10
7	S-18	Electronic Interlocking	4	26
8	S-18A	Electronic Interlocking Design	4	
		Standardized typical circuits for Electronic Interlocking	2	
		Generation of RCC through SigDATE	2	
9	S-21	Electric Point Machine	2	6
10	S-24	Intermediate Block Signalling, Block Proving Axle Counters & UFSBI,SSBPAC	2	6
11	S-25	Train Detection Systems-I(DCTrack Circuits,Coded AFTC and SSDAC)	1	2
12	S-26	TrainDetection Systems-II (MSDAC)	1	4
		Automatic Block Signalling With MSDAC	1	
13	S-27	Signalling Safety	2	4

S. No.	Code	Subject	Hours	Marks
14	S-28	Kavach-Indian Railways Automatic Train Protection System	15	22
15	S29	Railway Signalling Installation and Quality Practices	2	6
		Signalling Maintenance Management System (SMMS)	1	
16	G1(C)	Stress management , Inter-departmental coordination	1	0
17	G-3	(A)Disaster Management & Accident communication	1	0
		(B)Joint findings of Accident inquiry	1	0
18	G-4	Establishment & DAR	2	0
19	G-5	Accounts & Stores	2	0
20	G-6	Tenders and Contracts	2	0
21	G-7	Vigilance	2	0
22	G8	Quality and Reliability Standards	2	0
23	EL	Extension Lecture(P-Way)	2	0
24	TS1	Telecom for Signalling	2	0
		Total	**68**	**100**

D. Theory Examinations

S. No.	Examination	Subjects	Hours	Marks
1	Subjective	S12/S14, S18&S18A, S28	01	30
2	Objective	S7, S8, S9, S10, S11, S21, S18, S18A, S24, S25, S26, S27, S28, S29	01	70
3	Objective	Moodle practice exam	01	-
4		**Total**	**03**	**100**

E. Practicals

S. No.	Practicals	Hours for SSE/JE (Signal)	Hours for SSE/JE (Design)
1	Electrical Signalling Lab	12	12
2	Block SignallingLab	4	0
3	Outdoor Signalling Lab	4	0
4	Train Detection Lab	4	4
5	Kavach Lab	6	6
6	Auto CAD Lab	0	8
8	**Total**	**30**	**30**

F. Miscellaneous

S. No.	Item	Hours
1.	Local visit to Station Kavach installation, Kavach NMS & FRACAS, Loco Kavach Foot Plate etc.	12

Additional topics to be covered in training courses of Signal Supervisors in compliance to Railway Board's letter No. 2013/Sig/IRISET/Trg/Part1(efile3318098) dt. 28.07.2025

S.No.	Topic	Subject with code
1	Duty list as per IRSEM	S8-Signalling General
2	Earthing and Bonding as per RDSO guidelines	S18 – Electronic Interlocking & S29-Railway Signalling Installation and Quality Practices
3	In built Block working in EIs	S18-Electronic Interlocking
4	AFDAS-Maintenance and Testing	S29- Railway Signalling Installation and Quality Practices
5	NMS working of various Signalling systems	S11-Data logger & RDPMS, S18- Electronic Interlocking, S26-Train Detection Devices-II(MSDAC) & S28- Kavach: Indian Railway Automatic Train Protection System
6	Scrutiny of EI system Error Logs (hands-on practical)	This is to be covered in EI laboratory sessions.

Signalling Courses for Technicians & Helpers

Initial Course for Apprentice Technician (Signal) Grade -I (Course code – SNT2A)

Name of training	Training at	Duration	Marks
Institutional training	STTC	Phase I - 12 weeks	800
		Phase II – 10 weeks	600
		Sub-total - 22 weeks	1400
Field training	Zonal Railways	56 weeks	600
Total		**78 weeks**	**2000**

Overview of Phase – I

A. Course Program – 12 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	220
3.	Theory Examination	15
4.	Practicals	170
5.	Practicals Examination	8
6.	Miscellaneous (Study tour – Optional)	6
7.	CD spare	10
	Total	**432**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	15	500
2.	Practicals	8	200
3.	CD's evaluation	–	100
	Total	23	800

C. Theory

Code	Subject	Hours	Marks
ST-01	General	6	10
ST-02	Cleanliness and environment conservation, Personal Safety, Fire Prevention, First Aid	4	10
ST-03(a)	Measuring Instruments & a use of hand & portable tools.	4	10
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning, Surge protection devices & Earthing	16	25
ST-05(b)	Basic Electricity, Magnetism and Digital Electronics	4	10
ST-15	Basic Concepts of Signalling	20	70
ST-18	Inter-slotting, Electrical Key Transmitter and Electrical Point Detector	4	10
ST-19	Relays, Cables and Earth Leakage Detector (ELD)	14	40
ST-20	Track Circuits	12	25
ST-21	Colour Light Signals	6	10
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	16	40

Code	Subject	Hours	Marks
ST-23(a)	Panel Interlocking (British), RDSO Standardised Typical circuits	24	35
ST-23(b)	Panel Interlocking (Siemens)	10	20
ST-25 (b), (c)	Push button PTJ, Handle Type FM Daido Single line token-less block instruments and SGE Double Line Block Instrument	30	100
ST-28	Data logger, RDPMS and SMMS	12	15
ST-30	LC Gate interlocking	6	20
ST-31	EI & SigDATE	32	50
	Total	**220**	**500**

D. Theory Examinations

Examination	Subjects	Hours	Marks
Exam - I	ST-1,2,3(a) 4(a), 5(b), 20, 21.	3	100
Exam - II	ST-15, 18, 30.	3	100
Exam - III	ST-25 (b), (c)	3	100
Exam - IV	ST -23(a), 28,31	3	100
Exam - V	ST-19, 22, 23(b)	3	100
	Total	**15**	**500**

E. Practicals

Code	Practicals	Hours
ST-03(a)	Measuring Instruments and Use of Hand & Portable tools	4
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning, Surge protection devices & Earthing	14
ST-05(b)	Basic Electricity, Magnetism and Digital Electronics	2
ST-15	Basic Concepts of Signalling	4
ST-18	Inter-slotting, Electrical Key Transmitter and Electrical Point Detector	4
ST-19	Relays, Cables and Earth Leakage Detector (ELD)	10
ST-20	Track Circuits	12
ST-21	Colour Light Signals	4
ST-22	Point Machines -- IRS conventional and High Thrust Clamp types	24
ST-23(a)	Panel Interlocking (British) and RDSO Standardised Typical circuits	24
ST-23(b)	Panel Interlocking (Siemens)	8
ST-25 (b), (c)	Push button PTJ, Handle Type FM Daido Single line Token-less block instrument and SGE Double Line Block Instrument	16
ST-28	Datalogger, RDPMS and SMMS	8
ST-30	LC Gate interlocking	6
ST-31	EI & SigDATE	30
	Total	**170**

F. Practical Examinations

S. No.	Labs	Type	Hours	Marks
1.	Concerned laboratories	Record sheets (20%) Experiments (50%) Viva-voce (30%)	8	200

G. Miscellaneous

S. No.	Item	Hours
1.	Study tour (Optional)	6

Overview of Phase – II

A. Course Program – 10 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	180
3.	Theory Examination	12
4.	Practicals	110
5.	Practicals Examination	15
6.	Miscellaneous (Field visits & Study tour)	18
7.	CD spare	22
	Total	**360**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	12	400
2.	Practicals	15	100
3.	CD's evaluation	-	100
	Total	**27**	**600**

C. Theory

Code	Subject	Hours	Marks
ST-06	Safety in train operations, Schedule of dimensions, Disaster Management.	16	70
ST-07	Computer Appreciation	8	20
ST-10	Telephone Instruments	4	10
ST-16	Construction Practices	16	50
ST-17	Telecom Basics for Signalling	10	30
ST-27	Automatic Signaling, IBS	22	40
ST-24	SSDAC and MSDAC	36	60
ST-32(a)	Kavach	16	40
ST25(d)	UFSBI & SSBPAC(D)	20	30
ST-26	Signaling in RE Area	8	20
ST-29	Route Relay interlocking (British or Siemens)	24	30
	Total	**180**	**400**

D. Theory Examinations

Examination	Subjects	Hours	Marks
Exam - VI	ST-06, 07, 10.	3	100
Exam - VII	ST-16, 17, 26.	3	100
Exam - VIII	ST-27, 24.	3	100
Exam - IX	ST-25(d), 29, 32(a)	3	100
	Total	**12**	**400**

E. Practicals

S. No.	Practicals	Hours
ST-07	Computer Appreciation	6
ST-10	Telephone Instruments	4
ST-27	Automatic Signaling, IBS	16
ST-24	SSDAC & MSDAC	36
ST-32(a)	Kavach	14
ST-25(d)	UFSBI & SSBPAC(D)	14
ST-29	Route Relay interlocking	20
	Total	**110**

F. Practical Examinations

S. No.	Labs	Type	Hours	Marks
1.	Concerned laboratories	Record sheets (20%) Experiments (50%) Viva-voce (30%)	15	100

G. Miscellaneous

S. No.	Item	Hours
1	Field visits and study tours	18 hrs (which includes 08 hrs for Kavach)

Initial Course for Apprentice Technician (Signal) Grade -III (Course code – SNT2B)

Name of training	Training at	Duration	Marks
Institutional training	STTC	Phase I - 12 weeks	800
		Phase II – 10 weeks	600
		Sub-total - 22 weeks	1400
Field training	Zonal Railways	30 weeks	400
Total		**52 weeks**	**1800**

Overview of Phase – I

A. Course Program – 12 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	220
3.	Theory Examination	15
4.	Practicals	170
5.	Practicals Examination	8
6.	Miscellaneous (Study tour – optional)	6
7.	CD spare	10
	Total	**432**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	15	500
2.	Practicals	8	200
3.	CD's evaluation	–	100
	Total	**23**	**800**

C. Theory

Code	Subject	Hours	Marks
ST-01	General	6	10
ST-02	Cleanliness and environment conservation, Personal Safety, Fire Prevention, First Aid	4	10
ST-03(a)	Measuring Instruments and Use of hand & portable tools	4	10
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning, Surge protection devices & Earthing	16	25
ST-05(b)	Basic Electricity, Magnetism and Digital Electronics	4	10
ST-15	Basic concepts of Signalling	20	70
ST-18	Inter-slotting, Electrical Key Transmitter and Electrical Point Detector	4	10
ST-19	Relays, Cables and Earth Leakage Detector (ELD)	14	40
ST-20	Track Circuits	12	25
ST-21	Colour Light Signals	6	10
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	16	40

Code	Subject	Hours	Marks
ST-23(a)	Panel Interlocking (British), RDSO Standardised Typical circuits	24	35
ST-23(b)	Panel Interlocking (Siemens)	10	20
ST-25 (b), (c)	Push button PTJ, Handle Type FM Daido Single line token-less block instruments and SGE Double Line Block Instrument	30	100
ST-28	Data logger, RDPMS and SMMS	12	15
ST-30	LC Gate Interlocking	6	20
ST-31	EI & SigDATE	32	50
	Total	**220**	**500**

D. Theory Examinations

Examination	Subjects	Hours	Marks
Exam - I	ST-1,2,3(a) ,4(a), 5(b), 20, 21.	3	100
Exam - II	ST-15, 18, 30.	3	100
Exam - III	ST-25 (b), (c)	3	100
Exam - IV	ST -23(a), 28,31	3	100
Exam - V	ST-19, 22, 23(b)	3	100
	Total	**15**	**500**

E. Practicals

Code	Practicals	Hours
ST-03(a)	Measuring Instruments and use of hand & portable tools	4
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning, Surge protection devices & Earthing	14
ST-05(b)	Basic Electricity, Magnetism and Digital Electronics	2
ST-15	Basic Concepts of Signalling	4
ST-18	Inter-slotting, Electrical Key Transmitter and Electrical Point Detector	4
ST-19	Relays, Cables and Earth Leakage Detector (ELD)	10
ST-20	Track Circuits	12
ST-21	Colour Light Signals	4
ST-22	Point Machines -- IRS conventional and High Thrust Clamp types	24
ST-23(a)	Panel Interlocking (British) , RDSO Standardised Typical circuits	24
ST-23(b)	Panel Interlocking (Siemens)	8
ST-25 (b), (c)	Push button PTJ, Handle Type FM Daido Single line token-less block instrument and SGE Double Line Block Instrument	16
ST-28	Data logger, RDPMS and SMMS	8
ST-30	LC Gate interlocking	6
ST-31	EI & SigDATE	30
	Total	**170**

F. Practical Examinations

S. No.	Labs	Type	Hours	Marks
1.	Concerned laboratories	Record sheets (20%) Experiments (50%) Viva-voce (30%)	8	200

G. Miscellaneous

S. No.	Item	Hours
1.	Study tour (Optional)	6

Overview of Phase – II

A. Course Program – 10 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	180
3.	Theory Examination	12
4.	Practicals	110
5.	Practicals Examination	15
6.	Miscellaneous (Field visits & Study tour)	18
7.	CD spare	22
	Total	**360**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	12	400
2.	Practicals	15	100
3.	CD's evaluation	-	100
	Total	**27**	**600**

C. Theory

Code	Subject	Hours	Marks
ST-06	Safety in train operations, Schedule of dimensions, Disaster Management.	16	70
ST-07	Computer Appreciation	8	20
ST-10	Telephone Instruments	4	10
ST-16	Construction Practices	16	50
ST-17	Telecom Basics for Signalling	10	30
ST-27	Automatic Signaling, IBS	22	40
ST-24	SSDAC and MSDAC	36	60
ST-32(a)	Kavach	**16**	40
ST25(d)	UFSBI & SSBPAC(D)	20	30
ST-26	Signaling in RE Area	8	20
ST-29	Route Relay interlocking (British or Siemens)	**24**	30
	Total	**180**	**400**

D. Theory Examinations

Examination	Subjects	Hours	Marks
Exam - VI	ST-06, 07, 10.	3	100
Exam - VII	ST-16, 17, 26.	3	100
Exam - VIII	ST-27, 24.	3	100
Exam - IX	ST-25(d), 29, 32(a)	3	100
	Total	**12**	**400**

E. Practicals

S. No.	Practicals	Hours
ST-07	Computer Appreciation	6
ST-10	Telephone Instruments	4
ST-27	Automatic Signaling, IBS	16
ST-24	SSDAC & MSDAC	36
ST-32(a)	Kavach	14
ST-25(d)	UFSBI & SSBPAC(D)	14
ST-29	Route Relay interlocking	20
	Total	**110**

F. Practical Examinations

S. No.	Labs	Type	Hours	Marks
1.	Concerned laboratories	Record sheets (20%) Experiments (50%) Viva-voce (30%)	15	100

G. Miscellaneous

S. No.	Item	Hours
1	Field visits and study tours	18 hrs (which includes 08 hrs for Kavach)

Foundation Course for Promotee Technician (Signal) Grade -III (Course code – SNT9)

Name of training	Training at	Duration	Marks
Institutional training	STTC	10 weeks	600
Total		**10 weeks**	**600**

Overview

A. Course Program – 10 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	158
3.	Theory Examination	12
4.	Practicals	152
5.	Practicals Examination	12
6.	Miscellaneous (Field visits &Study tour)	12
7.	CD spare	11
	Total	**360**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	12	400
2.	Practicals	12	150
3.	CD's evaluation	-	50
	Total	**24**	**600**

C. Theory

Code	Subject	Hours	Marks
ST-03(a)	Measuring instruments & Use of hand and portable tools	4	10
ST-04(b)	Cells, Batteries, IPS, DG Set & Solar Panel, Lightning & Surge protection devices, Earthing	10	20
ST-06	Safety in train operations, Schedule of dimensions, Disaster Management.	6	10
ST-07	Computer Appreciation	2	10
ST-15	Basic Concepts of Signalling	12	20
ST-16	Construction Practices	6	10
ST-17	Telecom Basics for Signalling	4	10
ST-19	Relays, Cables and Earth leakage detector (ELD)	10	20
ST-20	Track Circuits	8	30
ST-21	Colour Light Signals	4	10
ST-22	Point Machines - IRS conventional and high thrust clamp types	12	30
ST-23(a)	Panel Interlocking (British) and RDSO standardised Typical circuits	10	30
ST-24	SSDAC and MSDAC	10	30
ST-25(b), (c), (d)	Push button PTJ, Handle type FM Diado single line token-less block instruments, SGE Double line block instrument, UFSBI & SSBPAC (D)	12	30
ST-27	Automatic Signaling and IBS	8	20

Code	Subject	Hours	Marks
ST-28	Data logger, RDPMS and SMMS	6	10
ST-29	Route Relay Interlocking (British or Siemens)	8	30
ST-30	LC Gate interlocking	2	10
ST-31	EI and SigDATE	10	30
ST-32(a)	Kavach	14	30
	Total	**158**	**400**

D. Theory Examinations

Examination	Subjects	Hours	Marks
Exam-I	ST-03(a),04(b),07,06,15,16&17&28	03	100
Exam-II	ST-20,21,22&23(a)	03	100
Exam-III	ST-19,24,25(b),25(c),25(d),27	03	100
Exam-IV	ST-29,30,31&32(a)	03	100
	Total	**12**	**400**

E. Practicals

Code	Practicals	Hours
ST-03(a)	Measuring Instruments & use of hand and portable tools	4
ST-04(b)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge protection devices and earthing	10
ST-06	Safety in train operations, Schedule of dimensions,DisasterManagement	4
ST-07	ComputerAppreciation	2
ST-15	BasicConcepts ofSignaling	8
ST-17	Telecom Basics for Signalling	4
ST-19	Relays, Cables and Earth leakage Detector (ELD)	12
ST-20	TrackCircuits	10
ST-21	Colour Light Signals	6
ST-22	PointMachines-- IRS conventional and High Thrust Clamp types	12
ST-23(a)	PanelInterlocking(British), RDSO standardised typical circuits	10
ST-24	SSDAC and MSDAC	12
ST-25(b), (c), (d)	Push button PTJ, Handle type FM Diado single line token-less block instruments,SGE Double line block instrument,UFSBI& SSBPAC (D)	14
ST-27	AutomaticSignaling and IBS	8
ST-28	DataLogger,RDPMS and SMMS	8
ST-29	RouteRelayInterlocking(Britishor Siemens)	10
ST-30	LC Gate interlocking	3
ST-31	EI and SigDATE	10
ST-32(a)	Kavach	5
	Total	**152**

F. Practical Examinations

S. No.	Labs	Type	Hours	Marks
1.	Concerned laboratories	Record sheets (20%) Experiments (50%) Viva-voce (30%)	12	150

G. Miscellaneous

S. No.	Item	Hours
1.	Field visits and study tour	12 hrs (which includes 08 hrs for Kavach)

Refresher Course for Technician (Signal) Grade -I & Grade -III (Course code – SNT4)

Name of training	Training at	Duration	Marks
Institutional training	STTC	4 weeks	200
Total		**4 weeks**	**200**

Overview

A. Course Program – 4 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	80
3.	Theory Examination	3
4.	Practicals	34
5.	Practicals Examination	6
6.	Miscellaneous (Field visits & Study tour)	12
7.	CD spare	6
	Total	**144**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	3	100
2.	Practicals	6	80
3.	CD's evaluation	-	20
	Total	**9**	**200**

C. Theory

Code	Subject	Hours	Marks
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge protection devices and Earthing	2	4
ST-06	Safety in train operations, Schedule of dimensions, Disaster Management	2	6
ST-17	Telecom Basics for Signalling	2	2
ST-19	Relays, Cables and Earth Leakage Detector (ELD)	2	4
ST-20	Track Circuits	2	4
ST-21	Colour Light Signals	2	4
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	4	6
ST-23(a)	Panel Interlocking (British), RDSO Standardised Typical circuits	5	8
ST-24	SSDAC and MSDAC	6	8
ST-25(b), (c)& (d)	Push button PTJ, Handle type FM Diado single line token-less block instruments, SGE Double Line block Instrument, UFSBI and SSBPAC(D)	10	10
ST-27	Automatic Signalling, IBS	6	8

Code	Subject	Hours	Marks
ST-28	Data Logger, RDPMS and SMMS	4	6
ST-29	Route Relay Interlocking (British OR Siemens)	5	6
ST-30	LC Gate interlocking	2	2
ST-31	EI and SigDATE	12	8
ST-32(a)	Kavach	14	14
	Total	**80**	**100**

D. Theory Examinations

Examination	Subjects	Hours	Marks
Exam - I	All	3	100 (70 – Objective & 30 – Subjective)

E. Practicals

Code	Practicals	Hours
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge protection devices and Earthing	2
ST-19	Relays, Cables and Earth leakage Detector (ELD)	2
ST-20	Track Circuits	1
ST-21	Colour Light Signals	1
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	4
ST-23(a)	Panel Interlocking (British), RDSO Standardised Typical circuits	1
ST-24	SSDAC and MSDAC	3
ST-25(b), (c) & (d)	Push button PTJ, Handle Type FM Diado single line token-less block instruments, SGE Double Line block Instrument, UFSBI and SSBPAC(D)	5
ST-27	Automatic Signaling, IBS	2
ST-28	Data logger, RDPMS and SMMS	2
ST-29	Route Relay Interlocking (British or Siemens)	2
ST-31	EI and SigDATE	4
ST-32 (a)	Kavach	5
	Total	**34**

F. Practical Examinations

S. No.	Labs	Type	Hours	Marks
1.	Concerned laboratories	Record sheets (20%) Experiments (50%) Viva-voce (30%)	6	80

G. Miscellaneous

S. No.	Item	Hours
1.	Field visits and study tour	12 hrs (which includes 08 hrs for Kavach)

Refresher Course for Helpers (Signal) (Course code – SNT6A)

Name of training	Training at	Duration	Marks
Institutional training	STTC	2 weeks	200

Overview

A. Course Program – 2 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	28
3.	Theory Examination	3
4.	Practicals	28
5.	Practicals Examination	4
6.	CD spare /Miscellaneous (Study tour – optional)	6
	Total	**72**

A. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	03	100
2.	Practicals	04	80
3.	CD's evaluation	--	20
	Total	**07**	**200**

B. Theory

Code	Subject	Hours	Marks
ST-01	General	1	6
ST-02	Cleanliness and environment conservation, Personal Safety, Fire Prevention & First Aid	1	4
ST-03 (a)	Measuring Instruments and Use of hand & portable tools	1	2
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge protection devices and Earthing	2	10
ST-05(b)	Basic Electricity, Magnetism and Digital Electronics	1	2
ST-06	Safety in train operations, Schedule of Dimensions & Disaster Management	2	6
ST-18	Inter-slotting, Electrical Key Transmitter and Electrical Point Detector	1	2
ST-19	Relays, Cables and Earth Leakage Detector(ELD)	1	4
ST-20	Track Circuits	2	8
ST-21	Colour light signals	1	4
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	2	8
ST-24	SSDAC and MSDAC	2	8
ST-25(b), (c) & (d)	Push button PTJ, Handle type FM Diado single line token-less block instruments and SGE Double Line Block Instrument and UFSBI & SSBPAC(D)	2	6

Code	Subject	Hours	Marks
ST-26	Signalling in RE area.	1	2
ST-28	Data Logger, RDPMS and SMMS	1	4
ST-29	Route Relay interlocking (British or Siemens)	2	4
ST-30	LC Gate interlocking	1	4
ST-31	EI and SigDATE	2	8
ST-32(a)	Kavach	2	8
	Total	28	**100**

C. Theory Examinations

Examination	Subjects	Hours	Marks
Exam-I	All	3	100

D. Practicals

Code	Subject	Hours
ST-01	General	2
ST-02	Cleanliness and environment conservation, Personal Safety, Fire Prevention & First Aid	1
ST-03(a)	Measuring Instruments and use of hand & portable tools	2
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge protection devices and Earthing	2
ST-06	Safety in train operations, Schedule of dimensions, Disaster Management	2
ST-19	Relays, Cables and Earth Leakage Detector(ELD)	1
ST-20	Track Circuits	2
ST-21	Colour light signals	1
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	2
ST-24	SSDAC & MSDAC	2
ST- 25 (b), (c) & (d)	Push button PTJ, Handle Type FM Diado single line token-less block instruments and SGE Double Line block Instruments and UFSBI & SSBPAC(D)	2
ST-26	Signaling in RE Area	1
ST-28	Data logger, RDPMS and SMMS	1
ST-29	Route Relay Interlocking	2
ST-30	LC Gate interlocking	1
ST-31	EI and SigDATE	2
ST-32(a)	Kavach	2
	Total	**28**

E. Practical Examinations

S. No.	Labs	Hours	Marks
1.	Concerned laboratories	4	80

F. Miscellaneous

S. No.	Item	Hours
1	Study Tour(Optional)	6

Induction Course for Unskilled Helpers (Signal & Telecom) (Course code – SNT1)

Name of training	Training at	Duration	Marks
Institutional training	STTC	4 weeks	200

A. Course Program – 4 weeks

S. No.	Details	Hours
1	Briefing, Registration & Open house discussion	3
2.	Theory	60
3.	Theory Examination	3
4.	Practicals	60
5.	Practicals Examination	4
6.	Miscellaneous (Study tour – Optional)	6
7.	CD spare	8
	Total	**144**

B. Summary of evaluation

S. No.	Topic	Hours	Marks
1.	Theory	3	100
2.	Practicals	4	80
3.	CD's evaluation	--	20
	Total	7	200

C. Theory

Code	Subject	Hours	Marks
ST-01	General	4	6
ST-02	Cleanliness and environment conservation, Personal safety, Fire Prevention & First aid	4	4
ST-03(a)	Measuring Instruments and Use of hand & portable tools	4	10
ST-04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge Protection Devices and Earthing	4	8
ST-05(b)	Basic Electricity, Magnetism and Digital Electronics	3	4
ST-15	Basic concepts of Signalling	5	8
ST-19	Relays, Cables and Earth Leakage Detector (ELD)	4	6
ST-20	Track Circuits	4	6
ST-21	Colour Light Signals	2	4
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	4	8
ST-31	EI and SigDATE	4	6
ST-32(a)	Kavach	4	8
ST-07	Computer Appreciation	1	4

Code	Subject	Hours	Marks
ST-08(b)	Telecom Cables	2	4
ST-49	Train Traffic Control and VoIP based Control Communication	3	4
ST-53	Emergency Communication	3	4
ST-10	Telephone Instruments	3	4
ST-56	VHF Systems	2	2
	Total	**60**	**100**

D. Theory Examinations

Examination	Subjects	Hours	Marks
Exam-I	All	3	100

E. Practicals

Code	Subject	Hours
ST-03(a)	Measuring Instruments and use of hand & portable tools	6
ST-04(a)	Cells, Batteries, IPS, DG Set , Solar Panel, Lightning & Surge protection devices And Earthing..	6
ST-05(b)	Basic Electricity, Magnetism and Digital Electronics.	4
ST-15	Basic Concept Of Signalling	4
ST-19	Relays, Cables and Earth Leakage Detector (ELD)	4
ST-20	Track Circuits	6
ST-21	Colour Light Signals	2
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types	6
ST-28	Data logger, RDPMS and SMMS	4
ST-31	EI and SigDATE	3
ST-32(a)	Kavach	3
ST-07	Computer Appreciation	2
ST-08(b)	Telecom Cables	4
ST-49	Train Traffic Control and VoIP based Control Communication	3
ST-53	Emergency Communication	3
	Total	**60**

F. Practical Examinations

S. No.	Labs	Hours	Marks
1.	Concerned laboratories	4	80

G. Miscellaneous

S. No.	Item	Hours
1	Study Tour (Optional)	**6**

Additional topics to be covered in training courses of Technicians (Signal) Gr I & Gr III, in compliance to Railway Board's letter No. 2013/Sig/IRISET/Trg/Part1(efile3318098) dt. 28.07.2025

S.No.	Topic	Subject with code
1	Duty list as per IRSEM	ST-01-General
2	Earthing and Bonding as per RDSO guidelines	ST-04(a) – Cells, batteries, IPS, DG Set, Solar Panel, Lightning & Surge Protection Devices and Earthing
3	In built Block working in EIs	ST-31-EI & SigDATE
4	AFDAS-Maintenance and Testing	ST-16-Construction Practices
5	NMS working of various Signalling systems	ST-28-Data logger, RDPMS and SMMS ST-31- EI & SigDATE ST-24-SSDAC & MSDAC ST-32(a)- Kavach ST-27-Automatic Signalling & IBS
6	Scrutiny of EI system Error Logs (hands-on practical)	This is to be covered in EI laboratory sessions.

Telecom Courses

Courses for JE/SSE (Telecom)

Initial course for App. JE/SSE (Telecom) (ITJE)

Nature of Training	Training at	Duration	Marks
Institutional training	IRISET	Phase I : 14 Weeks	2000
		Phase II: 14 Weeks	
		(Sub-Total): 28 weeks	
Field training	Zonal Railways	24 Weeks	1000
Total		**52 Weeks**	**3000**

Overview of Phase-I

A. Course Program: 14 Weeks

S. No.	Details	Hours
1	Briefing, registration & open house discussion	3
2	Theory	190
3	Theory examination	15
4	Practicals	168
5	Practical examination	20
6	Miscellaneous (project allotment)	2
7	Local visit	4
8	CD Spare	18
Total		**420**

B. Summary of Evaluation

S. No	Topic	Hours	Marks
1	Theory	15	500
2	Practicals	20	400
3	CD's Assessment	--	100
Total		**35**	**1000**

C. Theory

S. No.	Code	Subject	Hours	Marks
1	G1	Etiquette, Conduct, Ethics, Gender Sensitization, Personal Safety, Personality Development & Communication skills	12	0
2	TB1 (Part-1)	Telecom General Part-I (Overview of Telecom)	6	25
3	TM	Telecom Manual	12	50
4	TB4	Modulation Techniques (Digital)	4	25
5	TB5	Radio Propagation	4	20
6	TC1	Telecom Cables (Copper)	10	30
7	TC2	Public Address System	4	20
8	TC4	Power Supply Arrangement	8	25
9	TC5	Earthing, Lightning & Surge Protection for Telecom Installations	6	25
10	TC6	Train Traffic Control (Including VoIP based TCCS)	12	40
11	TCS4	ISDN Exchange and Advancements	6	30
12	TCS6	Asterisk based IP Telephony	14	50
13	TCT2	PDH Principles	4	20
14	TCT3	Programmable Digital Drop-Insert E1 Multiplexers	4	20
15	TA2	Data communication, Networking & WiFi	26	60
16	ST1	Signalling Basics	40	60
		Safety Practices & Rolling Block	2	0
17	G2	Official Language	2	0
18	G8	Quality and reliability standards	4	0
19	TCS7	Open Source Software and applications	10	0
		Total	**190**	**500**

D. Theory Examination (Subjective-60% & Objective-40%)

Exam	Subjects	Hours	Marks
Exam-I	TB1 (Part -1), TM, TB4	3	100
Exam-II	TB5, TC1, TC4, TC5	3	100
Exam-III	TCS4, TCS6, TCT2	3	100
Exam-IV	TC2, TCT3, TA2	3	100
Exam-V	TC6, ST1	3	100
	Total	**15**	**500**

E. Practicals

S. No	Name of Lab	Hours
1	Signalling Labs	12
2	Train Traffic Control Lab (Control)	20
3	Outdoor Telecom Lab (Cables)	20
4	Asterisk based VoIP Telephone Exchange Lab	30
5	Transmission Systems Lab	30
6	Networking Lab	40
7	Computer Lab (Linux, Free and Open Source)	16
	Total	**168**

F. Practical Examinations

S. No	Name of the Lab	Type	Hours	Marks
1	Train Traffic Control Lab (Control)	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	4	50
2	Outdoor Telecom Lab (Cables)		4	50
3	Telephony Lab		4	100
4	Transmission Systems Lab		4	100
5	Networking Lab		4	100
	Total		**20**	**400**

G. Others

S. No.	Description	Hours
1	Project work assignment	2
2	Local visits to Control Office, Test room, Major station, Work Centre etc.	4
	Total	6

Overview of Phase-II

A. **Course Program: 14 Weeks**

S. No.	Details	Hours
1	Briefing, registration & open house discussion	3
2	Theory	214
3	Theory examination	15
4	Practicals	114
5	Practical examination	20
6	Miscellaneous {Study tour (optional) & Project work evaluation}	24
7	Local visit	15
8	CD Spare	15
Total		**420**

B. **Summary of Evaluation**

S. No	Topic	Hours	Marks
1	Theory	15	500
2	Practicals	20	300
3	Project work	12	100
4	CD's Assessment	0	100
Total		**47**	**1000**

C. **Theory**

S. No.	Code	Subject	Hours	Marks
1	TB1 (Part-2)	Telecom General Part II (Overview of Telecom in IR)	6	20
2	TC3 & TA7	Passenger Information System & VSS	12	40
3	TCT4	OFC Systems	12	40
4	TCT5	SDH Principles	6	20
5	TCT6	SDH Equipment	6	20
6	TA1	Mobile Communication including VHF, TETRA, GSM & Tunnel Communication	14	30
7	TA3	Data Networks of IR	12	30
8	TA4	Cyber Security & Network Security	20	50
9	TA5	LTE	20	50
10	TA6	IP-MPLS & Converged communication	20	60
11	ST28A	KAVACH: IR-ATP including Communication arrangements	15	40

S. No.	Code	Subject	Hours	Marks
12	G3	Disaster Management, Accident Communication	6	20
		Joint Findings of Accident enquiry	2	0
13	G4	Establishment & DAR	12	20
14	G5	Accounts & Stores	8	20
15	G6	Tenders & contracts	8	20
16	G7	Vigilance	2	0
17	EL1	Overview of IR PSUs' / Govt Organisations related to Telecom	10	0
18	EL2	Recent Circulars	8	20
19	VLs	Visiting Lectures -Emerging Technologies in Telecom.	15	0
		Total	**214**	**500**

D. Theory Examination (Subjective-60% & Objective-40%)

S. No	Exam	Subjects	Hours	Marks
1	Exam-I	TB1(Part-2), (TC3&TA7), TCT4	3	100
2	Exam-II	TCT5, TCT6, TA1, TA3	3	100
3	Exam-III	TA4, TA5	3	100
4	Exam-IV	TA6, ST28A	3	100
5	Exam-V	G3, G4, G5, G6 & EL2	3	100
		Total	**15**	**500**

E. Practicals

S No.	Experiments	Hours
1	Passenger Information System Lab.	06
2	Outdoor Telecom Lab	06
3	Transmission Systems Lab (OFC)	12
4	Transmission Systems Lab (SDH)	16
5	LTE lab	20
6	Networking Lab	10
7.	Cybersecurity Lab	16
8.	IP-MPLS Lab	22
9.	Kavach Lab (including Frequency and Time slot allotment)	06
	Total	**114**

F. **Practical Examinations**

S. No.	Name of the Lab	Type	Hours	Marks
1	Passenger Information System Lab	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	2	25
2	Outdoor Telecom Lab		2	25
3	Transmission Systems Lab (OFC)		2	25
4	Transmission Systems Lab (SDH)		2	25
5	Networking Lab		2	50
6	LTE lab		2	50
7	Cyber security Lab		2	25
8	IP-MPLS Lab		2	50
9	Kavach Lab		4	25
	Total		**20**	**300**

G. **Others**

S. No	Details	Hours
1	Study Tour (Optional)	12
2	Project Presentation	12
3	Local visits to PIS & VSS at a major station, NOC and Data Center at RCIL, IP MPLS installation, Station Kavach, NMS & FRACAS, Loco Kavach foot plate, Loco shed etc.	15
Total		**39**

Topics to be covered in Initial Course for App. JE/SSE(Telecom) in compliance to Railway Board's letter No. 2013/Sig/IRISET/Trg/Part1(efile3318098) dt. 28.07.2025

Sl.No.	Topic	Subject with code
1	Network Redundancy & Failover for IP/MPLS Based Backbone Network	TA6 -IP-MPLS & Converged communication
2	Cyber security to include: Implementation of Security Operation Center (SOC), Firewall, IDS/IPS& Network Hardening	TA4-Cyber Security & Network Security
3	CCTV,VSS,ICCC and Central Monitoring: Technical standards for CCTV installations, Video Surveillance System (VSS) architecture, Integrated Central Monitoring & Command Centers, IP/MPLS based CCTV and VSS Integration.	TC3-Passenger Information System & VSS
4	Telecom Infrastructure in Projects: Telecom Planning in Major Projects, OFC & Tower Planning, Telecom Asset Register & GIS Integration, Telecom BOQ preparation for tenders.	OFC Planning : TCT4- OFC Systems Tower Planning: ST28A – Kavach:IR-ATP including Communication arrangements Telecom Asset Register: TB1-Telecom General GIS Integration: TB1 - Telecom General Telecom BOQ preparation : G6 –Tenders & Contracts
5	Virtualization, Storage, Disaster Recovery (DR)	TA4 -Cyber Security & Network Security
6	Saral Sanchar Licensing for VHF/KAVACH	TA1- Mobile Communication
7	VPN,NIC Email Admin	TA2- Data communication, Networking & Wi-Fi
8	GIS Mapping for Railway Tele	TB1 - Telecom General
9	Telecom Maintenance Practices: AMC vs In-house Maintenance, SLA-based Monitoring, NMS, SNMP-basedAlarm Systems, Preventive Maintenance, CBuD etc.	TB1 - Telecom General
10	DOT/TEC Guidelines, EMI/EMC Compliance	TB1-Telecom General
11	Safety Precautions in Telecom Work	TC1- Telecom Cables (Copper)
12	STQC/Non-STQC Standards for CCTV/PA systems	TA7 - VSS
13	ISO/IEC Standards(ISO27001 for Cyber Security)	TA4 - Cyber Security& Network Security

14	Innovation & Future Tech: 5G Trials in Railways, AI/ML in Telecom Fault Prediction	5G trials in Railways : TA5- LTE AI/ML in Telecom Fault Prediction : TB1-Telecom General
15	Case Studies (Including challenges faced and Success story of Achievement): Redevelopment of Major Stations with Smart Features (e.g.Rani Kamalapati, Gandhinagar)	TB1 -Telecom General
16	Assignments: Integration Diagrams (IP/MPLS+CCTV+IPIS+MTRC)	TA6 - IP-MPLS & Converged communication
17	Data Analytics for Telecom Networks	TA3 - Data Networks of IR

Initial course for Promoted JE/Tele (Intermediate) (ITPE)

Note: The initial training of JE(Tele) promoted under the 20% LDCE quota is held at IRISET. The initial training of JE(Tele) promoted under promotional quota is conducted at Zonal Training Centres with the same training module given below.

Nature of Training	Training at	Duration	Marks
Institutional training	IRISET	Phase I: 8 Weeks Phase II: 9 Weeks (Sub-Total): 17 Weeks	1900
Field training	Zonal Railways	17 Weeks	600
	Total	**34 Weeks**	**2500**

OVERVIEW OF PHASE-I-ITPE/01

A. Course Programme:08 Weeks

S. No.	Details	Hours
1	Briefing, registration & open house discussion	3
2	Theory	100
3	Theory examination	15
4	Practicals	92
5	Practical examination	12
6	Miscellaneous (Project allotment)	2
7	Local visit	4
8	CD Spare	12
	Total Hours	**240**

B. Summary of Evaluation

S. No.	Topic	Hours	Marks
1	Theory	15	500
2	Practicals	12	300
3	CD's Assessment	-	100
	Total	**27**	**900**

C. Theory

S. No.	Code	Subject	Hours	Marks
1	TB1	Telecom General	4	25
2	TM	Telecom Manual	4	25
3	TC1	Telecom Cables (Copper)	8	50
4	TC2	Public Address System	6	25
5	TC3	Passenger Information System & ISS	6	25
6	TC4	Power Plant Practice	6	25
7	TC5	Earthing, lightning & surge protection for Telecom Installations	6	25
8	TC6	Train Traffic Control (VoIP based TCCS)	10	60
9	TCS4	ISDN Exchange and Advancements	8	40
10	TCS6	Asterisk based IP Telephony	10	60
11	TCT2	PCM-TDM Principles	4	20
12	TCT3	Programmable Digital Drop-Insert EI Multiplexers	4	20
13	TA2	Data communication & Networking	16	80
14	G1	Personality Development	4	0
15	TCS7	Open Source software and applications	4	20
		TOTAL	**100**	**500**

D. Theory Examination

S. No.	Exam	Subjects	Hours	Marks
1	Exam - I	TB1,TM & TC1	3	100
2	Exam - II	TC2,TC3,TC4,TC5	3	100
3	Exam - III	TC6, TCS4	3	100
4	Exam - IV	TCS6, TCT2, TCT3	3	100
5	Exam-V	TA2, TCS7	3	100
		Total	**15**	**500**

E. Practicals

S. No.	Name of the Lab	Hours
1	Train Traffic Control Lab	14
2	Outdoor Telecom Lab	12
3	Asterisk based VoIP Telephone Exchange Lab	20
4	Transmission Systems Lab (MUX)	16
5	Networking Lab	20
6	Passenger Information Systems lab	10
	Total	**92**

F. Practical Examination

S. No.	Name of the Lab	Type	Hours	Marks
1	Train Traffic Control Lab	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	2	50
2	Outdoor Telecom Lab		2	50
3	Asterisk based VoIP Telephone Exchange Lab		2	50
4	Transmission Systems Lab (MUX)		2	50
5	Networking Lab		2	50
6	Passenger Information System lab		2	50
	Total		**12**	**300**

G. Miscellaneous

S. No.	Details	Hours
1	Project Work Allotment	02
2	Local visits to the Control Office, Test Room, Public Address System at a major station etc.	04
3	**Total**	**06**

OVERVIEW OF PHASE-II-ITPE/02

A. Course Programme: 09 Weeks

S. No.	Details	Hours
1	Briefing, registration & open house discussion	3
2	Theory	133
3	Theory examination	15
4	Practicals	80
5	Practical examination	15
6	Miscellaneous {Study tour (Optional) & Projects evaluation}	12
7	Local visit	6
8	CD Spare	6
	Total Hours	**270**

B. Summary of Evaluation

S. No.	Topic	Hours	Marks
1	Theory examination	15	500
2	Practical examination	15	300
3	Project Presentation	05	100
4	CD's Assessment	-	100
	Total	**35**	**1000**

C. Theory

S. No.	Code	Subject	Hours	Marks
1	TA1	Mobile Communication	6	25
2	TA3	Data Networks of IR	8	25
3	TA4	Cyber Security & Network Security	12	20
4	TA5	LTE	12	50
5	TA6	IP MPLS & Converged communication	12	50
6	TCT4	OFC systems	12	50
7	TCT5	SDH Principles	4	30
8	TCT6	SDH Equipments	8	30
9	G2	Official Language	2	0
10	G3	Disaster Management, Accident Communication	2	20
		Joint Findings of Accident enquiry	2	0
11	G4	Establishment & DAR	8	40
12	G5	Accounts & Stores	6	30
13	G6	Tenders & Contracts	6	30
14	G7	Vigilance	2	0
15	G8	Quality & Reliability Standards	2	0
16	ST1	Basic concepts of Signalling	10	40
		Safety Practices & Rolling Block	2	0
17	EL	Recent circulars	2	10
18	ST28A	KAVACH: IR-ATP including Communication arrangements	15	50
		Total	**133**	**500**

C. Theory Examination

S. No.	Exam	Subject Code	Hours	Marks
1	Exam - I	TA1,TA3,TA5	3	100
2	Exam - II	TA6,TCT4	3	100
3	Exam - III	TCT5,TCT6,ST1	3	100
4	Exam - IV	TA4,G4,G5,EL	3	100
5	Exam - V	G3,G6,ST28A	3	100
		Total	**15**	**500**

E. Practicals

S. No.	Name of the Lab	Hours
1	Transmission Systems Lab	12
2	Network Lab	12
3	Signaling Lab	10
4	LTE Lab	12
5	Kavach Lab	12
6	IP MPLS Lab	12
7	Cyber Security Lab	10
	Total	**80**

F. **Practical Examination**

S. No.	Name of the Lab	Type	Hours	Marks
1	Transmission Systems Lab	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	3	60
2	Network Lab & Cyber Security		3	60
3	LTE lab		3	60
4	Kavach lab		3	60
5	IP MPLS		3	60
	Total		**15**	**300**

G. **Others**

S. No.	Details	Hours	Hours
1	Project Presentation, Study Tour (optional), Experience sharing	8	12
2	Local visits to Station Kavach installation, Kavach NMS & FRACAS, Loco Kavach foot plate, Loco shed, RCIL Data centre & NOC etc.	8	6

Refresher course for SSE/JE (Tele) (Course code - RTSJE)

Nature of Training	Training at	Duration	Marks
Institutional training	IRISET	4 Weeks	120

A. Programme Summary

S. No.	Details	Hours
1	Briefing, registration & open house discussion	02
2	Theory	63
3	Theory examination	03
4	Miscellaneous (Project case studies/ Experience sharing)	02
5	Practicals	38
6	Local visit	07
7	CD Spare	05
	Total Hours	**120**

B. Summary of Evaluation(Objective- 70% & Subjective-30%)

S. No.	Topic	Hours	Marks
1	Theory Exam	03	100
2	CD's Assessment	--	20
	Total	**03**	**120**

C. Theory

S. No.	Code	Subject	Hours	Marks
1	TB1	Telecom General	02	05
2	TM	Telecom Manual	02	00
3	TC1	Telecom Cables (Copper)	02	05
4	TC3	Passenger Information System	02	05
5	TC4	Power Supply Arrangement	02	05
6	TC5	Earthing, Lightning & surge protection for Telecom Installations	02	05
7	TC6	Train Traffic Control (VoIP TCCS)	02	05
8	TCS4	ISDN Exchange, IP telephony and Advancements	02	05
9	TCT3	Programmable Digital Drop-Insert E1 PDH Equipments	01	05
10	TCT4	OFC Systems	02	05
11	TCT6	SDH Equipments	01	05
12	TA1	Mobile Communication	02	05
13	TA2	Data communication & Networking	04	10
14	TA5	LTE	04	10
15	TA6	IP-MPLS & Converged communication	04	10
16	TA4	Cyber Security & Network Security	04	05

S. No.	Code	Subject	Hours	Marks
17	ST1	Signalling Basics	02	0
		Safety Practices & Rolling Block	01	0
18	G3	Disaster Management, Accident Communication	02	0
		Joint Findings of Accident enquiry	01	0
19	G4	Establishment & DAR	03	0
20	G5	Accounts & Stores	02	0
21	G6	Tenders & Contracts	03	0
22	G7	Vigilance	02	0
23	G8	Quality & Reliability Standards	01	0
24	ST28A	Kavach	08	10
		Total	**63**	**100**

D. Theory Examination

S. No.	Type	Subject Code	Hours	Marks
1.	Subjective	TA2, TA5 & TA6 (Each subject 10 Marks)	01	30
2.	Objective	TB1, TC1, TC3, TC4, TC5, TC6, TCS4, TCT3,TCT4,TCT,TA1,TA4 (each subject 5 marks) and ST28A (10 marks)	01	70
3.	Objective	Moodle Practice exam	01	—-
		Total	**03**	**100**

E. Practicals

S. No.	Name of the Lab	Hours
1	Train Traffic Control Lab	02
2	Outdoor Telecom (Cables) Lab	02
3	Passenger Information System Lab	02
4	Asterisk based VoIP Telephony Lab	06
5	Transmission/OFC Lab	04
6	Networking Lab	
	a) Networking	04
	b) IP-MPLS	04
	c) Cyber security Lab	04
7	Kavach Lab	04
8	LTE Lab	04
9	Computer Lab (Open Source)	02
	Total	**38**

F. Miscellaneous

S. No.	Details	Hours
1	Project Case Studies/ Experience Sharing	02
2	Local visits to Station Kavach installation, Kavach NMS & FRACAS, Loco Kavach foot plate, Loco shed etc.	07

Telecom Courses for Technicians & Helpers

Initial course for Apprentice Technician (Telecom) Gr.III (Course code –SNT3)

Nature of Training	Training at	Duration	Marks
Institutional training	STTC	Phase I: 08 weeks	450
		Phase II: 09 weeks	450
		(Sub-Total):17 weeks	900
Field training	Zonal Railways	35 weeks	500
Total		**52 weeks**	**1400**

Overview of phase-I

A. Course Program–8 weeks

Sl. No	Details	Hours
1.	Briefing, registration & open house discussion	3
2.	Theory	154
3	Theory examinations	9
4.	Practicals	100
5.	Practical examinations	4
6.	Study Tour / Field visit	6
7.	CD spare	12
	Total	**288**

B. Summary of Evaluation:

Sl. No	Topic	Hours	Marks
1	Theory	9	300
2	Practical	4	100
3	CD's assessment	--	50
	Total	**13**	**450**

C. Theory:

Code	Subject	Hours	Marks
ST-01	General	10	25
ST-02	Cleanliness and environment conservation, Personal Safety, Fire Prevention, First Aid	6	10
ST-03 (b)	Measuring Instruments	14	30
ST-04 (b)	Telecom Power supply arrangements	18	35
ST-05 (a)	Basic Electricity and Magnetism	16	30
ST-06	Safety In Train Operations, Disaster Management, Schedule of Dimensions	8	10
ST-07	Computer Appreciation	16	30
ST-08(a)	Telecom Cables (Copper)	16	30
ST-09	Electronic components	14	25

Code	Subject	Hours	Marks
ST-49	Train Traffic control & VoIP based control communication	14	25
ST-52	Digital Fundamentals & Applications	10	25
ST-56	VHF Systems	12	25
	Total	**154**	**300**

D. Theory Examination

Exam	Subjects	Hours	Marks
Exam-I	ST-01,03(b),04(b),06	03	100
Exam-II	ST-02,05 (a),07,08 (a)	03	100
Exam-III	ST-09,49,52,56	03	100
	Total	**09**	**300**

E. Practicals

S.No.	Lab	Hours
1	Measuring Instruments	14
2	Power Equipments	10
3	Basic Electricity & Magnetism	10
4	Disaster Management	04
5	Computer Appreciation	14
6	Telecom Cables	12
7	Electronic Components	8
8	Train Traffic Control and VoIP based Control communication	14
9	Digital Fundamentals and Applications	10
10	VHF systems	4
	Total	**100**

F. Practical Examination

Sl No	Labs	Type	Hours	Marks
1	Practical	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	4	100

G. Miscellaneous

Sl. No	Item	Hours
1	Study Tour(optional)	6

Initial course for Apprentice Technician (Telecom) Gr III(Course code – SNT3)

Subject details of Phase-1

Code	Topic	Hrs	Sub Topic
ST-01	General	10	1. Railway Organisation and S&T structure 2. Abbreviations & Symbols used in Railways 3. Duties of Technician 4. Hours of Work and Period of Rest rules-2005 (HOER) 5. Medical, channel of promotion and promotion policies 6. Leave Rules and Joining Time 7. Pass Rules 8. Discipline and Appeal Rules, 1968 9. Railway Service Conduct Rules, 1966 10. Workmen Compensation Act 11. Labour organizations and PREM 12. Welfare measures in Railways 13. S&T stores 14. Telecom Manual 15. General & Subsidiary Rules (G& SR) of Indian Railways 16. Official Language policy and rules
ST-02	Cleanliness and environment conservation, Personal Safety, Fire Prevention, First Aid	06	1. Cleanliness and environment conservationof Workplace 2. Safe working practices 3. Safety Precautions to be followed while working in the vicinity of Railway track 4. Personal safety 5. Safety precautions in RE area 6. Safety precautions in maintenance & trouble shooting of Telecom assets 7. Classification of fire and fire extinguishers and its periodical maintenance 8. AFDAS (Automatic Fire Detection Alarm system) and its periodical maintenance 9. First aid including CPR procedure
ST-03 (b)	Measuring Instruments	14	1. Ammeter 2. Voltmeter 3. Digital Multimeter, True RMS Multimeter 4. Megger 5. Earth Tester 6. T.M.S. kit, E1 Tester 7. DB meter 8. Cross Talk meter 9. Psophometer 10. Clamp Meter 11. Vernier Calipers, Screw Gauge 12. Hand tools (Hammer, Chisel, Wrench, Spanner, Box spanner, Screwdrivers, Drilling machines, Vacuum blowers, Cleaners) and their operation 13. Soldering iron and soldering technique 14. Work station for soldering iron

ST-04 (b)	Telecom Power supply arrangements	18	1. Classification of cells 2. Different types of charging 3. Capacity test of batteries 4. Li-ion & NiMH cells 5. Defects in secondary cells and it's prevention 6. VRLA cells 7. Photovoltaic cells 8. Principles of working of Transformers, Inverters 9. UPS- working principle, Types,Applications 10. SMPS power supply 11. Telecom Integrated Power Supply System (TIPSS) 12. Typical power supply arrangement for various telecom installations and it's load calculation 13. Earthing and lightning &Surge Protection systems 14. Trouble shooting and periodical maintenance of Telecom power supply equipments 15. Working, maintenance and trouble-shooting of DG set and solar based power supply systems
ST-05 (a)	Basic Electricity and Magnetism	16	1. Idea about EMF, current, power, resistance, inductance, capacitance, power factor etc. and their measurements. 2. Study of Ohms law and its application, series and parallel connections. 3. Importance of insulation resistance 4. Idea about magnetism and magnetic induction. 5. Transformers- working principle, rectifier-working principle. 6. Electric power and energy, Power factor and it's calculation (KVA,KW) 7. Fuses, surge protection devices and Lightening arrestors. 8. Measurement of loop and insulation resistance of cables and measurement of earth resistance. 9. AC and DC principles 10. Brief introduction to various Electrical equipments like chargers, stabilizers, transformers, UPS, DC-DC Converter, AC-DC Converter.
ST-06	Safety In Train Operations, Disaster Management, Schedule of Dimensions	8	1. Knowledge and importance of S&T MR & S&T Disconnection 2. Use of detonators, hand signals and banner flag 3. Provision of speed restriction indicators 4. Working under integrated/ individual blocks 5. Protection of work site and safety precautions in RE area 6. Responsibility of S&T staff in case of disaster 7. Safety procedure, accident management, role of S&T staff 8. Safety circulars and instructions pertaining to S&T staff 9. Case study of accidents where S&T is involved 10. Need of schedule of dimensions 11. Schedule of dimensions applicable to S&T gears

ST-07	Computer Appreciation	16	**1. Computer hardware and interconnections** a) Identification of CPU mother board, RAM and various computer peripherals like CD ROM, hard disk, key board, mouse, printer, monitor, interface cards, modem, scanners. b) Identification of interconnecting cables and interconnections serial/parallel ports, monitor port, power supply connections, UPS connection, modem connection etc. 2. **Operating system function (Window 10 or latest)** 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 3 Software Package-MS Word, MS Excel & MS power point. 4 Basic menu driven commands and application 5. Introduction to Servers
ST-08 (a)	Telecom Cables (copper)	16	1. Different types of cables used for S&T applications 2. Quad cables: construction and its allocation 3. Cable route plan 4. Cable laying practices 5. Jointing of underground cables 6. Testing of cables 7. Cable termination 8. Cable faults and its localization. 9. Cable route tracer & Cable fault Locator 10. Trouble shooting & Periodical maintenance of Telecom cables
ST-09	Electronic components	14	1. Passive devices: Resistors, Capacitors, Inductors 2. Semi conductor diode, its parameters, uses etc. 3. Zener diode and its applications. 4. Special types of diodes used in Wireless. 5. Sensors and display devices: LEDs, LCDs, 7 segment display 6. Transistors – FET, BJT, UJT testing and applications. 7. Transistor - field effect and its uses 8. SCR, Diacs, Triacs 9. ICs analog and digital, precautions while handling and testing 10. Regulated power supplies 11. DC-DC converter and filter circuits

ST-49	Train Traffic control & VoIP based control communication	14	1. Control communication (Non RE/RE area) 2. DTMF signaling 3. Head quarter control system 4. Way station control system 5. Emergency control communication system 6. OFC based control communication system 7. Radio patching 8. VoIP based Train Control Communication system 9. Extension of auto phone to accident site over EC socket 10. Fault analysis of control working 11. Trouble shooting & periodical maintenance of control communication system
ST-52	Digital Fundamentals & Applications	10	1. Numbers, Codes & conversions 2. Boolean Algebra 3. Logic Gates & Flip flops 4. Arithmetic Circuits 5. Registers and counters 6. Encoders &Decoders 7. Multiplexers &demultiplexers 8. Memory circuits (RAM & ROM) 9. Principles of digital clock and Digital Switching. 10. Introduction to Microprocessor
ST-56	VHF Systems	12	1. Wave propagation, Frequency ranges 2. Simplex and duplex system of communication 3. Oscillators and Amplifiers 4. Modulation and demodulation principles 5. Transmission Line Fundamentals {Characteristic Impedance (Zo), Voltage Standing Wave Ratio (VSWR), Impedance Matching etc.} 6. Radio transmitter and receiver. 7. Types of Antennae and their installation. 8. Types of power supplies used for VHF sets 9. Various applications of VHF Trans receivers. 10. Precautions while using the VHF sets 11. Troubleshooting and periodical maintenance of VHF systems.

Over view of phase-II

A. Course Program: 9 weeks

Sl.No	Details	Hours
1.	Briefing, registration & open house discussion	3
2.	Theory	150
3	Theory examination	9
4.	Practicals	133
5.	Practical examination	4
6.	Miscellaneous (study tour-optional)	12
7.	CD spare	13
	Total	**324**

B. Summary of Evaluation:

Sl..No.	Topic	Hours	Marks
1	Theory exam	9	300
2	Practical exam	4	100
3	CD's assessment	--	50
	Total	**13**	**450**

C. Theory:

Code	Subject	Hours	Marks
ST-10	Telephone Instruments	6	15
ST-45	Passenger Amenities (PA, IPIS & GPS Clocks)	12	25
ST-46	Electronic and IP Exchange	14	30
ST-47	Tetra, GSM-R, LTE, Tunnel Communication	10	20
ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	10	20
ST-50	Optic Fibre Communication and its Applications	26	45
ST-54	Basics of Satellite Technologies, VSAT & Disaster Management Communication	12	25
ST-55	IP based Video Surveillance System	10	20
ST-57	Data Communication and Networking, NMS & Security of network	30	50
ST-58	IP MPLS Concepts and converged communication for Railway applications	10	25
ST-32(b)	Kavach	10	25
	Total	**150**	**300**

D. Theory Examination

Exam	Subjects	Hours	Marks
Exam-IV	ST-45,46,47,54	03	100
Exam-V	ST-10,48,50,55	03	100
Exam-VI	ST-57,58,32(b)	03	100
	Total	**09**	**300**

E. Practicals

Sl. No.	Lab	Hours
1	Telephone Instruments	06
2	Passenger Amenities (PA System, PIS, IPIS & GPS Clock)	15
3	Electronic Exchange &IP Exchange including Asterisk programming	20
4	Railnet, Wi-Fi System, PRS, UTS & FOIS	16
5	Optic Fiber Communication, PDH (2 Mbps TDM based multiplexers), SDH & Equipments	26
6	VSAT and Disaster Management Communications	06
7	IP based Video Surveillance System	14
8	Data Communication and Networking, NMS & Security of network	24
9	IP MPLS concepts	06
	Total	**133**

F. Practical Examination

Sl No	Labs	Type	Hours	Marks
1	Practical	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	4	100

G. Miscellaneous

Sl. No	Item	Hours
1	Study Tour (Optional)	6

Initial course for Apprentice Technician (Telecom) Gr III (Course code - SNT3)

Subject details of Phase-II

ST-10	Telephone Instruments	6	1. Telephone parts, Integrated circuit, buzzer, cadre hook, card etc 2. General defects in telephone instruments 3. Testing and repairing of telephone lines 4. Periodical maintenance of telephone instruments 5. Type of telephones 5.1 Push button Telephone 5.2 Hand free Telephone 5.3 Selective ringing Telephone 5.4 Wireless Telephone 5.5 DTMF Telephone 5.6 Magneto Telephone 5.7 Control Telephone 5.8 IP Telephone 5.9 DKT phone 5.10 Satellite Phone
ST-45	Passenger Amenities (PA, PIS, IPIS & GPS Clocks)	12	1. Commercial classification of stations and Scale of Passenger Amenities 2. PA systemand its sub components 3. Paging and talk back system 4. IP based IPIS 5. GPS based Digital Clocks 6. Telecom Arrangements for Public Functions including Video Conferencing Systems 7. Trouble shooting & periodical maintenance of passenger amenities 8. Installation & precommissioning check list of IPIS
ST-46	Electronic Exchange and IP Exchange	14	1. Exchanges and its classification 2. Electronic Exchanges in service 3. Principles of working of ISDN Exchanges 4. Different ISDN exchanges in use and Overview ofSiemens Hipath 4000 & Coral Flexicom 6000 ISDN Exchanges. 5. Common faults in Electronic telephone exchanges and their rectification 6. MDF/IDF Protective devices 7. VoIP Fundamentals 8. VoIP Protocols & VoIP Telephony 9. Asterisk based VoIP exchange 10. NGN and Protocols 11. Exchange Earthing 12. Trouble shooting & periodical maintenance of exchanges

ST-47	Tetra, GSM-R, LTE, Tunnel Communication	10	1. VHF Mobile Radio Communication 2. Introduction to TETRA 3. Cellular Mobile Radio Communication System 4. Overview of GSM, GSM-R & LTE 5. LTE network architecture in Indian Railways 6. SACFA &WPC clearance 7. Tunnel communication
ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	10	1. Railnet and its application in Indian Railways 2. Wi-Fi System and its implementation in offices, Stations & Trains 3. PRS 4. UTS 5. FOIS 6. COA
ST-50	Optic Fiber Communication and its Applications	26	1. Basic principles of optical fiber communication 2. OFC advantages and applications 3. OFC Propagation modes 4. Construction of optical fiber cable 5. OFC cable laying practices 6. Precautions in laying of Optical Fiber Communication cable 7. Splicing and termination of OFC 8. OFC measurements (Light source, Power meter, OTDR) 9. Optical sources and Detectors 10. Optical Link Power Budget 11. Multiplexing techniques: FDM, TDM 12. Pulse Code Modulation 13. PCM frame structure 14. Types of Mux equipment 15. Drop/insert MUX 16. Jitter & Wander 17. SDH multiplexing 18. STM frame structure 19. Various measurements during normal maintenance and trouble shooting 20. OFC interface for signaling systems 21. PDH Equipments : WEBFIL & PUNCOM 22. PDH Multiplexers 23. SDH Equipments TEJAS TJ100MC-1, TJ1400, FIBCOM 6325 24. Coordination with RCIL 25. NMS 26. Trouble shooting & periodical maintenance OFC

ST-54	Basics of Satellite Technologies, VSAT & Disaster Management Communication	12	1. Basics of Satellite communication 2. Role of Satellite communication in Indian Railways for Disaster Management communication with block diagrams 3. VSAT: Advantages &Role of S&T department, application 4. List of Minimum Essential Telecom Equipments to be Kept in Accident Relief Trains (ARTs) 5. Communication arrangements (Video) from accident site and Future trends in Emergency communication 6. Video conference as a Tele presence service 7. Provision of PT set at accident site 8. SIM aggregator
ST-55	IP based Video Surveillance System	10	1. Applications of CCTV 2. Analog & Digital CCTV system 3. Types of Cameras 4. IP based surveillance system with Schematic diagram 5. Components of VSS & Software 6. Networking of CCTV 7. Trouble shooting, failure rectification of IP based Video Surveillance System
ST-57	Data Communication and Networking, NMS & Security of network	30	1. Data representation 2. Data flow (Simples, Half duplex, Full duplex) 3. OSI and TCP/IP model 4. Baseband and broadband transmission 5. Networking elements (Switch, Router, Modem, LAN extender) 6. IP networks (IPV4, IPV6) 7. Basic protocols 8. Routing Basics 9. Routing & Switching 10. Networking, Firewalls 11. Data transmission in LAN, WAN 12. OFC/Quad Cable Connectivity for i) Block Circuit ii) Data Logger iii) SSDAC/MSDAC iv) EI v) KAVACH 13. NMS of communication networks, Test & Measuring equipments for Data Communication and Networking 14. Cyber security basics 15. Trouble shooting & periodical maintenance of Data communication system

ST-58	IP MPLS Concepts and converged communication for Railway applications	10	1. Why IP-MPLS 2. Advantages of IP-MPLS 3. MPLS components 4. MPLS Operations 5. MPLS Protocols 6. MPLS VPN 7. TAN guidelines for implementation of IP MPLS 8. Traffic Engineering 9. Concepts of converged communication
ST-32(b)	Kavach	10	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 6. NMS of Kavach

Refresher course for Technician (Telecom) (Course code – SNT5)

Nature of training	Training at	Duration	Marks
Institutional training	**STTC**	**4 weeks**	**200**

A. Course Program – 4 weeks

Sl. No	Details	Hours
1.	Briefing, registration & open house discussion	3
2.	Theory	72
3	Theory examinations	3
4.	Practicals	50
5.	Practical examinations	4
6.	Study Tour / Field visit	6
7.	CD spare	6
	Total	**144**

B. Summary of Evaluation:

Sl. No	Topic	Hours	Marks
1	Theory	3	100
2	Practical	4	80
3	CD's assessment	--	20
	Total	**7**	**200**

C. Theory:

Code	Subject	Hours	Marks
ST-03 (b)	Measuring Instruments	5	5
ST-04 (b)	Telecom Power supply arrangements	5	6
ST-06	Safety In Train Operations, Disaster Management, Schedule of Dimensions	2	3
ST-08(a)	Telecom Cables (Copper)	4	8
ST-10	Telephone Instruments	2	4
ST-45	Passenger Amenities (PA, IPIS & GPS Clocks)	6	8
ST-46	Electronic and IP Exchange	6	8
ST-47	Tetra, GSM-R, LTE, Tunnel Communication	2	3
ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	4	6
ST-49	Train Traffic control & VoIP based control communication	6	7
ST-50	Optic Fibre Communication and its Applications	8	10

Code	Subject	Hours	Marks
ST-54	Basics of Satellite Technologies, VSAT & Disaster Management Communication	2	3
ST-55	IP based Video Surveillance System	4	6
ST-56	VHF Systems	2	4
ST-57	Data Communication and Networking, NMS & Security of network	6	8
ST-58	IP MPLS Concepts and converged communication for Railway applications	4	7
ST-32(b)	Kavach	4	4
	Total	**72**	**100**

D. Theory Examination

Exam	Subjects	Hours	Marks
Exam-1	All subjects	03	100
	Total	**03**	**100**

E. Practicals

Sl. No.	Lab	Hours
1	Measuring Instruments	6
2	Telephone Instruments (Exchange-IP &Non IP)	2
3	Electronic Exchange &IP Exchange including Asterisk programming	6
4	Train Traffic Control and VoIP based Control Communication	4
5	Passenger Amenities (PA, PIS, IPIS & GPS Clocks)	2
6	Railnet, Wi-Fi System, PRS, UTS & FOIS	2
7	VHF Systems	2
8	Optic Fibre Communication, PDH (2 Mbps TDM based multiplexers), & SDH Equipments	6
9	IP based Video Surveillance System	4
10	Data Communication and Networking, NMS & Security of network	10
11	IP MPLS concepts	4
12	VSAT and Disaster Management Communications	2
	Total	**50**

F. Practical Examination

Sl. No	Labs	Type	Hours	Marks
1	Practical	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	4	80

G. Miscellaneous

Sl. No	Item	Hours
1	Study Tour (Optional)	6

Refresher course for Technician (Telecom) (Course code - SNT5)

Subject details

Code	Topic	Hrs	Sub Topic
ST-03(b)	Measuring Instruments	5	1. Digital Multimeter, True RMS Multimeter 2. Megger 3. Earth Tester 4. T.M.S. kit, E1 Tester 5. DB meter 6. Cross Talk meter 7. Psophometer 8. Clamp Meter 9. Vernier Caliper, Screw Gauge 10. Soldering iron and soldering technique
ST-04 (b)	Telecom Power supply arrangements	5	1. Classification of cells 2. Different types of charging 3. Capacity test of batteries 4. Li-ion & Ni MH cells 5. VRLA cells 6. Photovoltaic cells 7. UPS- working principle, Types, Applications 8. SMPS power supply 9. Telecom Integrated Power Supply System (TIPSS) 10. Typical power supply arrangement for various telecom installations and its load calculation 11. Earthing and lightning &Surge Protection systems 12. Trouble shooting and periodical maintenance of Telecom Power supply arrangements
ST-06	Safety In Train Operations, Disaster Management, Schedule of Dimensions	2	1. Knowledge and importance of S&T MR & S&T Disconnection 2. Use of detonators, hand signals and banner flag 3. Provision of speed restriction indicators 4. Working under integrated/ individual blocks 5. Protection of work site and safety precautions in RE area 6.Responsibility of S&T staff in case of disaster 7. Safety procedure, accident management, role of S&T staff 8. Safety circulars and instructions pertaining to S&T staff 9. Case study of accidents where S&T is involved 10. Need of schedule of dimensions 11. Schedule of dimensions applicable to S&T gears
ST-08(a)	Telecom Cables (Copper)	4	1. Different types of cables used for S&T applications 2. Quad cables: construction and its allocation 3. Cable laying practices 4. Jointing of underground cables 5. Testing of cables, cable route plan 6. Cable faults and its localization. 7. Cable route tracer & Cable fault Locator 8. Trouble shooting & Periodical maintenance of Telecom cables

ST-10	Telephone Instruments	2	1. Telephone parts, Integrated circuit, buzzer, cadre hook, card etc 2. General defects in telephone instruments 3. Testing and repairing of telephone lines 4. Periodical maintenance of telephone instruments 5. Type of telephones 5.1 Push button Telephone 5.2 Hand free Telephone 5.3 Selective ringing Telephone 5.4 Wireless Telephone 5.5 DTMF Telephone 5.6 Magneto Telephone 5.7 Control Telephone 5.8 IP Telephone 5.9 DKT phone 5.10 Satellite Phone
ST-45	Passenger Amenities (PA, PIS, IPIS & GPS Clocks)	6	1. Commercial classification of stations and Scale of Passenger Amenities 2. PA system and its sub components 3. Paging and talk back system 4. IP based IPIS 5. GPS based Digital Clocks 6. Telecom Arrangements for Public Functions including Video Conferencing Systems 7. Trouble shooting & periodical maintenance of passenger amenities 8. Installation & precommissioning check list of IPIS
ST-46	Electronic Exchange and IP Exchange	6	1. Exchanges and its classification 2. Electronic Exchanges in service 3. Principles of working of ISDN Exchanges 4. Different ISDN exchanges in use and Overview of Siemens Hipath 4000 & Coral Flexicom 6000 ISDN Exchanges. 5. Common faults in Electronic telephone exchanges and their rectification 6. VoIP Fundamentals 7. VoIP Protocols & VoIP Telephony 8. Asterisk based VoIP exchange 9. NGN and Protocols 10. Exchange Earthing 11. Trouble shooting & periodical maintenance of exchanges
ST-47	Tetra, GSM-R, LTE and Tunnel communication	2	1. Introduction to TETRA 2. Overview of GSM, GSM-R & LTE 3. LTE network architecture in Indian Railways 4. SACFA & WPC clearance 5. Tunnel communication

ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	4	1. Railnet and its application in Indian Railways 2. Wi-Fi System and its implementation in offices, Stations & Trains 3. PRS 4. UTS 5. FOIS 6. COA
ST-49	Train Traffic control & VoIP based control communication	6	1. Control communication (Non RE/RE area) 2. DTMF signaling 3. Head quarter control system 4. Way station control system 5. Emergency control communication system 6. OFC based control communication system 7. Radio patching 8. VoIP based Train Control Communication system 9. Extension of auto phone to accident site over EC socket 10. Fault analysis of control working 11. Trouble shooting & periodical maintenance of control communication system
ST-50	Optic Fiber Communicatio n and its Applications	8	1. Basic principles of optical fiber communication 2. OFC Propagation modes 3. OFC cable laying practices 4. Precautions in laying of Optical Fiber Communication cable 5. Splicing and termination of OFC 6. OFC measurements (Light source, Power meter, OTDR) 7. Optical Link Power Budget 8. Pulse Code Modulation 9. Drop/insert MUX 10. SDH multiplexing 11. Various measurements during normal maintenance, OFC interface for signaling systems 12. PDH Equipments : WEBFIL & PUNCOM 13. SDH Equipments TEJAS TJ100MC-1, TJ1400, FIBCOM 6325 14. Coordination with RCIL 15. NMS 16. Trouble shooting & periodical maintenance OFC
ST-54	Basics of Satellite Technologies, VSAT & Disaster Management Communicatio--n	2	1. Basics of Satellite communication 2. Role of Satellite communication in Indian Railways for Disaster Management communication with block diagrams 3. VSAT: Advantages &Role of S&T department, application 4. List of Minimum Essential Telecom Equipments to be Kept in Accident Relief Trains (ARTs) and periodicity of inspection 5. Communication arrangements (Video) from accident site and Future trends in Emergency communication 6. Video conference as a Tele presence service 7. Provision of PT set at accident site 8. SIM aggregator

ST-55	IP based Video Surveillance System	4	1. Applications of CCTV 2. Analog & Digital CCTV system 3. Types of Cameras 4. IP based surveillance system with Schematic diagram 5. Components of VSS & Software 6. Networking of CCTV 7. Trouble shooting, failure rectification of IP based Video Surveillance System
ST-56	VHF Systems	2	1. Wave propagation, Frequency ranges 2. Simplex and duplex system of communication 3. Oscillators and Amplifiers 4. Modulation and demodulation principles 5. Transmission Line Fundamentals {Characteristic Impedance (Zo), Voltage Standing Wave Ratio (VSWR), Impedance Matching etc.} 6. Radio transmitter and receiver. 7. Types of Antennae and their installation. 8. Types of power supplies used for VHF sets 9. Various applications of VHF Trans receivers. 10. Precautions while using the VHF sets 11. Troubleshooting and periodical maintenance of VHF systems.
ST-57	Data Communicatio n and Networking, NMS & Security of network	6	1. OSI and TCP/IP model 2. Baseband and broadband transmission 3. Networking elements (Switch, Router, Modem, LAN extender) 4. IP networks (IPV4, IPV6) 5. Networking, Firewalls 6. OFC/Quad Cable Connectivity for i) Block Circuit ii) Data Logger iii) SSDAC/MSDAC iv) EI 7. KAVACH 8. NMS of communication networks, Test & Measuring equipments for Data Communication and Networking 9. Cyber security basics 10. Trouble shooting & periodical maintenance of Data communication system
ST-58	IP MPLS Concepts and converged communication for Railway applications	4	1. Why IP-MPLS 2. Advantages of IP-MPLS 3. MPLS components 4. MPLS Operations 5. MPLS Protocols 6. TAN guidelines for implementation of IP MPLS 7. MPLS VPN 8. Traffic Engineering 9. Concepts of converged communication

ST-32(b)	Kavach	4	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 6. NMS of Kavach

Foundation course for Promotee Technician (Telecom) Gr.III (Course code –SNT10)

Nature of training	Training at	Duration	Marks
Institutional training	STTC	8 weeks	450

A. Course Program

Sl. No	Details	Hours
1.	Briefing, registration & open house discussion	3
2.	Theory	128
3.	Theory examinations	9
4.	Practicals	120
5.	Practical examinations	4
6.	Study Tour / Field visit	12
7.	CD spare	12
	Total	**288**

B. Summary of Evaluation:

Sl. No	Topic	Hours	Marks
1	Theory	9	300
2	Practical	4	100
3	CD's assessment	--	50
	Total	**13**	**450**

C. Theory:

Code	Subject	Hours	Marks
ST-01	General	2	6
ST-03 (b)	Measuring Instruments	4	12
ST-04 (b)	Telecom Power supply arrangements	6	12
ST-05 (a)	Basic Electricity and Magnetism	8	16
ST-07	Computer Appreciation	6	14
ST-08 (a)	Telecom Cables (Copper)	8	14
ST-09	Electronic components	6	14
ST-10	Telephone Instruments	6	12
ST-45	Passenger Amenities (PA, IPIS & GPS Clocks)	8	20
ST-46	Electronic and IP Exchange	10	24
ST-47	Tetra, GSM-R, LTE, Tunnel Communication	6	10
ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	8	20
ST-49	Train Traffic control & VOIP based control communication	10	26
ST-50	Optic Fibre Communication and its Applications	12	24

Code	Subject	Hours	Marks
ST-54	Basics of Satellite Technologies, VSAT & Disaster Management Communication	4	12
ST-55	IP based Video Surveillance System	4	12
ST-56	VHF Systems	4	12
ST-57	Data Communication and Networking, NMS & Security of network	8	16
ST-58	IP MPLS Concepts and converged communication for Railway applications	4	12
ST-32(b)	Kavach	4	12
	Total	**128**	**300**

D. Theory Examination:

Exam	Subjects	Hours	Marks
Exam-I	ST-01,03(b),04(b),05(a),07,08(a),09 & 10	03	100
Exam-II	ST-45,46, 47, 48,49	03	100
Exam-III	ST-50, 54,55,56,57,58 & 32(b)	03	100
	Total	**09**	**300**

E. Practicals

Sl.No.	Lab	Hours
1	Measuring Instruments	8
2	Power Equipments	4
3	Telecom Cables	10
4	Basic Electricity& Magnetism	4
5	Computer Appreciation	6
6	Electronic Components	2
7	Telephone Instruments (Exchange-IP &Non IP)	4
8	Passenger Amenities (PA, PIS, IPIS & GPS Clocks)	8
9	Electronic Exchange &IP Exchange including Asterisk programming	10
10	Railnet, Wi-Fi System, PRS, UTS & FOIS	8
11	Train Traffic Control Communication including VOIP based Control	8
12	Optic Fibre Communication, PDH (2 Mbps TDM based multiplexers), & SDH Equipments	14
13	VSAT & Disaster Management Communications	4
14	IP based Video Surveillance System	6
15	VHF Systems	4
16	Data Communication and Networking, NMS & security of network	14
17	IP MPLS Concepts and converged communication for Railway applications	6
	Total	120

F. Practical Examination

Sl No	Labs	Type	Hours	Marks
1	Practical	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	4	100

G. Miscellaneous

Sl. No	Item	Hours
1	Study Tour (Optional)	12

Foundation course for Promotee Technician (Telecom) Gr.III (Course code – SNT10)

Subject details

Code	Topic	Hrs	Sub Topic
ST-01	General	2	1. Railway Organisation and S&T structure 2. Duties of Technician 3. S&T stores 4. Telecom Manual 5. General & Subsidiary Rules (G& SR) of Indian Railways 6. Official Language policy and rules
ST-03 (b)	Measuring Instruments	4	1. Digital Multimeter, True RMS Multimeter 2. Megger 3. Earth Tester 4. T.M.S. kit, E1 Tester 5. DB meter 6. Cross Talk meter 7. Psophometer 8. Clamp Meter 9. Soldering iron and soldering technique
ST-04(b)	Telecom Power supply arrangements	6	1. Classification of cells 2. Different types of charging 3. Capacity test of batteries 4. Li-ion & Ni MH cells 5. VRLA cells 6. Photovoltaic cells 7. UPS- working principle, Types, Applications 8. SMPS power supply 9. Telecom Integrated Power Supply System (TIPSS) 10. Typical power supply arrangement for various telecom installations and it's load calculation 11. Earthing and lightning &Surge Protection systems 12. Trouble shooting and periodical maintenance of Telecom power supply equipments
ST-05(a)	Basic Electricity and Magnetism	8	1. Idea about EMF, current, power, resistance, inductance, capacitance, power factor etc. and their measurements. 2. Study of Ohms law and its application, series and parallel connections. 3. Importance of insulation resistance 4. Idea about magnetism and magnetic induction. 5. Transformers- working principle, rectifier-working principle. 6. Electric power and energy, Power factor and it's calculation (KVA,KW) 7. Fuses, surge protection devices and Lightening arrestors. 8. Measurement of loop and insulation resistance of cables and measurement of earth resistance. 9. AC and DC principles 10. Brief introduction to various Electrical equipments like chargers, stabilizers, transformers, UPS, DC-DC Converter, AC-DC Converter.

ST-07	Computer Appreciation	6	1. Computer hardware and interconnections a) Identification of CPU mother board, RAM and various computer peripherals like CD ROM, hard disk, key board, mouse, printer, monitor, interface cards, modem, scanners. b) Identification of interconnecting cables and interconnectionsserial/parallel ports, monitor port, power supply connections, UPS connection, modem connection etc. 2. <u>Operating system function (Window 10 or latest)</u> 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 3. Software Package-MS Word, MS Excel & MS power point. 4. Basic menu driven commands and application 5. Introduction to Servers
ST-08(a)	Telecom Cables (Copper)	8	1. Different types of cables used for S&T applications 2. Quad cables: construction and its allocation 3. Cable laying practices 4. Jointing of underground cables 5. Cable faults and its localization. 6. Testing of cables, cable route plan 7. Cable route tracer & Cable fault Locator 8. Trouble shooting& Periodical maintenance of Telecom cables
ST-09	Electronic components	6	1. Passive devices: Resistors, Capacitors, Inductors 2. Semi conductor diode, its parameters, uses etc. 3. Zener diode and its applications. 4. Special types of diodes used in Wireless. 5. Sensors and display devices: LEDs, LCDs, 7 segment display 6. Transistors – FET, BJT, UJT testing and applications. 7. Transistor - field effect and its uses 8. SCR, Diacs, Triacs 9. ICs analog and digital, precautions while handling and testing 10. Regulated power supplies 11. DC-DC converter and filter circuits

ST-10	Telephone Instruments	6	1. Telephone parts, Integrated circuit, buzzer, cadre hook, card etc 2. General defects in telephone instruments 3. Testing and repairing of telephone lines 4. Periodical maintenance of telephone instruments 5. Type of telephones 5.1 Push button Telephone 5.2 Hand free Telephone 5.3 Selective ringing Telephone 5.4 Wireless Telephone 5.5 DTMF Telephone 5.6 Magneto Telephone 5.7 Control Telephone 5.8 IP Telephone 5.9 DKT phone 5.10 Satellite Phone
ST-45	Passenger Amenities (PA, PIS, IPIS & GPS Clocks)	8	1. Commercial classification of stations and Scale of Passenger Amenities 2. PA system and Its sub components 3. Paging and talk back system 5. Remote paging 6. IP based IPIS 7. GPS based Digital Clocks 8. Telecom Arrangements for Public Functions including Video Conferencing Systems 9. Trouble shooting & periodical maintenance of passenger amenities 10. Installation & precommissioning check list of IPIS
ST-46	Electronic Exchange and IP Exchange	10	1. Exchanges and its classification 2. Electronic Exchanges in service 3. Principles of working of ISDN Exchanges 4. Different ISDN exchanges in use and Overview of Siemens Hipath 4000 & Coral Flexicom 6000 ISDN Exchanges. 5. Common faults in Electronic telephone exchanges and their rectification 6. MDF/IDF Protective devices 7. VoIP Fundamentals 8. VoIP Protocols & VOIP Telephony 9. Asterisk based VOIP exchange 10. NGN and Protocols 11. Exchange Earthing 12. Trouble shooting & periodical maintenance of exchanges

ST-47	Tetra, GSM-R, LTE, Tunnel Communicatio n	6	1. VHF Mobile Radio Communication 2. Introduction to TETRA 3. Cellular Mobile Radio Communication System 4. Overview of GSM, GSM-R & LTE 5. LTE network architecture in Indian Railways 6. SACFA & WPC clearance 7. Tunnel communication 8. WLL
ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	8	1. Railnet and its application in Indian Railways 2. Wi-Fi System and its implementation in offices, Stations & Trains 3. PRS 4. UTS 5. FOIS 6. COA
ST-49	Train Traffic control & VOIP based control communication	10	1. Control communication (Non RE/RE area) 2. DTMF signaling 3. Head quarter control system 4. Way station control system 5. Emergency control communication system 6. OFC based control communication system 7. Radio patching 8. VoIP based Train Control Communication system 9. Extension of autophone to accident site over EC socket 10. Fault analysis of control working 11. Trouble shooting & periodical maintenance of control communication system

ST-50	Optic Fiber Communication and its Applications	14	1. Basic principles of optical fiber communication 2. OFC advantages and applications 3. OFC Propagation modes 4. Construction of optical fiber cable 5. OFC cable laying practices 6. Precautions in laying of Optical Fiber Communication cable 7. Splicing and termination of OFC 8. OFC measurements (Light source, Power meter, OTDR) 9. Optical sources and Detectors 10. Optical Link Power Budget 11. Multiplexing techniques: FDM, TDM 12. Pulse Code Modulation 13. PCM frame structure 14. Types of Mux equipment 15. Drop/insert MUX 16. Jitter & Wander 17. SDH multiplexing 18. STM frame structure 19. Various measurements during normal maintenance and trouble shooting 20. OFC interface for signaling systems 21. PDH Equipments : WEBFIL & PUNCOM 22. PDH Multiplexers 23. SDH Equipments TEJAS TJ100MC-1, TJ1400, FIBCOM 6325 24. Coordination with RCIL 25. NMS 26. Trouble shooting & periodical maintenance OFC
ST-54	Basics of Satellite Technologies, VSAT & Disaster Management Communication	4	1. Basics of Satellite communication 2. Role of Satellite communication in Indian Railways for Disaster Management communication with block diagrams 3. VSAT: Advantages &Role of S&T department, application 4. List of Minimum Essential Telecom Equipments to be Kept in Accident Relief Trains (ARTs) and periodicity of inspection 5. Communication arrangements (Video) from accident site and Future trends in Emergency communication 6. Video conference as a Tele presence service 7. Provision of PT set at accident site 8. SIM aggregator
ST-55	IP based Video Surveillance System	4	1. Applications of CCTV 2. Analog & Digital CCTV system 3. Types of Cameras 4. IP based surveillance system with Schematic diagram 5. Components of VSS & Software 6. Networking of CCTV 7. Trouble shooting, failure rectification of IP based Video Surveillance System

ST-56	VHF Systems	4	1. Wave propagation, Frequency ranges 2. Simplex and duplex system of communication 3. Oscillators and Amplifiers 4. Modulation and demodulation principles 5. Transmission Line Fundamentals {Characteristic Impedance (Zo), Voltage Standing Wave Ratio (VSWR), Impedance Matching etc.} 6. Radio transmitter and receiver. 7. Types of Antennae and their installation. 8. Types of power supplies used for VHF sets 9. Various applications of VHF Trans receivers. 7.Precautions while using the VHF sets 8.Troubleshooting and periodical maintenance of VHF systems
ST-57	Data Communication and Networking, NMS & Security of network	8	1. Data representation 2. Data flow (Simples, Half duplex, Full duplex) 3. Networking elements (Switch, Router, Modem, LAN extender) 4. IP networks (IPV4, IPV6) 5. Routing & Switching 6. Networking, Firewalls 7. OFC/Quad Cable Connectivity for i) Block Circuit ii) Data Logger iii) SSDAC/MSDAC iv) EI v) KAVACH 8. Cyber security basics 9. Trouble shooting & periodical maintenance of Data communication system
ST-58	IP MPLS Concepts and converged communication for Railway applications	6	1. Why IP-MPLS 2. Advantages of IP-MPLS 3. MPLS components 4. MPLS Operations 5. MPLS Protocols 6. TAN guidelines for implementation of IP MPLS 7. MPLS VPN 8. Traffic Engineering 9. Concepts of converged communication
ST-32(b)	Kavach	4	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 6. NMS of Kavach

Refresher Course for Helpers (Telecom)(Course code –SNT6B)

Nature of training	Training at	Duration	Marks
Institutional Training	STTC	2 weeks	200

A. Course Program

Sl. No	Details	Hours
1.	Briefing, registration & open house discussion	3
2.	Theory	20
3	Theory examinations	3
4.	Practicals	39
5.	Practical examinations	4
6.	Study Tour / Field visit	0
7.	CD spare	3
	Total	**72**

B. Summary of Evaluation:

Sl. No	Topic	Hours	Marks
1	Theory	3	100
2	Practical	4	80
3	CD's assessment	--	20
	Total	**7**	**200**

C. Theory:

Code	Subject	Hours	Marks
ST-03 (b)	Measuring Instruments	6	25
ST-04(b)	Telecom Power supply arrangements	2	10
ST-05 (a)	Basic Electricity and Magnetism	1	5
ST-06	Safety in Train-operations, Disaster Management, Schedule of Dimensions	1	5
ST-08 (a)	Telecom Cables (Copper)	1	5
ST-10	Telephone Instruments	1	5
ST-45	Passenger Amenities (PA, IPIS & GPS Clocks)	1	5
ST-46	Electronic and IP Exchange	1	5
ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	1	5
ST-49	Train Traffic control & VoIP based control communication	1	5
ST-50	Optic Fibre Communication and its Applications	1	5
ST-55	IP based Video Surveillance System	1	5
ST-56	VHF Systems	1	5
ST-57	Data Communication and Networking	1	10
	Total	20	100

D. Theory Examination

Exam	Subjects	Hours	Marks
Exam-1	All subjects	03	**100**
	Total	**03**	**100**

E. Practicals

Sl.No.	Lab	Hours
1	Measuring Instruments	6
2	Power Equipments	4
3	Telecom Cables	4
4	Basic Electricity& Magnetism	2
5	Disaster Management	2
6	Telephone Instruments	2
7	Passenger Amenities (PA, PIS, IPIS & GPS Clocks)	3
8	Electronic Exchange &IP Exchange	2
9	Railnet, Wi-Fi System, PRS, UTS & FOIS	2
10	Train Traffic Control and VoIP based Control Communication	4
11	Optic Fibre Communication, PDH (2 Mbps TDM based multiplexers), & SDH Equipments	2
12	IP based Video Surveillance System	2
13	VHF Systems	2
14	Data Communication and Networking	2
	Total	**39**

F. Practical Examination

Sl No	Labs	Type	Hours	Marks
1	Practicals	Record Sheets (20%) Experiment (50%) Viva-voce (30%)	4	80

G. Miscellaneous

Sl. No	Item	Hours
1	Study Tour (Optional)	0

Refresher course for Helpers (Telecom)(Course code –SNT6B)

Subject details

Code	Topic	Hrs	Sub Topic
ST-03 (b)	Measuring Instruments	6	1. Ammeter 2. Voltmeter 3. Digital Multimeter, True RMS Multimeter 4. Megger 5. Earth Tester 6. T.M.S. kit, E1 Tester 7. Cross Talk meter 8. Psophometer 9. Clamp Meter 10. Hand tools (Hammer, Chisel, Wrench, Spanner, Box spanner, Screwdrivers, Drilling machines, Vacuum blowers, Cleaners) and its operation 11. Soldering iron and soldering technique 12. Upkeepment of Tools & Plants
ST-04(b)	Telecom Power supply arrangements	2	1. Cells and batteries 2. VRLA cells 3. SMPS power supply 4. UPS
ST-05 (a)	Basic Electricity and Magnetism	1	1. Series and parallel circuits 2. Applications of Electricity and magnetism
ST-06	Safety In Train Operations, Disaster Management, Schedule of Dimensions	1	1. Disasters & Accidents 2. Communication arrangements during disaster 3. Protection of work site and precautions while working in RE area
ST-08 (a)	Telecom Cables (copper)	1	1. Different types of cables used for S&T applications 2. Jointing of underground cables 3. Cable route tracer & Cable fault Locator
ST-10	Telephone Instruments	1	1. DTMF telephone 2. 4W control telephone 3. Periodic Maintenance of Telephone Instruments and its testing
ST-45	Passenger Amenities (PA, PIS, IPIS & GPS Clocks)	2	1. PA system 2. GPS based Digital Clocks 3. Telecom Arrangements for Public Functions including Video Conferencing Systems
ST-46	Electronic Exchange and IP Exchange	1	1. Different ISDN exchanges in use and Overview of Siemens Hipath 4000 & Coral Flexicom 6000 ISDN Exchanges. 2. Common faults in Electronic telephone exchanges 3. Earthing of an exchange

ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS	1	1. Railnet and its application in Indian Railways 2. Wi-Fi System and its implementation in offices, Stations & Trains
ST-49	Train Traffic control & VoIP based control communication	1	1. Principles of control working 2. DTMF signaling 3. Emergency control communication system
ST-50	Optic Fiber Communicatio n and its Applications	1	1. OFC cable laying practices 2. Splicing and termination of OFC
ST-55	IP based Video Surveillance System & ISS	1	1. Applications of CCTV 2. Periodical maintenance of IP based Video Surveillance System
ST-56	VHF Systems	1	1. Types of power supplies used for VHF sets 2. Precautions while using the VHF sets & Troubleshooting.
ST-57	Data Communicatio n and Networking	1	1. Networking elements (Switch, Router, Modem, LAN extender) 2. OFC/Quad Cable Connectivity for i) Block Circuit ii) Data Logger iii) SSDAC iv) EI v) Kavach

Annexures

Annexure I

List of subjects of training at IRISET

Signalling subjects

Sl No	Code	Name of the Subject
1	S1	Basics of Signal Engineering
2	S2	Principles of Interlocking, Selection Circuits and Control Tables
3	S7	Signalling in 25KV AC Electrified Section
4	S8	Signalling General
		Rolling Block programme
5	S9	Power Supply for Signalling, Earthing and Lightning & Surge protection arrangements
6	S10	Colour Light and Automatic Signaling.
7	S11	Data Logger & RDPMS
8	S12	Relay Interlocking - Metal to Carbon Relays (British)
9	S13	Circuit Practices – British
10	S14	Relay Interlocking - Metal to Metal Relays (Siemens)
11	S16	RRI Siemens
12	S17	Circuit Practice-Siemens
13	S18	Electronic Interlocking
14	S18A	Electronic Interlocking Design
		Standardized typical circuits for Electronic Interlocking
		Generation of RCC through SigDATE
15	S19	Signalling Relays and Cables
16	S20	Slot Circuit, Lifting Barriers & Key Transmitter
17	S21	Electric Point Machine
18	S22	Block working: Single Line –Push button PTJ Type and SGE double line Block Instruments
19	S23	Token-less Block Instrument for Single Line-FM Diado

Sl No	Code	Name of the Subject
20	S25	Train Detection Systems-I (DC Track Circuits, Coded AFTC and SSDAC)
21	S26	Train Detection Devices - II(MSDAC)
		Automatic Block Signalling With MSDAC
22	S27	Signalling Safety
23	S28	Kavach: Indian Rly Automatic Train Protection System
24	S29	Railway Signalling Installation and Quality Practices
		Signalling Maintenance Management System (SMMS)
25	TS1	Telecom for Signalling

Telecom Subjects

Sl No	Code	Name of the Subject
1.	TA1	Mobile Communication
2.	TA2	Data communication, Networking & WiFi
3.	TA3	Data networks of IR
4.	TA4	Cyber Security & Network Security
5.	TA5	LTE
6.	TA6	IP-MPLS & Converged communication
7.	TA7	Video Surveillance System
8.	TB1	Telecom General
9.	TB3	Digital Electronics
10.	TB4	Modulation Techniques (Digital)
11.	TB5	Radio propagation
12.	TC1	Telecom Cables (Copper)
13.	TC2	Public Address System
14.	TC3	Passenger Information System & VSS
15.	TC4	Power Supply Arrangement
16.	TC5	Earthing, Lightning & Surge Protection for Telecom Installations
17.	TC6	Train Traffic Control (Including VoIP based TCCS)
18.	TCS4	ISDN Exchange and Advancements
19.	TCS6	Asterisk based IP Telephony
20.	TCS7	Open Source Software and applications
21.	TCT2	PDH Principles
22.	TCT3	Programmable Digital Drop-Insert E1 PDH Equipments
23.	TCT4	OFC Systems
24.	TCT5	SDH Principles
25.	TCT6	SDH Equipment
26.	TM	Telecom Manual
27.	ST1	Signalling Basics
		Safety Practices & Rolling Block
28.	ST28A	KAVACH: IR-ATP including Communication arrangements

General Subjects

Sl No	CODE	Name of the Subject
1	G1	Personality Development
2	G2	Rajbhasha
3	G3	Disaster Management, Accident Communication & Joint findings of Accident inquiry
4	G4	Establishment & DAR
5	G5	Accounts & Stores
6	G6	Tenders and Contract
7	G7	Vigilance
8	G8	Quality and Reliability Standards

Annexure II

List of subjects of training at STTCs

Subject Index - Signalling

Subject code	Description
ST-01	General
ST-02	Cleanliness, Personal Safety, Fire Prevention, First aid
ST-03(a)	Measuring Instruments and use of hand & portable tools
ST–04(a)	Cells, Batteries, IPS, DG Set, Solar Panel, Lightning & Surge protection devices and earthing
ST–05(b)	Basic Electricity, Magnetism and Digital Electronics
ST-06	Safety in train operations, Schedule of dimensions, Disaster Management
ST-07	Computer Appreciation
ST-08(b)	Telecom Cables
ST-10	Telephone Instruments
ST-15	Basic concepts of Signalling
ST-16	Construction Practices
ST-17	Telecom Basics for Signalling
ST-18	Inter-slotting, Electrical Key Transmitter and Electrical Detector
ST-19	Relays, Cables and Earth Leakage Detector (ELD)
ST-20	Track Circuits
ST-21	Colour Light Signals
ST-22	Point Machines-- IRS conventional and High Thrust Clamp types
ST-23(a)	Panel Interlocking (British), RDSO Standardised Typical circuits
ST-23(b)	Panel Interlocking (Siemens)
ST-24	SSDAC & MSDAC
ST-25(b)	Push button PTJ, Handle Type FM Daido Single line token-less block instruments
ST-25(c)	SGE Double Line Block Instrument
ST-25(d)	UFSBI & SSBPAC(D)
ST-26	Signalling in RE Area

ST-27	Automatic Signaling, IBS
ST-28	Data logger, RDPMS and SMMS
ST-29	Route Relay Interlocking
ST-30	LC Gate interlocking
ST-31	EI & SigDATE
ST-32(a)	Kavach
ST-49	Train Traffic Control and VoIP based Control Communication
ST-53	Emergency Communication
ST-56	VHF Systems

Indicative topics of subjects

Note: The topics of each subject are required to be selected based on the target trainee.

ST-01 – General

- Railway Organisation and S& T structure
- Abbreviations & Symbols used in Railways
- Duties of Supervisors, Technicians and Helpers
- Hours of Work and Period of Rest rules-2005 (HOER)
- Leave Rules and Joining Time
- Pass Rules
- Discipline and Appeal Rules, 1968
- Railway Service Conduct Rules, 1966
- Workmen Compensation Act
- Welfare measures in Railways
- S& T stores
- Mandatory modules on iGOT Karmayogi Bharat portal

ST-02 - Cleanliness, Personal Safety, Fire Prevention, First aid

- Cleanliness at work place and environment conservation
- Safe working practices
- Safety Precautions to be followed while working in the vicinity of Railway track
- Personal safety
- Safety precautions in RE area
- Safety precautions in maintenance & trouble-shooting of Telecom assets
- Classification of fire, fire extinguishers, usage and periodical maintenance
- AFDAS (Automatic Fire Detection Alarm system) and its periodical maintenance
- First aid including CPR procedure

ST-03(a) - Measuring Instruments and Use of hand & portable tools

- Voltmeter
- Ammeter
- Digital Multi meter, True RMS Multi meter
- Clamp meters
- Analog and Digital meggar
- Earth resistance tester
- Earth leakage detector
- Cable route tracer
- Cable fault locator
- TMS kit
- Splicing machine
- OTDR
- Vernier Callipers
- Screw Gauge
- Hand tools (Hammer, chisel, wrench, spanner, box spanner, screw drivers, drilling machines, vacuum blower, cleaners) and their operation
- Work station for soldering

ST-04(a) - 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 and Bonding 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

ST-05(b) - Basic Electricity, Magnetism and Digital Electronics

- Idea about EMF, current, power, resistance, inductance, capacitance, power factor etc. and their measurements
- Study of Ohm's law and its application, series and parallel connections
- Idea about magnetism and magnetic induction (Electro magnetism)
- Transformer-working principle, Rectifier – working principle
- AC and DC principles
- Kirchhoff's voltage law & current law
- Digital electronics
  - Introduction to electronics & digital systems
  - Semi-conductor diodes
  - Special types of diodes
  - Transistors
  - Logic gates
  - Latches, flip-flops
  - Analog-Digital converters
  - Introduction to Microprocessor

ST-06 - Safety in train operations, Schedule of dimensions, Disaster Management

- Knowledge and importance of S&T MR & S&T Disconnection
- Train operations during failure of Points and Signals
- Authorities for passing signals at ON and precautions to be taken for train operations
- Precautions to be taken during maintenance, trouble-shooting and restoration of failures of Signalling assets
- Use of detonators, hand signals and banner flag
- Provision of speed restriction indicators
- Rolling block programme
- Working under integrated/ individual blocks
- Protection of work site
- Temporary single line working
- Train operations during total communication failure
- Responsibility of S&T staff in case of disaster
- Safety procedures, accident management, role of S&T staff
- Accident inquiry procedures
- Safety circulars and instructions pertaining to S&T staff
- Case studies of accidents where S&T is involved
- Need of schedule of dimensions
- Schedule of dimensions applicable to S&T gears

ST-07 – Computer Appreciation

- Computer hardware and interconnections
    - Identification of CPU mother board, RAM and various computer peripherals like CD ROM, hard disk, key board, mouse, printer, monitor, interface cards, modem, scanners
    - Identification of interconnecting cables and interconnections, serial/parallel ports, monitor port, power supply connections, UPS connection, modem connection etc.
- Operating system function (Window 10 or latest)
    - 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
    - Software Package-MS Word, MS Excel & MS power point
- Basic menu driven commands and applications
- Introduction to Servers

ST-08(b) – Telecom Cables

- Different types of cables used for S& T applications
- Quad cables: construction and its allocation
- OFC
- Cable route plan
- Cable laying practices
- Jointing/splicing of underground cables (6 quad & OFC)
- Cable termination
- Cable route tracer & Cable fault Locator

ST-10 – Telephone Instruments

- Telephone parts, Integrated circuit, buzzer, cadre hook, card etc
- General defects in telephone instruments
- Testing and repairing of telephone lines
- Periodical maintenance of telephone instruments
- Type of telephones
  - Push button Telephone
  - Hand free Telephone
  - Selective ringing Telephone
  - Wireless Telephone
  - DTMF Telephone
  - Magneto Telephone
  - Control Telephone
  - IP Telephone
  - DKT phone
  - Satellite Phone

ST-15 – Basic Concepts of 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 despatch 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

ST-16 – Construction Practices

- Survey
- Planning of indoor & outdoor works
- Execution of outdoor works
- Execution of indoor works
- Wiring diagrams and Bell test
- Testing of installation including FAT, SAT, Functional and Square sheet testing

- AFDAS-Maintenance & Testing
- Pre- NI & NI works
- Documentation
- Safety in Execution of works
- Mandatory sanctions for new works
- CRS inspection

ST-17 – Telecom basics for Signalling

- 6 Quad cable
- OFC
- Train Control Communication Systems
- Computer Networking
- Communication medium for Signalling Systems

ST-18 - Inter-slotting, Electrical Key Transmitter and Electrical Detector

- Inter-slotting
  - Explanation of inter-slot – one slot one train feature
  - Purpose, various methods, circuitry explanation
  - Cross protection, double cutting
  - Testing of inter-slot and fault localization
- Electrical Key Transmitter
  - Principle of working and usage
  - Construction features
  - Method of connection
  - Coil used, voltage, resistance, current
  - Mode of connecting a pair and wiring
  - Maintenance, testing, trouble-shooting and rectification of Mechanical and Electrical parts
  - Safety checks
- Electrical Detector
  - IRS type Electrical Detector
  - Combined lock and detectors, different slides
  - Adjustment of detection and cross protection contacts
  - Fixing and wiring
  - Adjustments
  - Safety instructions and fail-safe adjustments

ST-19 – Relays, Cables and Earth Leakage Detector

- Relays
  - DC Neutral relays, plug in type – Principle of working, usage
  - Track and line relays
  - AC relays–Principle of working, usage
  - Parameters/characteristics of all types of relays
  - Polarised relays – Principle of working
  - Plug in type relays – types of relays used
  - Metal to carbon, Metal to Metal relays

  - Identification of relays, their contacts and relay contact analysis
  - AC immunized DC neutral relays
  - Electronic timer
  - Flasher relay
  - Heavy duty contact relays (QBCA1, Siemens point contactor relays)
  - Periodicity of overhauling, sealing
  - Relay fixing & wiring practices
  - Documentation & painting particulars
  - Testing of relay circuits
  - Maintenance activities & Safety checks
  - Typical failures and trouble-shooting
- Cables
  - Different types of cables used in Signaling, their usage and construction features
  - Cable laying and termination practices
  - Electrical characteristics
  - Testing of cables
  - Maintenance practices, fault localization and rectification
  - Use of Cable route tracer and Cable fault locator
  - Cable route plan
  - Cable distribution plan
  - Cable termination particulars – Documentation and painting
  - Safety checks
- Earth Leakage Detector
  - Working principles
  - Uses
  - Setting references
  - Pre-commissioning check lists
  - Maintenance activities
  - Potential free contacts for data logger

ST-20 – 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
- 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
- Audio frequency track circuits
  - Principle of working
  - Common failures, trouble-shooting and maintenance practices

ST-21 – Colour Light Signals

- 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
- Gantry signal
- Lamp proving relays
- Maintenance activities and trouble-shooting
- Safety checks

ST-22 - Point Machines-- IRS conventional and High Thrust Clamp types

- IRS Conventional Point Machine
    - Principle of working
    - Construction features
    - Ground connections
    - Installation and wiring practices
    - Permanent way requirements
    - Testing and safety checks
    - Maintenance activities
    - Adjustment of point machine
    - Joint inspection with Permanent Way wing
    - Trouble-shooting and failure restoration
- 220mm TWS & High thrust clamp type Point Machine
    - Principle of working
    - Construction features
    - Ground connections
    - Installation and wiring practices
    - Spring setting device (SSD), its parameters and maintenance
    - Permanent way requirements
    - Testing and safety checks
    - Maintenance activities
    - Adjustment of point machine
    - Joint inspection with Permanent Way wing
    - 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

ST-23(a) - Panel Interlocking (British), RDSO Standardised Typical circuits

- Features of control panel
- Types of buttons, knobs, indications
- Various controls
- Basic principles of interlocking
- Basic control circuits
- Point control circuits
- Route setting, checking and holding circuits
- One signal one train feature
- Siding control, crank handle control and LC gate control circuits
- Signal control circuits
- Route cancellation circuits
- Route release circuits
- Indication circuits
- Typical failures and trouble-shooting
- Centralized operation with SM's control
- Installation, testing and maintenance practices
- Maintenance activities and safety checks
- Important registers
- Documentation
- Overview of RDSO standardized typical circuits

ST23(b) – Panel Interlocking (Siemens)

- Route section plan
- Features of control panel
- Types of buttons, knobs, indications
- Various controls
- Different relay groups in use
- Basic control circuits
- One signal one train feature
- Button control, siding control, crank handle control, LC gate control
- Point control with individual and auto operation
- Route release, sectional route release and signal control
- LSS control
- Sub-route, full route and emergency cancellation
- Typical failures and trouble-shooting
- Installation, testing and commissioning practices
- Maintenance activities and safety checks

ST-24 – SSDAC & MSDAC

Note: SSDAC and MSDAC of makes of the choice of Zonal Railways can be considered for training purpose.

- SSDAC
    - Principle of working
    - Components of the system and their purpose
    - Power supply and communication medium requirements
    - Address setting

    - Resetting procedure
    - Interface with EI
    - Installation practices and pre-commissioning check list
    - Maintenance, trouble-shooting, diagnostic features and failure rectification
    - Testing and safety checks
    - BPAC working using SSDAC
    - Dual detection SSDAC
    - HASSDAC

- MSDAC
    - Principle of working
    - Components of the system and their purpose
    - Configuration of detection devices
    - Power supply and communication medium requirements
    - Resetting procedure
    - Interface with EI
    - Installation practices and pre-commissioning check list
    - Maintenance, trouble-shooting, diagnostic features and failure rectification
    - Testing and safety checks
    - IBS using MSDAC
    - ABS using MSDAC
        - With supervisory axle counter
        - With main and redundant axle counters
    - Track circuiting in station yard using MSDAC

- Protection of track devices during Engineering works
- Provisions of SWR regarding SSDAC and MSDAC working
- Remote monitoring
- Policy guidelines on resetting of axle counters

ST-25(b) - Push button PTJ, Handle Type FM Daido Single line token-less block instruments

- Requirements of token-less block working
- Push button PTJ Single line token-less block instrument
    - Construction features
    - Medium of communication
    - Power supply arrangements
    - Sequence of operations
    - Wiring & Installation practices
    - Explanation of relay circuits
    - Maintenance practices
    - Testing and Safety checks
    - Trouble-shooting and failure restoration
    - Overhauling requirements

- Handle type FM Daido Single line token-less block instrument
    - Construction features
    - Medium of communication
    - Power supply arrangements
    - Sequence of operations
    - Wiring & Installation practices
    - Explanation of relay circuits
    - Maintenance practices
    - Testing and Safety checks

    - Trouble-shooting and failure restoration
    - Overhauling requirements

ST-25(c)- SGE Double Line Block Instrument

- Requirements of double line block instruments
- Construction features – TOL lock, half notch, contacts, indicators, PR relay
- Medium of communication
- Power supply arrangements
- Sequence of operations
- Wiring & Installation practices
- Explanation of relay circuits
- Maintenance practices
- Testing and Safety checks
- Trouble-shooting and failure restoration
- Overhauling requirements

ST-25(d) – UFSBI & SSBPAC(D)

- UFSBI
    - System description
    - Working principles
    - Communication medium
    - Power supply requirements
    - Hardware architecture
    - Relays and their sequence of operation
    - Address settings
    - Reset operation
    - Installation practices
    - Maintenance, trouble-shooting and failure restoration
- SSBPAC(D)
    - Features of SSBPAC(D)
    - Sub-systems of SSBPAC(D)
    - Communication medium
    - Power supply requirements
    - Block panel
    - Block operations
    - Interface relays
    - Interfacing with EI
    - Installation and testing
    - Maintenance practices, trouble-shooting and failure rectification

ST-26 – 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

ST-27 - Automatic Signaling, IBS

- Automatic Signalling
    - Control circuits of ABS using track circuits / axle counters and Aspect control sequence
    - Cascading / Cutting in arrangements
    - Red lamp protection
    - Automatic and semi-automatic signals and King knob control
    - A marker, AG marker and G marker – Provisions of G&SR
    - Modifed automatic signaling
    - LC gate control in Automatic Signalling territory, Approach warning
    - Power supply requirements for Automatic signalling
    - Automatic working on Single line and 3rd line sections
    - ABS using MSDAC
    - Supervisory track section working
    - Resetting procedures including auto reset and manual reset
    - Lightning and surge protection systems and Earthing requirements for ABS
    - Exception report to monitor mismatch in dual digital axle counter system
    - Precautions before and during maintenance of digital axle counters / signals / LC gates
    - G&SR provisions for train operations in case of failure of signals in Automatic / Semi-automatic mode with/without LC gate
    - Train operations during prolonged failure and wrong direction movement
    - Duties of Look Out person during failure and maintenance in block section
    - Check list for Automatic Signalling works
    - Twin single line with ABS working
    - Overview of RDSO standardized circuits of ABS

- IBS
    - IBS for section capacity enhancement
    - Block working rules for IBS
    - Use of SSDAC / MSDAC for IBS
    - Power supply requirements of IBS
    - Signalling Circuits in IBS
    - Resetting arrangements
    - Passing IBS at ON
    - Telephone circuit for IBS
    - Safety checks
    - Maintenance activities, trouble-shooting and restoration

ST-28 – Datalogger, RDPMS and SMMS

- Datalogger
    - Principle of working
    - Hardware and Software
    - Power supply requirements

    - Networking of data loggers
    - Central monitoring
    - Validation of inputs
    - Diagnostic features
    - Maintenance practices
    - Fault logics, Exception reports
    - Online / Off-line simulation
- RDPMS
    - Need for RDPMS
    - Parameters monitored for point, signal and track circuit
    - Study of RDPMS of an OEM
- SMMS
    - Introduction
    - User Id and Employee Id creation with assigning Location
    - Field Survey
    - Asset registration, verification and approval
    - Entry of disconnection memo and failures
    - Maintenance scheduling
    - Entry of field maintenance works

ST-29 – Route Relay Interlocking

Note: Zonal Railways can decide on either British or Siemens type of Route Relay Interlocking for training.

- Route Relay Interlocking (British)
    - Introduction
    - Features of RRI over PI
    - Description of panel, switches/Knob, buttons, Colour code, Layout indications, Cancellation counter, SMs Key etc.
    - Automatic Route setting and LR circuits
    - Point lock relay and control circuits
    - Auto Point operation including point chain group circuit and Point indication circuit
    - Route Checking circuit
    - Track stick relay circuit
    - Approach & Route locking circuit
    - Signal control circuit
    - Signal aspect lighting circuit
    - Sequential and sectional route (sub route) release circuit
    - Time release circuits
    - Panel indication circuits
    - Point crank handle interlocking circuits
    - L.C gate control circuits
    - Siding point interlocking circuit
    - Cable termination, Fuses links
    - Indoor and outdoor maintenance
    - Power supply arrangements

- Route Relay Interlocking (Siemens)
    - Introduction of siemens route relay interlocking
    - Description of panel, switches/Knob, buttons, Colour code, Layout indications,

Cancellation counter, SMs Key etc.
- Zone wise concept & circuit requirements
- Selection table and locking table
- Button relays and button checking relays
- Signal operation
- Slot control
- Point operation
- Automatic Route Release
- Emergency operations
- Semi-automatic signals
- Indication circuits
- Indoor and outdoor maintenance
- Power supply arrangements

ST-30 – LC gate interlocking

- Policy on interlocking of LCs
- Aspect control in interlocking of LC Gates
- Mechanical lifting barrier gates
  - Functions of different components
  - Approach warning and route holding arrangements at LC gates
  - Working of Sliding Booms
  - Power supply arrangements
  - Relay circuits
  - Maintenance activities
  - Safety checks

- EOLB
  - Principle of working (of a specific make of EOLB as per Zonal Railway's choice)
  - Functions of different parts
  - Sequence of relay operations
  - Power supply & cabling requirements
  - Installation practices
  - Pre-commissioning checklists
  - Maintenance activities including safety checks
  - Trouble shooting & failure restoration

ST-31 – EI & SigDATE

- 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
- I/O bit calculations
- 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
- RDSO approved circuits
- Specifics about a particular OEM make EI on hard ware, software, installation & maintenance practices and trouble-shooting (as per Zonal Railway's requirements)
- VDU, Interface requirements and Operations
- Inbuilt block working in EI
- SigDATE
    - Basics
    - Capturing yard
    - Generation of RCC

ST-32(a) – Kavach

- Overview and basics of Kavach and its working, SM's unit, OFC & RIU
- Basics of onboard Kavach, Various Modes of operations, Train position, Movement authority, target distance
- Overview of communication between station and loco Kavach
- Types of RFID, RFID Layout & programming, RFID fixing and trouble-shooting
- Overview of Kavach TOC, 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

ST-49 - Train Traffic Control and VoIP based Control Communication

- Principles of control working
- DTMF signaling
- Head quarter control system
- Way station control system
- Overview of VoIP based Train Control Communication system

ST-53 – Emergency Communication

- Use of portable control telephone & megaphone
- Mobile and portable VHF sets
- Use of PA system
- Use of magneto phones, selective calling telephones and field service cables
- Items used in breakdown
- Satellite phone
- Remote subscriber unit for extension of auto telephone at accident site

ST-56 – VHF systems

- Working of 5 W Walkie talkie and 25 W VHF sets
- Programming of VHF sets
- Testing of VHF sets

- Types of power supplies used for VHF sets
- Types of antennae and their installation
- Precautions while using VHF sets
- Common defects and trouble-shooting

Subject index - Telecom

Code	Subject
ST-01	General
ST-02	Cleanliness and environment conservation, Personal Safety, Fire Prevention, First Aid
ST-03 (b)	Measuring Instruments
ST-04 (b)	Telecom Power supply arrangements
ST-05 (a)	Basic Electricity and Magnetism
ST-06	Safety In Train Operations, Disaster Management, Schedule of Dimensions
ST-07	Computer Appreciation
ST-08 (a)	Telecom Cables (Copper)
ST-09	Electronic components
ST-10	Telephone Instruments
ST-45	Passenger Amenities (PA, IPIS & GPS Clocks)
ST-46	Electronic and IP Exchange
ST-47	Tetra, GSM-R, LTE, Tunnel Communication
ST-48	Railnet, Wi-Fi System, PRS, UTS & FOIS
ST-49	Train Traffic control and VoIP based control Communication system
ST-50	Optic Fibre Communication and its Applications
ST-52	Digital Fundamentals & Applications
ST-54	Basics of Satellite Technologies, VSAT & Disaster Management Communication
ST-55	IP based Video Surveillance System
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ST-57	Data Communication and Networking, NMS & Security of network
ST-58	IP MPLS Concepts and converged communication for Railway applications
ST-32 (b)	Kavach