



Programme Handbook
Induction Training
Of
Junior Telecom Officer Trainees

**NATIONAL TELECOMMUNICATIONS INSTITUTE
FOR POLICY RESEARCH, INNOVATION & TRAINING**

Department of Telecommunications, Ministry of Communications
ALTTC Campus, Govt of India Enclave, Raj Nagar Extension
Ghaziabad-201002, India
Website: www.ntiprit.gov.in

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ABOUT NTIPRIT

NTIPRIT was established in the year 2010 as National Telecom Academy, the telecom training institute of Department of Telecommunications. Subsequently, in year 2011, the mandate of the institute was expanded by bringing into the activities related to Policy Research and Innovations under its ambit and the institute was rechristened as National Telecommunications Institute for Policy Research, Innovations & Training (NTIPRIT).

The institute is the focal point of training activities for all technical cadres in Ministry of Communications. It caters to the training needs of Indian Telecommunication Service (ITS) & BWS Group 'A' and Group 'B' officers. The institute is entrusted with the responsibility of conducting Mid Carrier Training Program (MCTP) of ITS officers at various levels / stages of their career before they are promoted to positions of higher responsibilities. The institute regularly organizes in-service trainings, workshops, conference etc. for serving Group 'A' and Group 'B' officers on contemporary topics. The institute also organizes capacity building programs on relevant and useful topics for the officers of Central Govt., State Governments and other stake holders in Digital Communication space. The institute has developed a niche in the emerging areas of telecom technology such as 5G and its applications, AI, Block chain, IoT, Big Data Analytics, Green Energy, etc.

As an apex training institution of the country in Telecom domain and a premium telecom training institution in the Asia Pacific region, NTIPRIT has shouldered the responsibility of capacity building for developing countries by conducting several courses under Indian Technical and Economic Cooperation (ITEC) Programme of Ministry of External Affairs (MEA), Govt. of India, and for Asia-Pacific Telecommunity (APT) member countries.

NTIPRIT is operating from ALTTC campus which consists of Administrative and Academic Blocks, Satellite Earth Station, hostels and residential complex spread over 81 acres of land situated in Government of India Enclave, Rajnagar, Ghaziabad. The Institute is nearly 30 Kms from New Delhi Railway Station and about 50 kms from Indira Gandhi International Airport, New Delhi.

FACILITIES AT NTIPRIT-ALTTC CAMPUS

OFFICE COMPLEX: Administrative Block of the ALTTC campus houses, on its eight floors, a good number of fully equipped classrooms with audio-visual aids, a library, a seminar hall, a conference hall to accommodate ninety persons and a canteen. The Academic Block houses laboratories of technologies such as NGN, 3G, GSM, CDMA, SDH, DWDM, Broadband etc. A little distance away from these blocks is the Satellite Earth Station easily distinguished by its large antenna disc.

HOSTELS: There are three hostels for course participants namely, J.C. Bose Hostel, Raman Hostel and Bhabha hostel. Residence in the campus is compulsory for the Officer Trainees under probation. Permission to stay outside will be accorded only under the most compelling circumstances. Families and guests are not allowed to stay in the hostels.

AUDITORIUM: The campus has a state-of-the-art, multipurpose auditorium named C.K. Reddy Hall with a seating capacity of about five hundred persons. All landmark events of campus are held here and it has a rich heritage of hosting some of the finest artistes of the world and leading personalities who have been successful in their respective fields.

SHOPPING CENTRE: A small shopping centre with few shops is situated between the colony and hostels to cater to both the residents and trainees.

SPORTS FACILITIES: The campus provides various sports and recreation facilities for the trainee officers and faculty members. There are two Tennis courts as well as Volleyball and Basketball courts all of which are located close to the hostels. The student centre provides facilities for Table Tennis, Billiards, Chess, Carom, Cards etc. Adjoining the Student Centre is a Gymnasium Hall, which houses two indoor Badminton Courts, being another attraction for the trainees. A Cricket ground and a Football field with athletic track are also available in the campus.

ABOUT THE INDUCTION TRAINING PROGRAMME

OBJECTIVES: The purpose of this course is to prepare the Junior Telecom Officer Trainees (also referred to as JTOs in this handbook), under probation, for handling various duties assigned in Department of Telecommunications such as Office procedure and Administration, Licensing and Regulation functions, LSA functions, PSU coordination, Network and Cyber Security, Standards & Mandatory testing for telecom network and equipment, etc. It also provides a strong foundation through specialized training in telecom technologies.

After implementation of National Digital Communication Policy-2018, the role and responsibility of the Department has increased many fold to become key enabler of implementation of policies for Digital India. The Department will play key role in timely deployment and growth of 5G networks and other emerging technologies, ensuring customer satisfaction, Quality of Service and effective Grievance Redressal, Leveraging Artificial Intelligence and Big Data in a synchronized and effective manner to enhance the overall Quality of Service, Spectrum Management, Network Security and Reliability etc.

This course exposes the participants to the fundamentals of telecom technologies and administration, licensing and regulation aspects, legal framework, LSA functioning; emerging technologies such as AI / ML/ Blockchain, IoT; Network and Cyber Security, etc. The course is designed for overall development of Officer Trainees wherein apart from telecom administration and technologies, special focus has been given to development of Managerial and Soft skills.

To impart clear understanding about the role and functioning of various units of Department and associated organizations, the class room induction training programme has been supplemented with field attachments to DoT headquarter, LSAs, BSNL, etc. For holistic development of officers, a trekking trip has been included as a part of induction curriculum.

Besides foundational training covering generic understanding of all functions within DoT, to groom the officers for posting in various specialized units of department like TEC, NCCS, Telecom Security wing, licensing wing, LSA verticals, etc., specialized training will be imparted as self-paced learning for each unit of posting through the Role based specialization module.

CONTENTS: The Programme broadly comprises classroom modules at NTIPRIT and other institutions, and field attachment to various units of DoT, LSAs and PSUs of DoT, Project work and Role based specialization module at the unit of posting of the officer trainee.

The description of training modules, given in this handbook, is indicative only. The sequence of training modules and field attachments, may be changed at any stage to cover the latest developments and emerging needs or due to other administrative reasons.

SCHEDULE OF TRAINING AND FIELD ATTACHMENT

The structure of the 52 weeks long induction training including class room modules and field attachment trainings shall be as under:

S. No.	Topic	Duration of Module (in weeks)
A	Phase I: Classroom Training at NTIPRIT	
1	Orientation	1
2	Office Procedures and Administration	2
3	Establishment Rules	1
4	Ethics and soft skills	2
5	Fundamentals of digital communications technologies	2
6	Licensing and Regulation	1
7	Trekking trip	1
8	Telecom Networks and Technologies- Access Services	3
9	Telecom Networks and Technologies- Data Services	2
10	Telecom Networks and Technologies- Carrier Services	1
11	Standards and Testing	1
12	Information Security Management System and emerging technologies with focus on topics like AI/ML/Blockchain, IoT	1
13	Big Data Analytics	1
14	Network and Cyber Security	1
	Field Attachment	
15	Field Attachment DoT HQ	4
16	Field attachment BSNL	4
17	Field attachment Big LSAs	8
18	Field attachment Tenure LSAs	4
B	Phase II: Classroom Training at NTIPRIT	
19	Project work, Experience sharing and Valediction	2
C	Phase III: Role based specialization module	
20	Role based specialization module through IGoT or other platform (<i>Maximum One hour per day</i>)	10
	Total duration (in weeks)	52

The individual course details and contents are covered in the subsequent sections.

Note:

1. The courses are to be conducted as outlined in this handbook.
2. The sequence of conduction of individual training modules shall be decided by NTIPRIT, and may not be conducted in the sequence given above.

Course objectives and contents of various trainings and field attachment modules

Phase I: Classroom Training at NTIPRIT

1. Orientation (One week)

The module will be aimed at familiarizing the officers with the organizational structures of DoT within the framework of functioning of Government machineries. After this module, officers should be aware of functions of the department and its various wings.

1.1. Learning Objectives

- 1.1.1** Complete joining formalities
- 1.1.2** Get exposed to new work culture
- 1.1.3** Interact with senior officers
- 1.1.4** Explain allocation of business rules
- 1.1.5** Interpret organization structure of DoT
- 1.1.6** Outline the role of various wings of DoT

1.2. Course Contents

- 1.2.1** Interaction with Chairman and Members of Digital Communications Commission and Senior Officers of Department of Telecommunications.
- 1.2.2** Interaction with Senior dignitaries of TRAI, TDSAT, TCIL, BSNL, MTNL, BBNL, C-DOT etc
- 1.2.3** Briefing on the Training Programme of the Officer Trainees
- 1.2.4** Organizational setup of the Ministry of Communications, Digital Communications Commission and Department of Telecom
- 1.2.5** Organizational structure and functions of the Telecom Directorate, Telecom Engineering Centre, and LSAs.
- 1.2.6** History of Telecom and overview of Indian Telecom scenario
- 1.2.7** Roles of the public sector organizations of DoT i.e. BSNL, MTNL, BBNL, ITI, TCIL & C-DOT
- 1.2.8** Role of TRAI and TDSAT
- 1.2.9** International co-operation in the field of telecom, role and functions of ITU, UNDP, and APT
- 1.2.10** Policy Analysis & Research in Telecom & ICT
- 1.2.11** Telecom Technology trends.
- 1.2.12** Role of Industrial bodies in Telecom sector- COAI, AUSPI, ISPAI, TEMA etc.

2. Administrative Functions (Two weeks)

The module on administrative rules will focus on developing the necessary competence of the officers in handling section works and running offices. After this module, the officers shall also be aware of the rules and ways by which administrative decisions are taken within the Government. The officers shall know using e-offices and get familiarized with procurement procedures of Government. It will develop ability in the officers to dispose of matters/cases with

speed and quality following the due procedures prescribed.

2.1. Learning

Objectives

- 2.1.1** To be able to carry out noting and drafting
- 2.1.2** To be able to maintain files, documents and records
- 2.1.3** To interpret delegation of financial powers and Manual of Office Procedures
- 2.1.4** To be able to apply GFR and use GeM /CPPP portals
- 2.1.5** To list channel of submission and explain process of decision making
- 2.1.6** To be able to explain administrative powers
- 2.1.7** To be able to use e-office
- 2.1.8** To be able to handle PQ, RTI, Court cases, grievances etc.
- 2.1.9** Consumer Protection Act
- 2.1.10** Gender sensitization

2.2. Course

Contents

- 2.2.1** Organizational structures of Government of India/ Machinery of Government of India:
 - 2.2.1.1** Flow of power from President of India
 - 2.2.1.2** Allocation of Business Rule/Transaction of Business Rule including that for DoT
 - 2.2.1.3** Integrated Finance Division
 - 2.2.1.4** Organizational Structure of DoT and its functions
- 2.2.2** Detailed responsibilities as JTO in different units of DoT:
- 2.2.3** Decision-making in Government, Delegation of Powers and Channel of Submission.
- 2.2.4** Office Procedure:
 - 2.2.4.1** Overview of Central Secretariat Manual of Office Procedures
 - 2.2.4.2** Management of dak and receipts
 - 2.2.4.3** File Management: Filing System/Part File/Volume of file/Docketing/Referencing/Aids to processing
 - 2.2.4.4** Record Management including its retention policy
- 2.2.5** Noting:
 - 2.2.5.1** Principles of Noting /Functional Approach to Noting
 - 2.2.5.2** Exercise
- 2.2.6** Drafting:
 - 2.2.6.1** Principles of Drafting/Forms of Communication
 - 2.2.6.2** Drafting Official Communication in any given situation
 - 2.2.6.3** Exercise
- 2.2.7** E-office procedures and working on e-office:
- 2.2.8** Handling of PQ
- 2.2.9** RTI: Handling of RTI questions in relation to provisions of RTI and in reference to Official Secret Act
- 2.2.10** Delegation of Financial Power Rules (DFPRs):
- 2.2.11** General System of Financial Management:
- 2.2.12** Budgeting

- 2.2.13** Public Procurement- Principles/ Procedure:
 - 2.2.13.1** GFR Provisions for Goods, Services
 - 2.2.13.2** Guidelines and Process in Procurement Manuals
- 2.2.14** Procurement of works
- 2.2.15** Tendering Concepts including e-tendering, Reverse Auction:
- 2.2.16** CPP Portal
- 2.2.17** Government e-Marketplace (GeM)
- 2.2.18** Preparation of RFP document
- 2.2.19** Inventory Management
- 2.2.20** Contract Management
- 2.2.21** Consumer Protection Act
- 2.2.22** Handling of Public Grievances in Telecom Sector and Citizen Charter
- 2.2.23** Gender Sensitization
- 2.2.24** Conducting Meeting (Preparing agenda, leading discussion to preparing Minutes)
- 2.2.25** PFMS:
 - 2.2.25.1** Overview/Features/Applications
 - 2.2.25.2** DDO functions
- 2.2.26** Preparation of reports:
 - 2.2.26.1** Types of reports (Status report, Inspection Report, MIS, etc.)
 - 2.2.26.2** Report Writing

3. Establishment Rules (one week)

This module shall be aimed at developing a basic understanding of different rules related to establishment matters, including vigilance functions. This is expected to develop the capacity amongst the officers to interpret the rules and assist the office in taking appropriate decisions.

3.1. Learning Objectives

- 3.1.1** To be able to interpret FR/SR
- 3.1.2** To be able to explain conduct rules
- 3.1.3** To be able to exercise leave rules
- 3.1.4** Medical Rules
- 3.1.5** LTC and Travelling Allowance Rules
- 3.1.6** Vigilance functions in Government
- 3.1.7** Career growth and role of performance appraisal

3.2. Course Contents

- 3.2.1** General rules and regulations:
 - 3.2.1.1** Relationship between various Legal Instruments (Constitutional Provisions/Acts/Statutory Provisions/Orders, etc.) and their interpretations.
- 3.2.2** FR-SR Provisions:
 - 3.2.2.1** Service and Recruitment Rules: Organized/Non- Organized Service
 - 3.2.2.2** Recruitment
 - 3.2.2.3** Appointment
 - 3.2.2.4** Training
 - 3.2.2.5** Staff establishment

- 3.2.2.6 APAR
- 3.2.2.7 Seniority
- 3.2.2.8 Promotions
- 3.2.2.9 Cadre Review
- 3.2.3 Constitutional Provisions and Conduct Rules:
 - 3.2.3.1 Art 309/310/311
 - 3.2.3.2 Conduct Rules, 1964
 - 3.2.3.3 CCS(CCA) Rules, 1965
 - 3.2.3.4 Suspension
 - 3.2.3.5 IPR
- 3.2.4 Establishment Rules:
 - 3.2.4.1 Reservation Rules
 - 3.2.4.2 Joining Time
 - 3.2.4.3 Welfare measures
 - 3.2.4.4 Leave Rules
 - 3.2.4.5 Medical Rules
 - 3.2.4.6 Income Tax Rules
 - 3.2.4.7 LTC and Travelling Allowance Rules
 - 3.2.4.8 Service Book
 - 3.2.4.9 Terminal Benefits including NPS provisions
 - 3.2.4.10 Unions & Associations
- 3.2.5 Office Inspection
- 3.2.6 Vigilance functions in Government:
 - 3.2.6.1 Vigilance set up in Government
 - 3.2.6.1.1 Vigilance set-up
 - 3.2.6.1.2 Role of CVC & CBI
 - 3.2.6.2 Prevention of Corruption Act
 - 3.2.6.3 Complaint Handling
- 3.2.7 Role and Function of CAT:
 - 3.2.7.1 Role and Function of CAT
 - 3.2.7.2 Handling of Court Case

4. Ethics and Soft-Skill (2 weeks)

The importance of ethics in functioning of Government has been emphasized time and again. Therefore, imparting the education of values and ethics to the officers with special focus on Government functioning is must to ensure that the rules and principles are applied in most rational and objective manner. Also, to effectively and meaningfully contribute in the Government, various core competences like team-work and collaboration, effective communication, commitment to organization and result-focused approach is essential. This course shall help the officers in imbibing these values and attitudes resulting into ethical functioning and effective outcome. The course shall also help the officers learn about report writing and data interpretations.

4.1.

Learning

Objectives

- 4.1.1 To understand importance of values and ethics with focus on Government functioning
- 4.1.2 To understand various core competences like team-work and collaboration,

effective communication

4.1.3 Critical Thinking & Problem-Solving

4.2.

Course

Contents

- 4.2.1 Stress Management
- 4.2.2 Organizational Behavior
- 4.2.3 Ethics & Value in Public Governance
- 4.2.4 Emotional Intelligence
- 4.2.5 Team Building & Leadership
- 4.2.6 Communication Skills
- 4.2.7 Inter Personal Effectiveness
- 4.2.8 Critical Thinking & Problem-Solving Techniques

5. Fundamentals of Digital Communications Technologies (Two weeks)

This module is aimed at imparting knowledge of core concepts of digital communications technologies so as to create enabling context for understanding different licensing and regulatory provisions and functions. After completion of the module, the officers shall be in a position to understand the generic framework, service requirements and network structures. It would help officers in developing understanding of departmental functions with their linkages to different digital communications technologies.

5.1.

Learning

objectives

- 5.1.1 To be able to list the facility infrastructure in Telecom domain
- 5.1.2 To explain and distinguish the features of facility infrastructure for 24x7 operation
- 5.1.3 To understand and be able to explain circuit switched and packet networks
- 5.1.4 Identify the components of telecom network and understand relevance for DoT officers
- 5.1.5 Analyze the relationship among various components of telecom network
- 5.1.6 To be able to explain the uses of wireline and wireless technologies
- 5.1.7 To outline the concept of functional & generic requirements for telecom products

5.2.

Course

Contents

- 5.2.1 Architecture and Functioning of Telecommunication System
- 5.2.2 PCM principles and speech signal Processing
- 5.2.3 Concept of Digital Switching; Circuit and Packet switching
- 5.2.4 NNP-2003 and Numbering Resources
- 5.2.5 Overview of Legacy Networks and NGN
- 5.2.6 Architecture of NGN
- 5.2.7 NGS: Convergence, Migration and Security issues
- 5.2.8 Understanding of different access technologies
- 5.2.9 Field visit to legacy networks having application of different digital technologies

- 5.2.10 Supplementary and Value-Added Services in Wireline and Wireless sector
- 5.2.11 Overview of Optical Fibre Communications
- 5.2.12 Overview of Digital Transmission and Multiplexing Technologies (SDH)
- 5.2.13 Evolution of Fibre media for high bandwidth transmission. ITU specified Fibre.
- 5.2.14 WDM and its Evolutions
- 5.2.15 Trends in Optical Transport Technologies
- 5.2.16 FTTX Concepts
- 5.2.17 SDH and DWDM Lab Visit
- 5.2.18 Design of Telecom Product: Regularity Norms.
- 5.2.19 Overview of Satellite Communications, Rural Connectivity via Satellite, Broadband Over Satellite.
- 5.2.20 Disaster Management via Satellite, Meteorological Services via Satellite.
- 5.2.21 Government Policy on Satellite Services.
- 5.2.22 NOCC Functions, visit to NOCC Earth Station
- 5.2.23 Overview of Radio communications
- 5.2.24 Frequency plans and configurations, Spectrum Management.
- 5.2.25 Trend in Backhaul Technologies.
- 5.2.26 Overview of Towers, civil infrastructure, and Safety regulations
- 5.2.27 Right of Way

6. Licensing and Regulation (One week)

The aim of this module is to create understanding of different statutory provisions related to Telecom sector and various Licenses. The module shall also touch upon the different approaches of regulation and familiarize the officers of regulation architecture of Telecom sector. After this course, the officers shall be in position to understand the requirement of regulations and different aspects of licensing.

6.1. Learning

objectives:

- 6.1.1 To be able to list various legislations applicable to Telecom sector
- 6.1.2 To understand important legal provisions
- 6.1.3 To know the various types of licenses issued under the Indian Telegraph Act and Indian Wireless Telegraphy Act
- 6.1.4 To appreciate the need for deeper study of the telecom licensing framework
- 6.1.5 To understand important dimensions of licensing and regulation related functions.
- 6.1.6 Roles, Rights and Responsibilities of Licensor, Licensee and Consumers

6.2. Course

Contents

- 6.2.1 Licensing in Telecom Sector: Defining licensing & Regulations, Evolution of Telecom Licensing framework In India, International Practices, Policy and Grant of Licenses under: Indian Telegraph Act 1885 & Indian Wireless Telegraph Act 1933
- 6.2.2 Regulations in Telecom Sector: Understanding of Regulations, Regulations in Telecom sector & consumer protection; Role & Scope of TRAI, TRAI Act 1997, Consultations & Recommendations procedure
- 6.2.3 TDSAT Role in Telecom sector: Constitution of TDSAT, Powers & Jurisdictions, Dispute redressal mechanism

Access Services

- 6.2.4** Indian Licensing Framework (Access Services): Unified Licenses (Access Service Authorization), Authorization process, Services in UL Scope, Structure of UL Licensing agreement
- 6.2.5** Indian Licensing Framework (Access Services): Unified Licenses (Virtual Network Operator), Authorization process, Services in UL-VNO Scope, Structure of UL-VNO licensing agreement
- 6.2.6** Indian Licensing Framework (Access Services): Service Area, Scope of Access Service, Financial Conditions, Technical & Operating Conditions, Provision of IPTV Service, Network Interconnection, Emergency & Public Utility Service, Security Conditions, Calculation Of 'Revenue' and 'License Fee'
- 6.2.7** Procedure for evaluating & processing of TRAI Recommendations, parameters
- 6.2.8** Mobile Number Portability (MNP): Framework and stakeholders, Implementation process and flow of Information, Salient features of MNP licensing agreement, Monitoring and reporting
- 6.2.9** National Numbering Plan: NNP -2003 & its amendment 2015, Short code, MSC code and Tele marketer code
- 6.2.10** Subscriber verification: Requirement, Sampling process, Non-compliance and rectification process, Penalty, important instructions /guidelines
- 6.2.11** Merger & Acquisition(M&A): Merger/Demerger/Transfer of Access Service License, Lock-in-period of sale of equity, Substantial equity, Six monthly review of compliance to FDI, Net-worth & paid-up equity, Change of Name, Registered address and equity structure of Licensee Company
- 6.2.12** Right of Way (RoW): Significance, Indian Telegraph Right of Way Rules, 2016, Status & its implementation, Challenges
- 6.2.13** Security Aspects: LIM/LIS, Policy, Framework & Stakeholders, Implementation process, Monitoring and reporting
- 6.2.14** Quality of Service: Definition, Policy, Framework, Monitoring mechanism, Grievance's redressal mechanism
- 6.2.15** Interconnection: Licensing conditions, Monitoring Framework, Grievance's redressal mechanism
- 6.2.16** Disaster management: Role of telecom in Disaster Management, Disaster management Policy, Control room set up and role of LSA, Monitoring mechanism, Coordination with TSPs, State govt etc.
- 6.2.17** Roll out obligation: Roll out obligation, Licensing norms, Mechanism for Assessment and implementation, Delegation of power & Issue of Notice procedure, Penalty
- 6.2.18** Special areas: Special areas, Guidelines and privileges
- 6.2.19** Court cases, Arbitration cases & Land mark judgements: Existing procedure to deal with court cases, Reasons for the cases, Precautions, Case studies

Carrier Services

- 6.2.20** Indian Licensing Framework (Carrier Services-I): ILD & NLD, Scope, Service area, Technical and Financial Conditions, Security Issues
- 6.2.21** Indian Licensing Framework (Carrier Services -II): Mobile Radio Trunking Service (PMTRS), Global Mobile Personal Communication by Satellite (GMPCS)

Service, Service Area, Scope of PMTRS & GMPCS, Technical and Financial Conditions, Roll out Obligation, Security Conditions, Calculation of 'Revenue' and 'License Fee.

- 6.2.22** Infrastructure Provider Category (IP-I): Introduction, Policy, Registration process, Timeline, List of IP's.
- 6.2.23** NOC for International Roaming SIM Cards: International Roaming SIM cards, Policy, Procedure for granting NOC, Statistic
- 6.2.24** Other Service Providers (OSP): Introduction, Registration policy, Online registration process, Framework and coordination with NIC & LSA
- 6.2.25** Telecom Commercial Communications Customer Preference Regulations, 2018: Introduction, Customer Preferences Registration System, Registration system for related Entities, UCC complaint handling System
- 6.2.26** EMF: Introduction, Guidelines, Monitoring and Enforcement mechanism

Data Services

- 6.2.27** Indian Licensing Framework (ISP Licenses): Service area, Scope of Internet, Technical and Financial Conditions, Network Interconnection, Provisioning of Services, Security condition, Monitoring facility
- 6.2.28** Information Technology Act 2000
- 6.2.29** Indian Licensing Framework (Mobile Satellite Services): Reporting (MSS-R) & CUG VSAT license, Service area, Scope, Technical and Financial Conditions, Roll out obligation, Network interconnection, Performance testing
- 6.2.30** Interception, Monitoring and prevention of telecom resources: Centralized Monitoring System & Internet Monitoring Systems-Importance, Policy, Framework, Monitoring mechanism and status
- 6.2.31** Interception, Monitoring and prevention of telecom resources: URL Blocking/ Un-blocking – Introduction, Policy and court directives, Framework, Monitoring and reports
- 6.2.32** Scrutiny & Clearance: Security Monitoring & Lawful Interception Monitoring (LIM), Security clearance of International Long-Distance Gateways and related issues, clearance of foreign personnel/crew from MHA with respect to NLD and ILD licenses, Clearance of Submarine Cable Repair Ships
- 6.2.33** Resale of International Private Leased Line (IPCL): Resale of IPCL, Service Area, Scope of IPCL service, Technical and Financial Conditions, Security Conditions
- 6.2.34** Customer grievances, RTI, portal & Call drops handling: Definition, Provisions of various Acts, Redressal Mechanism -Online registration portal, Timeline, reports and monitoring mechanism, Redressal mechanism and penalties, Coordination with TSP's for reduction in call drops, Challenges

7. Trekking trip (1 week)

Trekking is an activity which is a test for physical as well as mental abilities. At the same time, it promotes team spirit, camaraderie and creates an opportunity for making life time friendships. It ensures one to realize one's own potential and stretches the limits that are set in mind. Trekking promotes leadership. The hard circumstances and limited resources make officers stronger mentally and physically.

7.1.**Learning****objectives:**

- 7.1.1 To foster a spirit of adventure.
- 7.1.2 To promote esprit de corps and camaraderie among fellow officer trainees.
- 7.1.3 To improve self-esteem, feeling for friends, know/ understand each other better and make lasting friendships
- 7.1.4 To appreciate the pristine glory of nature
- 7.1.5 Learn to endure in hard circumstances and limited resources
- 7.1.6 Realizing one's own potential of mental and physical capabilities
- 7.1.7 Helps in team building and understanding the group dynamics in difficult circumstances.
- 7.1.8 Opportunity for relaxing amidst of the natural and healthy surroundings

8. Telecom Networks and Technologies- Access Services (3 weeks)

This module shall be aimed at familiarizing the officers with different access technologies, including wire line and wireless. Different aspects of licenses related to access services, issues arising out of its enforcement and compliance issues shall be the main theme of this course. Policy and implementation aspects of Spectrum, numbering plans, Mobile Number Portability and roll-out obligations requirement shall be discussed to ensure a broader understanding of issues and challenges. The main emphasis of this course shall be to develop capacity for understanding various provisions of Access service license and related aspects of technology and implementations to ensure compliance.

8.1.**Learning****objectives**

- 8.1.1 To list and explain various access services under licensing framework
- 8.1.2 To be able to list components of PSTN and mobile networks
- 8.1.3 To be able to explain 2G, 3G, 4G and 5G mobile network architecture
- 8.1.4 To understand the security dimensions of IP networks including lawful interception.
- 8.1.5 To understand the frauds committed through misuse of Telecom Network such as SIM Swap, OTP, SMS Header, call Spoofing etc.
- 8.1.6 To be able to explain mandatory testing of access network equipment
- 8.1.7 To discuss the inspection, audit and compliance aspects of access services
- 8.1.8 To be able to relate legal provisions to various scenarios of access services
- 8.1.9 To be able to understand basic concepts of spectrum and roll-out obligations and process
- 8.1.10 To understand guidelines and license conditions of access services
- 8.1.11 To analyze case studies of TRAI and TDSAT pertaining to access services
- 8.1.12 To understand USOF requirements
- 8.1.13 To assess the role of telecommunications during disasters

8.2.**Course****Contents**

- 8.2.1** Access Services, its components, Network Architecture, Security Aspects and Lawful Interception
- 8.2.1.1** PSTN Access Services: Overview and Architecture, Access Network, components and management, Speech Signal Processing & PCM principles, Digital Switching Concepts Digital Signaling Concepts - CAS, CCS#7
- 8.2.1.2** 2G Mobile (GSM/GPRS/EDGE) Access Services: GSM/GPRS/EDGE Core Network Architecture (MSC, HLR, EIR, SGSN, GGSN etc.), GSM Radio Access Network (BSC, BTS, OMC-R etc.), Mobile Number Portability
- 8.2.1.3** 2G Mobile (CDMA) Access Services CDMA: CDMA Network Architecture (MSC, MSC, HLR, Home Agent, Foreign Agent etc.), CDMA Radio Network (BSC, BTS, OMC-R etc.)
- 8.2.1.4** 3G Mobile (UMTS) Access Services CDMA: UMTS Network Architecture (MSC-S, Media Gateway, HSS, MSC-Server, IMS, SGSN, GGSN etc.), UMTS Radio Access Network (RAN, Node-B, RNC, HSPA, evolved HSPA, VoIP over HSPA
- 8.2.1.5** 4G Mobile (LTE/LTE Advanced) Access Services: LTE /LTE Advanced Network Architecture (SAE/ EPC, MME, Serving Gateway, PDN Gateway, PCRF, IMS etc.), LTE/LTE Advanced Radio Access Network (E-UTRAN, eNodeB, Air Interface, Relays, Inter-RAT working etc.), Self-Organized Network, Applications/ Services in LTE/LTE Advanced (VoIP, IP based conferencing, VPN)
- 8.2.1.6** 5G and Beyond Technologies Access Services: Introduction to 5G, 5G Core Network Architecture, 5G Radio Access Network Architecture, 5G Spectrum, Numerology and Frame Structure, 5G BWP, Carrier Aggregation in 5G, 5G Deployment Options, mMIMO, Emergency Call on IP, eMBMS etc); End-User Devices in Wireless Networks: Mobile Handset, Dongle, OS, Applications; Identities, 5G Use Cases, Quality of Service in 5G, Dynamic Spectrum Sharing , Fronthaul (including IAB), Midhaul and backhaul, Open RAN, Security Aspects and Lawful Interception related to 5G, 5G in India (5G Test Bed , Trial and Rollout), 6G Requirements.
- 8.2.2** RF Planning, Rollout Obligation/Quality of Service testing and EMF measurement of Access Network: Provisions of the License Conditions, TSTP issued by TEC; RF Planning for 2G,3G,4G and 5G Network; Drive Test for Coverage QoS testing of 2G, 3G, 4G and 5G Network; Post Processing tool, EMF Measurement.
- 8.2.3** Security Aspects and Lawful Interception for 2G,3G,4G and 5G Network.
- 8.2.4** Emerging Wireless Technologies and Applications: Evolution of 6G technologies, High-altitude platform systems (HAPS), SRDs, Cognitive radios, ZigBee, Emergency services and Mobile Networks, Disaster Management & Mobile Networks; Voice, SMS Spam handling in Mobile Network; Jammers, Inter-mobile technologies interference analysis; Linkages of Mobile Technologies, applications/ services with inclusive growth; TRAI recommendations related to Mobile technologies/ services; Emerging issues related to Mobile technologies/ services with respect to Licenses.
- 8.2.5** Spectrum Management: Frequency Spectrum Management, National Frequency Allocation Plan, Spectrum related issues, Study of Auction of Natural Resources like Spectrum etc. Along with use cases of Domestic and Global scenarios;

Statutory functions of the Central Government and issues licenses to establish, maintain and operate wireless stations; Licensing and Regulation, Coordination and standardization interface with ITU, Standing Advisory Committee on Radio Frequency Allocation (SACFA) .

- 8.2.6** Service Compliance: Checking of the service compliance by the licensee in respect of the license conditions and any directions issued by the licensor in public interest; Matters related to Electro Magnetic Radiation (EMR) emission from Telecom installations & Tarang Sanchar Portal; Subscriber Document Verification with the objective to ascertain whether the mobile service operators are following the DoT guidelines for Subscriber verification before providing connections; Service Testing of various Licensed Service Providers in the License area and checking roll-out obligation as per license condition; Issues related to Mobile Number Portability; Advocacy and Public Awareness on related matters.
- 8.2.7** Disaster Management: Types of Disasters, Fundamentals of Disaster Management, Role of Communication Technologies during Disaster, Disaster Management framework in India, Role of DoT during Disaster, Case Studies, National Disaster Management Act, National Disaster Management Plan, National Disaster Management Authority (NDMA) and its role in Disaster Management.
- 8.2.8** Telecom Frauds and its Management: Evolution of Telecom Frauds; Types of Frauds (Subscription Fraud, Internal Fraud, Partnership Fraud, Fix Network Fraud, Mobile Network Fraud, Prepaid Fraud, Roaming Fraud, Content and Value-Added Services Fraud); Fraud Detection and Prevention; Data Mining applied to Fraud Detection and Prevention.
- 8.2.9** Other Topics to be covered: Mandatory Testing and Certification of Telecommunication Equipment's (MTCTE); Key TRAI recommendations; Case study on orders and Judgements of TDSAT

9. Telecom Networks and Technologies- Carrier Services (1 week)

This course shall aim at familiarizing the officers with different types of Career Services under licensing framework, process and procedures and license conditions. Also, different issues related to Infrastructure provider services and aspects related to compliance and enforcement shall form the core theme of the course. Technologies used by career service providers shall be discussed with their linkages to license conditions and statutory provisions. After attending this course, the officers would be able to understand technologies and policies related to long distance transmission of traffic.

9.1. Learning objectives

- 9.1.1** To list and explain various carrier services under licensing framework
- 9.1.2** To discuss the architecture of NLD, ILD, IPLC services etc.
- 9.1.3** To understand the security dimensions of IP networks including lawful interception
- 9.1.4** To be able to explain mandatory testing applicable to carrier services
- 9.1.5** To discuss the inspection, audit and compliance aspects of carrier services
- 9.1.6** To be able to relate legal provisions to various scenarios of carrier services
- 9.1.7** To analyze case studies of TRAI and TDSAT pertaining to carrier services

9.2. Course Contents

- 9.2.1 Introduction to Carrier Services & Transmission Technologies.
- 9.2.2 Functions of CS Wing of DoT HQ and Carrier Services in UL Framework.
- 9.2.3 Architecture of NLD and ILD and IPLC Services
- 9.2.4 Submarine Cable Systems-Global Perspective
- 9.2.5 CLS and Submarine Cable-Indian scenario and regulations
- 9.2.6 Lawful Interception-Legal Provisions and Licensing Conditions
- 9.2.7 Introduction to CMS.
- 9.2.8 Introduction to LIS-LIM Testing set-up.
- 9.2.9 Role of different LEAs in LI
- 9.2.10 Procedure of LI and Challenges
- 9.2.11 Inspection, audit, and compliance of ILD and NLD Networks.
- 9.2.12 Tariff of IPLCs-ITU recommendations, TRAI Orders.
- 9.2.13 Field visit to give exposure to live inspection, audit, compliance, and LI
- 9.2.14 Case study of Carrier Services-TRAI
- 9.2.15 Case study of Carrier Services-TDSAT

10. Telecom Networks and Technologies- Data Services (2 weeks)

This course shall be aimed at creating a basic understanding of internet technologies with special emphasis on and with linkages to licensing and policy aspects. After completing this module, the officers shall be able to understand the structures of data networks, the way internet traffic is routed from one part of the globe to other part with special emphasis on different traffic management practices. Various issues related to licensing and enforcement related to license conditions shall form part of the module to develop capability among the officers to effectively handle related cases.

10.1. Learning objectives

- 10.1.1 To list and explain various data services under licensing framework
- 10.1.2 To understand and be able to explain IP networks, various topologies
- 10.1.3 To be able to explain various connections, such as ATM, MPLS and VPN etc.
- 10.1.4 To understand the security dimensions of IP networks including lawful interception
- 10.1.5 To be able to explain mandatory testing of data network equipment
- 10.1.6 To discuss the inspection, audit and compliance aspects of data services
- 10.1.7 To be able to relate legal provisions to various scenarios of data services
- 10.1.8 To analyze case studies of TRAI and TDSAT pertaining to data services

10.2. Course Contents

- 10.2.1 Licensing, Policy, and Regulatory Aspects of Data Services
 - 10.2.1.1 Various Data Services under Unified License and licensing provisions
 - 10.2.1.2 Standardization; International bodies for administration and standardization of Internet technologies (IETF, IANA, ICANN, IRINN, IEEE, etc.); National bodies for administration and standardization of Internet technologies; Role of MeitY, DoT, and other Ministries/ Departments; Linkages of Internet technologies / standards with Licensing provisions

10.2.2 Data Communication Technology

10.2.2.1 Introduction to Data Communications: Basic concepts, Elements of data communication systems, Terminology used in data communication, Networking concepts, Topology & components used in a typical network. OSI Layer Model: Concept of having layered communication, function of each layer

10.2.2.2 TCP/ UDP/ IP

10.2.2.3 IPv4 and IPv6 Addressing, Sub-netting, CIDR, VLSM

10.2.2.4 Layer 2 and Layer 3 Protocols: ARP, RARP, ICMP, IGMP protocols, IP multicasting

10.2.2.5 DNS/ DNS6/ DNS64/ DHCP/ DHCP6/ FTP/ TFTP/ HTTP/ E-mail/ SMTP/POP3/ Proxy/ SNMP/ SCTP

10.2.2.6 RADIUS/ AAA / VLAN/ Access Control list

10.2.2.7 Router/ RAS/ Switch/ Routing Principles/ Router Architectures/ RIP/ OSPF/BGP

10.2.2.8 Frame Relay/ ATM/ PPP/ DSL/ WiFi

10.2.2.9 DP (Label Distribution Protocol), VPN, MPLS, MPLS-VPN, MPLS Traffic Engineering, MPLS and Quality of Service, IPv6 over MPLS

10.2.2.10 ISP Gateway and Internet Traffic Management Practices

10.2.2.11 Data Link Control (DLC)/ HDLC/ LAP-B

10.2.3 Monitoring, Enforcement and Legal Aspects of Data Services

10.2.3.1 Security of IP Networks; Linkages of security aspects of Internet technologies with Licensing provisions; Role of LSAs

10.2.3.2 Lawful interception in Data Services under UL

10.2.3.3 Mandatory Testing of Data Services Equipment

10.2.3.4 Inspection, Audit, and Compliance aspects of Data Services

10.2.3.5 Indian Telegraph Act, 1885

10.2.3.6 IT Act, 2000

10.2.3.7 Case Studies of TRAI and TDSAT

10.2.4 Discussion, Role Play exercise, Group tasks

11. Standards and Testing

Standards play a major role in development of ecosystem and standardization is an essential function to ensure economy of scale and facilitate growth. This module shall make the officers aware with needs, process and framework for development of standards. Various international standardization organization and their functions shall be touched upon to provide an understanding about how the Standards Development Organizations function. After this module, the officers shall be able to understand and describe the institutional mechanisms for development of standards and processes of conformance testing. Some important national standards and the framework for Mandatory testing and statutory provisions shall also be discussed. After this module, the officers shall be able to analyze the procedures and frameworks for standard developments and conformance testing.

11.1. Learning Objectives

11.1.1 To know about the international framework for standard development

11.1.2 To understand the concept of de-facto and de-jure standards

11.1.3 To understand role of international/national bodies like ITU, WRC, IETF,

Common Criteria, 3GPP, OneM2M, TEC, TSDSI, BIS etc.

- 11.1.4 To be able to describe the institutional mechanism for development of standards and conformance testing in India
- 11.1.5 To know and be able to describe the process for standards development
- 11.1.6 To know and be able to describe the DoT framework for conformance testing

11.2. Course Contents

- 11.2.1 International framework for standard development-Introduction, Concept of de-facto and de-jure standards
- 11.2.2 International and National Standard Development Organizations and their Functioning
- 11.2.3 ITU -About ITU, ITU Sectors and its Working Groups and functions, WRC and its WPs and functions, IMT and its key standards, Ongoing / Future Plans
- 11.2.4 3GPP - About 3GPP, 3GPP Specification Groups and its functions, Key Specifications /Releases, Ongoing and future plans
- 11.2.5 Other International Standard Developing Organizations and Functioning
- 11.2.6 TSDSI: About TSDSI, Organizational Structure, Technical Activities, Standards and Reports, Membership and Collaboration, Key Achievements
- 11.2.7 TEC: Organizational Structure
- 11.2.8 Role and Functions of TEC
 - 11.2.8.1 Standards: Standard Development Process, Essential Requirement, Standard Adoption/ratification policy and status
 - 11.2.8.2 Conformity Assessment: Mandatory Testing and Certification of Telecom Equipment, Voluntary Testing & certification of Telecom Equipment, CAB Scheme and status
 - 11.2.8.3 Certification: Type Approval Process, Interface Approval Process, Technology Approval Process
 - 11.2.8.4 International Engagement: Engagement with ITU, APT, IEEE,3GPP, OneM2M, IETF, OCEANIS etc. and Key Contributions made; WTO-TBT Enquiry Point
 - 11.2.8.5 Other Functions of TEC: Study paper and White paper, System for providing technical advice to DoT, Conformity Assessment Body (CAB), Mutual Recognition Assessment (MRA), Case studies, National Accreditation Board of Information and Communication Technology (NABICT), Public Procurement Preference to Make in India (PPP-MII) policy in telecom sector, Policy for Cross Sector Standardization and coordination activities thereof

12. Information Security Management System (ISMS) and Emerging Technologies (One week)

With rapid advancement of technologies and increasing adoption of internet in various government functions, security of information has become a prime concern. Also, the officers are required to conduct security audits of digital communication networks in their field duties. Therefore, officers must be aware with basic approaches and standards related to security and familiar with basic tools and techniques to perform network vulnerabilities assessments. Besides ISMS, exposure to emerging technologies such as cloud computing, IoT/M2M, AI and Blockchain may also be necessary since these have special security considerations.

12.1. Learning Objectives: -

- 12.1.1 To be familiar with standards and approaches to Information security
- 12.1.2 To learn to conduct network vulnerability assessment using standard tools.
- 12.1.3 To understand practices and strategies for making an organization secure
- 12.1.4 To learn about security audit methodologies, frameworks and processes
- 12.1.5 To understand basic concepts of IoT/M2M, AI/ML and Block chain technologies
- 12.1.6 To discuss issues and challenges related to uses of these technologies with use cases
- 12.1.7 To dwell upon the issues related to security and policy matters related to development of these technologies.

12.2. Course Contents

- 12.2.1 Information Security Concepts and Standards: Information Security Concepts, Legal Framework, Standards
- 12.2.2 ISO27001: About the Standard, Implementation aspects, Auditing aspects
- 12.2.3 ISO27011; ISMS for Telecom Sector: Telecom specific requirement, Implementation Guideline
- 12.2.4 NIST Cyber Security Framework: Framework for critical infrastructure, Core, Tiers, Profile
- 12.2.5 Risk Management: Risk Identification, Analysis and counter measure, Risk Mitigation
- 12.2.6 GSMA Baseline Security Controls: Business Controls, Technology Controls, Security Control checklist
- 12.2.7 National Critical Information Infrastructure Protection Centre (NCIIPC): Planning Controls, Implementation Controls, Operations controls, Disaster recovery and business continuation planning, Reporting and accountability controls
- 12.2.8 NISPG guideline: About NISPG, Core domains, Guidelines for technology specific ICT deployment
- 12.2.9 Cyber Laws: IT Act and role of Intermediaries, Data Protection Act
- 12.2.10 Cyber Risk Management of Digital Supply Chain: Foundational Practices, Enterprise wise Practices, Risk Management Processes, Critical Systems
- 12.2.11 TIA-942 Telecommunications Infrastructure standard for Data Centre: Requirements, TIA942 Vs Uptime Institute, TIA 942 Certification and Rating
- 12.2.12 Internet Cloud: Cloud Definition, Models and Ecosystem; Uses cases, Requirements & Architecture; Cloud security, Infrastructure & Network enabled Cloud; Cloud Services & Resource Management, Platforms and Middleware; Cloud computing benefits & first Requirements from ICT perspectives
- 12.2.13 Blockchain Technology: Introduction to Blockchain and Distributed Ledger Technologies-Use cases in Telecom, Blockchain Security risk, threats and Vulnerabilities; Blockchain standards for compliance and Trust
- 12.2.14 AI & ML: Introduction to AI &ML Technologies, Ethics and use cases in Telecom; AI System life cycle processes; Data Quality for Analytics & Assessment of Machine Learning classification
- 12.2.15 IOT: Introduction to IOT/M2M, & its Architectures; IOT -Cybersecurity and Privacy Framework; IOT-Regulations and Standards

13. Big Data Analytics (1 week)

The module shall be aimed at understanding skill in digital age to store, process and analyze data

to inform crucial decisions. The trainees will understand become conversant with the terminology and the core concepts behind big data problems, applications, and systems. The knowledge thus gained would help for creating databases, compiling various information from government databases, collecting patterns of intelligence and providing technical intelligence to Intelligence and Law Enforcement Agencies.

13.1. Learning Objectives: -

- 13.1.1** Understand Big Data and Hadoop Ecosystem
- 13.1.2** Understand essential statistical concepts including measures of central tendency, dispersion, correlation, and regression
- 13.1.3** Master SQL concepts such as Universal Query Tool and SQL command
- 13.1.4** Python programming-implementing concepts of variables, strings, functions, loops, and conditions
- 13.1.5** Understand the nuances of lists, sets, dictionaries, conditions and branching, objects and classes in Python
- 13.1.6** Case studies in Telecommunications

13.2. Course Contents

- 13.2.1** Introduction to Big Data Analytics: Understanding Big Data and its sources, Characteristics of Big Data-3V's, Traditional Databases and its limitations, Big Data - An opportunity
- 13.2.2** Challenges in harnessing Big Data potential: The problem of Storage, Processing and Speed
- 13.2.3** Introduction to Hadoop Framework: Hadoop as solution to Big data problems, Hadoop Architecture, Map Reduce, Hadoop Distributed File System (HDFS), Yet Another Resource Negotiator (YARN)
- 13.2.4** Hadoop Ecosystem: Hadoop Ecosystem/Friends of Hadoop-Hive, HBase, Pig, Mahout, Zookeeper etc.; Features of Hadoop, Limitations, Other technologies outside Hadoop framework
- 13.2.5** Understanding Databases: Types of Databases-Relational/Non-Relational, What is Database Management System (DBMS), Advantage and limitations of RDBMS, Databases for improved Decision Making
- 13.2.6** Introduction to Structured Query Language (SQL): What is SQL, Brief history of SQL, Oracle's SQL implementation, A simple Database
- 13.2.7** Basic SQL Commands: Data manipulation language DML- Addition, Deletion, Updation; The WHERE clause
- 13.2.8** Advance SQL Commands: Joins, Unions, Group operation, Subqueries
- 13.2.9** Operations on Databases: Create, Drop, Backup DB; Create, Drop, Alter Table; Concept of primary key and foreign key
- 13.2.10** Hands-on Session: Hands-on on SQL
- 13.2.11** Introduction to Python: History, Features, Installation, Data Types, Keywords
- 13.2.12** Python Operators: Arithmetic, Assignment, Comparison, Logical, Bitwise, Identity, Membership
- 13.2.13** Python Data Types-Immutable: Numbers, Stings, Tuples
- 13.2.14** Python Data Types-Mutable: List, Dictionaries, Sets
- 13.2.15** Python Control Flow statements: If, If...else, if...elif...else, while, for, continue, break
- 13.2.16** Python Functions and Libraries & File Handling: Build-in Functions & Libraries, User defined Functions; Opening, reading, writing, and closing
- 13.2.17** Python Basic Hands-On: Data handling & File Operations

- 13.2.18** Introduction to NumPy: NumPy Arrays, Arithmetic with NumPy Arrays, Indexing and Slicing, Boolean Indexing, Transposing Arrays, Sorting Arrays, File Input and Output with Arrays
- 13.2.19** Introduction to Pandas: Introduction, General Functions in Pandas, Pivoting, Cross Tabulation, Missing Values, Data Conversion
- 13.2.20** Pandas Data frames, Series & Operations: Pandas Series, Arrays, Data frames, Data frame Operations, Grouping, Merging, Concatenating, Index Objects
- 13.2.21** NumPy & Pandas Hands-On: Job1 - Text Data Mining & Analysis; Job2 - Time Series Data Analysis
- 13.2.22** Application of Big Data: Application of Big Data in- Sentiment Analysis, Market Basket Analysis, Behavioral Analysis, Predictive Analysis
- 13.2.23** Application of Big Data in Telecom: Network optimization, customer retention, location based device analysis
- 13.2.24** Application of Big Data in DoT: Projects / Pilots in DoT-TSOC, Bulk migration, DIU

14. Network and Cyber Security (1 week)

This module shall be aimed at developing a deeper understanding of information and system protection technology and methods. It shall cover fundamental aspects of security in a modern networked environment with the focus on understanding various attacks and vulnerabilities and response to them. The main objective of this module shall be to learn skill-set in assuring network security against various threats.

14.1. Learning Objectives: -

- 14.1.1** To learn the philosophy of Protect, Detect, Respond and Predict for perimeter security, End point security, Network security, Cloud security etc.
- 14.1.2** To have understating of OS and OS level security
- 14.1.3** To differentiate Virus, Worm, Malware, BOTNET and recent vulnerabilities.
- 14.1.4** Vulnerability assessment.
- 14.1.5** To explain and distinguish Intrusion Detection System (IDS) and Intrusion Prevention System (IPS).
- 14.1.6** To understand Incident Response, Forensic Investigation, Business continuity and Disaster recovery.
- 14.1.7** To understand the role of ITU, DoT and CERT-IN in Network and Cyber Security.

14.2. Course Contents

- 14.2.1** Fundamentals of Network and cyber security Ecosystem: Basics of Networking-OSI & TCP IP Models, Network Components, Active Directory Solutions
- 14.2.2** Network Security Threats: Network Security Threat Types, Type of Network Attacks, Password Attacks, Privilege Escalation, Social Engineering, Malware, Botnets, DDoS, Injection Attacks MiTM
- 14.2.3** Network Security Policies: Security Policy Hierarchy, Security Policy Design Consideration, Access Controls

- 14.2.4 VLAN: Introduction & Types, VLAN Ports-Access port and Trunk port, Functions and Topologies, Advantages & Necessity of VLAN
- 14.2.5 Physical Security: Physical Security Controls, Surveillance, Biometric Readers, Facilities Security; Fire Fighting & Suppression, HVAC, Equipment Shielding; Data Centre Environment Controls & Protection, Visitor Management
- 14.2.6 Host Security: Host Security Threats & Assessment, User Accounts & Password Management, Hardening, Updates and Patches, Unnecessary Applications & Restricting Applications, Browser Security, Antivirus and Anti-Malware
- 14.2.7 Firewalls: Firewall Defense System, Hardware & Software Firewalls, Firewall Technologies; Packet Filtering Firewalls, Application Level Firewalls, Multilayer Inspection Firewalls; Network Address Translation
- 14.2.8 IDP/IPS Systems: Intrusions and Detections, IDS/IPS Classifications, IDS Functions & Components, IPS Technologies & Functions, IDS Vs IPS
- 14.2.9 Virtualization: Virtualization, Hypervisor Concept & Types, VM Security, Hypervisor Security, Container Concept
- 14.2.10 Encryption & Cryptography: Symmetric and Asymmetric Cryptography; Symmetric Algorithms - DES, AES, RC4; Asymmetric Algorithms, Hashing, Public Key Infrastructure-PKI, CA, DSC, Digital Signatures
- 14.2.11 VPN Systems: Working of VPN, Types: Client to Site VPNs, Site-to-Site VPNs, Hardware & Software VPNs, VPN Functions & Topologies, VPN Security
- 14.2.12 Traffic Monitoring and Analysis: Monitoring Techniques, Suspicious Traffic Categories, Analysis Techniques, Wireshark: Protocol & Packet Inspection, Monitoring & Analyzing Tools, Traffic Monitoring & Log Analysis of Communications Service Providers
- 14.2.13 LTE Network Security: Threat Landscape, 3GPP Standardization overview, Security in 4G & 5G network, RAN & Core Security
- 14.2.14 Risk & Vulnerability Assessment: Risk Matrix, Risk Management, Assessment & Treatment, Risk Tracking & Review, Vulnerability Management, Asset Identification & Prioritization, Vulnerability Assessment
- 14.2.15 Data Backup & Recovery: Backup Strategy, RAID Levels & Components, Network Attached Storage-NAS, Backup Types & Tools, Data Recovery Tools
- 14.2.16 Incident Response: Incident Response Role & Responsibilities, First Responder; Incident Severity, Assessment & Communication; Incident Classification & Prioritization, Incident Notifications & Containment, IR Procedures & Planning, Role of CERT-IN
- 14.2.17 Network Forensics: Network Forensics, Investigative Data, Forensic Procedures, Data Collection Procedures
- 14.2.18 Role of DoT: DoT Guidelines related & Framework, Minimum Requirement for Security Policy of DoT; Role of DoT officers
- 14.2.19 NIC Network: NIC-Network Overview and Framework
- 14.2.20 Demonstrations: Host Security, Wireshark & Malware Traffic analysis; Firewalls, IDS/IPS; VPN, SIEM, Encryption Tools

Field Attachments

15. Field Attachment DoT HQ (4 weeks)

The officers shall be attached for 4 weeks in various divisions of DoT HQ, viz., AS cell, CS cell, DS cell, Security cell or PG Cell etc. The officers shall be assigned a clear assignment of understanding the functions of division, rules, procedures and channels of submission and the way policy issues are handled and resolved. The officers shall use their knowledge gained during classroom training to observe and analyze the practical scenarios in the department. The officers shall be required to note all their observations and submit report of their learning, issues observed and solutions proposed, if any, to NTIPRIT during their experience sharing module. After completion of this module, the officers are expected to be competent to work in the department.

16. Field attachment BSNL (4 weeks)

During the field attachment of 4 weeks with BSNL/MTNL, each Officer shall be attached to one of the nodal CMTS circles of BSNL/MTNL, where they shall undergo field exposure to Network configuration and O&M activities of the cellular mobile network, and data network including the respective billing centres, TAXs etc., under the guidance of the officers working there. After completing this attachment, the officers should be able to understand various services offered by the service providers, their provisioning and issues related to customer's satisfaction. They should also be able to appreciate different implementation and enforcement related aspects from the perspective of licensees.

17. Field attachment Big LSAs (8 weeks)

One of the key roles of Department of Telecom is enforcement of policies & license conditions, monitoring and security related functions of telecom network in India. This field attachment module is intended to expose the JTOs to actual working of LSA units in following domains:

17.1. Security

- 17.1.1** Interaction with LEAs and Telecom Service Providers
- 17.1.2** Understand Operation and Maintenance aspects of CMS/ IMS
- 17.1.3** Learn about ongoing activities of LSA regarding control of illegal operation of telecom networks
- 17.1.4** To learn how to file FIR against culprits, issue notices indicating violation of conditions of various Acts
- 17.1.5** Participate in Security Audit of Telecom Service Provider

17.2. Technology

- 17.2.1** Participate in inspections of Telecom Service Providers [Access Service, NLD, ILD, ISP, OSP, IP, VSAT, etc.]
- 17.2.2** Learn about OSP Registrations.
- 17.2.3** Understand process for verification of VLR data
- 17.2.4** Matters related to NOC for selling of the global calling cards, international SIMs etc.

17.3. Compliance

- 17.3.1** Participate in service compliance checks of the licensee in respect of the license conditions
- 17.3.2** Carry out Electro Magnetic Radiation (EMR) emission testing and learn about Tarang Sanchar Portal
- 17.3.3** Experience Subscriber Document Verification

17.4. Rural

- 17.4.1** Understand Right of Way (RoW) related issues and coordination with State Governments.
- 17.4.2** Learn about Network coverage/connectivity of villages for Direct Benefit Transfer (DBT) mission and of Banks in rural areas under Financial Inclusion Planning (FIP)
- 17.4.3** Participate in Inspection of LWE & USOF sites for technical compliance being funded by DoT

17.5. Admin

- 17.5.1** Understand mechanism of Grievance redressal of subscribers in respect of deficiency by various operators and interaction on social media.
- 17.5.2** Learn about responding to RTI queries and Parliamentary matters
- 17.5.3** Handling Court cases
- 17.5.4** Other regular administrative works

18. Field attachment Tenure LSAs (4 weeks)

Some of the LSAs, like in NE and J&K are considered tenure LSAs and officers are required to serve there in their career. These areas may have difficult terrain, sparsely distributed population and other geographical or social issues making the installation of networks, effective operation etc. difficult and commercially unfeasible. There may be various issues of policy importance which can be identified and studied by the officers during this attachment. Fostering development in the North-Eastern regions has been one of the key strategic objectives of Government of India. Therefore, the officers will be attached to any one of tenure LSAs to study specific challenges, identify issues and develop or propose solutions for the same. The reports submitted by JTOs can be analyzed and refined, if necessary, by the empowered group of faculties of NTIPRIT and based upon the nature of studies, it can be part of knowledge repositories or recommendations to DoT.

Phase II: Classroom Training at NTIPRIT

19. Project work, Experience sharing and valediction (2 weeks)

Towards the end of the training, the Officers shall return to NTIPRIT for a period of two weeks for a valedictory module. Under this module, emphasis will be laid on experience sharing by the Officer Trainees out of the exposure gained from the various attachments. All the officers would be required to share their learning in different attachments. As a matter of rule, all officers would be required to submit a consolidated report of all his/her learning and experiences in different attachments including issues observed and solutions proposed, if any. The officers would be given opportunity to present their experiences, learning and their works during different attachment to group of officers constituted by NTIPRIT. The marks would be awarded by the group to individual officers which shall be considered for overall evaluation.

After the experience sharing, a valediction ceremony shall be conducted which will include awarding officers for excellence and outstanding performance.

Phase III: Role based specialization module (10 Weeks)

Role based specialization module through IGoT or other platform (Maximum One hour per day)

Different offices in DoT such as TEC, NCCS, Telecom Security wing, Licensing wing, LSA

verticals, etc. require specialized training to groom the officers for contributing effectively in respective work area. In the absence of structured specialized training, officer may require longer duration to understand the complexities and the necessary knowledge pertaining to his/her job role. Therefore, besides foundational training covering generic understanding of all functions within DoT, specialized training is to be imparted as self-paced learning. Online learning has to be leveraged as a part of this module for which IGOT or other platform will be leveraged for imparting the online learning.

This training for the unit of posting will be imparted under the mentorship of NTIPRIT and a Guide will be designated by the office where JTOs gets final posting. The Officer will be required to devote a time of about one hour per day for learning the online contents based on his role of posting.

The officer after completion of self-paced learning module shall be required to pass the Evaluation or Examination to be conducted by NTIPRIT within three months of assuming charge of that post. The completion of Induction Training of the JTO will be subject to successful completion of this module along with other modules.

GENERAL INSTRUCTIONS FOR JUNIOR TELECOM OFFICER TRAINEES

1. EXPECTATIONS FROM OFFICER TRAINEES- CODE OF CONDUCT

- 1.1. Etiquette and Behaviour (*Shishtachar*):** Good manners and etiquette lend confidence and charm to an officer's personality. The Officer Trainees are expected to maintain the highest standards of behaviour and decorum, befitting an officer - both inside and outside the Institute. It is expected of the Officer Trainees to be courteous, polite and well-mannered towards each other, with faculty and with the institute and hostel staff. The same standard of behaviour and decorum is expected from the Officer Trainees when they go to other Institutions/ Offices for training or visits. Officer Trainees must ensure that their behaviour and conduct towards Officer Trainees of opposite sex is beyond reproach. The Officer Trainees are advised to go through the *Shishtachar* booklet, which contains exhaustive guidelines on etiquette, protocol and manners during official and semi- official occasions, compiled for guidance and ready reference of the Officer Trainees.
- 1.2. Punctuality:** Punctuality on each occasion is a sine-qua-non for discipline. It is expected that the Officer Trainees will reach the venue of any scheduled event, at the classroom or otherwise, five minutes ahead of time and will be seated in their allotted place-position at least five minutes before the event. This is the first expectation from Officer Trainees and they should ensure that there will not be any occasion to remind it during the course.
- 1.3. Conduct:** All officers in Govt. service are bound by a code of conduct and norms of behaviour. The Officer Trainees are advised to familiarize themselves of the CCS (Conduct) Rules, 1964 at the earliest and follow the code of conduct and the norms of behaviour in letter and spirit.
- 1.4. Attire:** The Officer Trainees are expected to be appropriately attired for every occasion. The details about what constitutes proper attire are given in the *Shishtachar* booklet (enclosed as Appendix). The Officer Trainees are advised to follow the appropriate norms of attire in the Institute as well as Hostels. Inappropriate or shabby attire during classroom sessions shall be viewed seriously.
- 1.5. Participation:** It is expected that the Officer Trainees participate fully in all the activities that make-up the Training Programme. The Officer Trainees shall demonstrate their youthful and praiseworthy creativity in all their endeavours. During participation in classroom discussions, the Officer Trainees are expected to be polite and considerate to all others present.
- 1.6. Maturity:** Above all the Officer Trainees are expected to behave like mature individuals. Mature persons have a balanced frame of mind at all times be it their workplace or personal space. They prove to be an asset to any organization.

2. INSTRUCTIONS

- 2.1.** Use of mobile phones/tablets etc. during classroom sessions is strictly prohibited.
- 2.2.** Officer Trainees are expected to take their own notes in the classes. Some

supplementary/ background reading materials may be circulated for some of the lectures.

2.3. Questions may be asked to clarify doubts. However, in case of difference of opinion, lengthy argument with the speaker is to be avoided. On such occasions, the point may be separately discussed with the speaker after the class.

2.4. The Officer Trainees shall ensure that there is no noisy behaviour during the assembly or dispersal of classroom sessions, or during tea-breaks. No disturbance or inconvenience should be caused to other offices or classrooms in the institute.

2.5. Participation in extra-curricular activities and organization of events:

2.5.1 It is mandatory for all Officer Trainees to regularly participate in Jogging at the scheduled time and place.

2.5.2 In addition, they are also required to participate either in PT or Yoga in the morning at the scheduled time. All these activities will be conducted under the supervision of instructors.

2.5.3 For Jogging/PT/Yoga, proper clothing needs to be arranged by the Officer Trainees. The male Officer Trainees should wear white T-shirt with white track pants/shorts, or a white tracksuit and white canvas/sports shoes with socks. Female Officer Trainees should wear white salwar-kurta, or white T-shirt with white track pants, or a white tracksuit and white canvas/sports shoes with socks.

2.5.4 In addition to PT, Yoga and Jogging, the Officer Trainees are required to take part in other games like Tennis, Table Tennis, Badminton, Carom, Cricket, Basketball etc., for which facilities exist in the Campus. Instructors/ coaches will be available for the sports activities.

2.5.5 Sports Tournaments: The Officer Trainees shall be required to organise tournaments of sports like Cricket, Badminton, Table Tennis, Carom tournaments etc. and Athletic events, with participation by all Officer Trainees in individual or team events.

2.5.6 Cultural Programmes: The Officer Trainees shall be required to organise Cultural Programmes consisting of solo and group performances, skits, plays etc., ensuring participation by all Officer Trainees in the programmes.

2.5.7 The participation in all these activities and events shall form part of the assessment and evaluation.

2.6. Leave

2.6.1 **No leave will normally be granted during the courses, except in the most compelling circumstances.**

2.6.2 In case leave is granted, then before proceeding on leave the written approval of the ADG in-charge must be obtained. Any absence without permission would be treated as 'unauthorized absence from duty' and will be dealt with as per disciplinary rules.

2.6.3 Willful absence from duty after expiry of sanctioned leave period renders a Govt. servant liable for disciplinary action. If any Officer Trainee overstays beyond the sanctioned period of leave, the entire period of absence will be treated as unauthorized and probation period may also be extended.

2.6.4 If an Officer Trainee is unable to attend the course on medical grounds, he/she shall obtain a certificate from the Medical Officer from a Government Hospital and only thereafter he/she shall apply for leave.

2.6.5 Officer Trainees who are granted leave shall take specific permission for leaving

the station. Even during weekends and holidays, station leave permission shall invariably be obtained from the ADG in-charge, duly furnishing their leave address and contact number. Station leave permission during weekends can be denied by the ADG in-charge, in case assignments or self-study topics are given to the OTs during a training module.

3. ASSESSMENT AND EVALUATION

The Institute has a well-laid out methodology for assessment and evaluation of the Officer Trainees during the probation period. The approach of the Institute in this regard is elaborated below:

- 3.1. The evaluation and assessment of the Officer Trainees should be exhaustive.
- 3.2. Each individual training module will have tests, for which the Officer Trainees will be awarded marks. It would be necessary for every OT to pass these tests as per the qualifying criteria of 60% marks. The following methodology will be adopted for assessment & evaluation of the Officer Trainees:
 - 3.3. Each individual classroom training module will have a written test or a lab-based test for 40 marks per week, e.g. a two-weeks duration training module may have one or more than one test of total 80 marks.
 - 3.4. The field attachments and trekking trip shall carry marks as indicated in the assessment table. The assessment shall be based on the performance of the Officer Trainee during Field Attachment as assessed by the respective controlling officer i.e., the concerned head of division or unit and the presentation/ report of attachment submitted by the trainee to NTIPRIT. For trekking trip, the marks will be awarded by the designated officer of NTIPRIT.
 - 3.5. The Project work and Experience Sharing shall be of 80 marks.
- 3.6. **Assessment by Training Cell, NTIPRIT:** During the Training Programme, the Officer Trainees shall also be assessed on a continuous basis, based on their participation & performance in group-activities, presentations, sports & cultural activities and general behaviour, attendance, punctuality, discipline & personal conduct. This assessment shall be out of total 50 marks, which will be awarded by the designated officer of Training Cell, NTIPRIT.
- 3.7. **Total marks at NTIPRIT:** The overall marking shall be done as given in the Assessment Table in next page.

Assessment Table: Constitution of Total Marks

Assessment Heads	Duration of Module (in weeks)	Marks
Office Procedures and Administration	2	80
Establishment Rules	1	40
Ethics and soft skills	2	80
Fundamentals of digital communications technologies	2	80
Licensing and Regulation	1	40
Trekking trip	1	40
Telecom Networks and Technologies- Access Services	3	120
Telecom Networks and Technologies- Data Services	2	80
Telecom Networks and Technologies- Carrier Services	1	40
Standards and Testing	1	40
Information Security Management System and emerging technologies with focus on topics like AI/ML/Blockchain, IoT	1	40
Big Data Analytics	1	40
Network and Cyber Security	1	40
Field Attachment		
Field Attachment DoT HQ		50
Field attachment BSNL	4	40
Field attachment Big LSAs	8	80
Field attachment Tenure LSAs	4	40
Phase II: Classroom Training at NTIPRIT		
Project work, Experience sharing and valediction	2	80
Phase III: Role based specialization module		
Role based specialization module through IGoT or other platform (<i>Maximum One hour per day</i>)	10	100
Assessment by Training Cell, NTIPRIT		50
Total Marks		1200

3.8. Qualifying Criteria:

3.8.1 It will be necessary for every Officer Trainee to secure at least 60% marks in each test to successfully complete the concerned module. In case the OT fails to secure 60% marks in any test, or fails to appear in the test, he/she will be given an opportunity to appear in a re-test. The OT shall have to qualify the re-test (with 60% marks) and this will be treated as a second attempt/supplementary test, but he/she will be awarded the qualifying marks (60%) only, for the purpose of arriving at the total marks obtained during probation period. If the OT fails to qualify in the re-test also, then he/she will have to repeat the concerned module, and his/her probation period will be extended to that extent.

3.8.2 The qualifying criteria of securing at least 60% marks shall also be applicable to the marks obtained in other training modules which do not include tests, including Field Attachment, Project work, Assessment by Training Cell, NTIPRIT etc. as detailed above. In case the OT fails to qualify in any of the aforesaid modules, the probation period shall be extended, as decided by the Competent Authority.

3.8.3 Attendance: Every OT will have to maintain a minimum attendance of 60% in each course/module during the training programme. This attendance criterion shall also be applicable in those cases where he/she has been sanctioned any leave, including any leave sanctioned on medical grounds. If the attendance of any OT falls short of this criterion, he/she may not be permitted to appear in the tests, and he/she may have to repeat the concerned module. In such a case, his/her probation period will be extended by the duration of the repeated modules. No request for relaxation of this criterion will be entertained.

4. ASSESSMENT BY OFFICER TRAINEES

An evaluation questionnaire will be given to the Officer Trainees at the end of the individual courses to obtain their comments about the various aspect of the course. Informal discussions will also be held with the Officer Trainees during the course to obtain feedback from them. Feedback given by the Officer Trainees will be used for improving future courses. Feedback can be useful only if it is made objectively. All comments made by Officer Trainees must be polite.

5. STAY IN THE HOSTEL

Stay in the campus is compulsory for the Officer Trainees. Permission to stay outside will be accorded only under the most compelling circumstances. Families and guests are not allowed to stay in the hostels. No visitors will be allowed after 10 P.M.

Officer Trainees are expected to return to the hostel before 10 P.M. The hostel warden should be informed in advance if an Officer Trainee intends to come later than 10 P.M.

The hostel has fully equipped mess and hostel mess is compulsory. A mess committee may be appointed to supervise and suggest the improvement in the arrangements of mess.

No intoxicating drinks and drugs are allowed in the hostel. Action will be taken under Conduct Rules if any OT is found consuming liquor or in an inebriated state.

Cultural Programs are arranged in the C. K. Reddy Hall. Special Programs are arranged on National Festivals. Attending the Flag Hoisting Ceremonies on National Festivals is compulsory for all Officer Trainees.