FIRE TECHNOLOGY
& INDUSTRIAL SAFETY MANAGEMENT

NSQF LEVEL- 6

SECTORS - FIRE & SAFETY

COMPETENCY BASED CURRICULUM

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

GOVERNMENT OF INDIA
Ministry of Skill Development & Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City, Kolkata – 700091

FIRE TECHNOLOGY & INDUSTRIAL SAFETY MANAGEMENT

(Also applicable for Fireman Trade)

(Non-Engineering Trade)

SECTOR – FIRE & SAFETY

(Designed in 2020)

Version 1.0

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

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Developed By
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1. COURSE OVERVIEW

The Craft Instructor Training Scheme is operational since inception of the Craftsmen Training Scheme. The first Craft Instructors' Training Institute was established in 1948. Subsequently, 6 more institutes namely, Central Training Institute for Instructors (now called as National Skill Training Institute (NSTI)), NSTI at Ludhiana, Kanpur, Howrah, Mumbai, Chennai and Hyderabad were established in 1960's by DGT. Since then the CITS course is successfully running in all the NSTIs across India as well as in DGT affiliated institutes viz. Institutes for Training of Trainers (IToT). This is a competency based course of one year duration. "Fire Technology and Industrial Safety Management" CITS trade is applicable for Instructors of "Fire Technology and Industrial Safety Management" and "Fireman" Trade.

The main objective of Craft Instructor training programme is to enable Instructors explore different aspects of the techniques in pedagogy and transferring of hands-on skills so as to develop a pool of skilled manpower for industries, also leading to their career growth & benefiting society at large. Thus promoting a holistic learning experience where trainee acquires specialized knowledge, skills & develops attitude towards learning & contributing in vocational training ecosystem.

This course also enables the instructors to develop instructional skills for mentoring the trainees, engaging all trainees in learning process and managing effective utilization of resources. It emphasizes on the importance of collaborative learning & innovative ways of doing things. All trainees will be able to understand and interpret the course content in right perspective, so that they are engaged in & empowered by their learning experiences and above all, ensure quality delivery.

2. TRAINING SYSTEM

2.1 GENERAL

CITS courses are delivered in National Skill Training Institutes (NSTIs) & DGT affiliated institutes viz., Institutes for Training of Trainers (IToT). For detailed guidelines regarding admission on CITS, instructions issued by DGT from time to time are to be observed. Further complete admission details are made available on NIMI web portal http://www.nimionlineadmission.in. The course is of one-year duration. It consists of Trade Technology (Professional skills and Professional knowledge), Training Methodology and Engineering Technology/ Soft skills. After successful completion of the training programme, the trainees appear in All India Trade Test for Craft Instructor. The successful trainee is awarded NCIC certificate by DGT.

2.2 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1.	**Trade Technology**	
	Professional Skill (Trade Practical)	640
	Professional Knowledge (Trade Theory)	240
2.	**Soft Skills**	
	Practical	100
	Theory	100
3.	**Training Methodology**	
	TM Practical	320
	TM Theory	200
	Total	**1600**

2.3 PROGRESSION PATHWAYS

- Can join as an Instructor in vocational training Institute/ technical Institute.
- Can join as a supervisor in Industries.

2.4 ASSESSMENT & CERTIFICATION

The CITS trainee will be assessed for his/her Instructional skills, knowledge and attitude towards learning throughout the course span and also at the end of the training program.

a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** to test competency of instructor with respect to assessment criteria set against each learning outcomes. The training institute has to maintain an individual trainee portfolio in line with assessment guidelines. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The **Final Assessment** will be in the form of **Summative Assessment Method**. The All India Trade Test for awarding National Craft Instructor Certificate will be conducted by DGT as per the guidelines of DGT. The learning outcome and assessment criteria will be the basis for setting question papers for final assessment**.** The external examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS CRITERIA

S No.	Subject		Marks	Internal Assessment	Full Marks	Pass Marks	
						Exam	Internal Assessment
1.	Trade Technology	Trade Practical	200	60	260	120	36
		Trade Theory	100	40	140	40	24
2.	Soft Skills	Practical	50	25	75	30	15
		Theory	50	25	75	20	15
3.	Training Methodology	TM Practical	200	30	230	120	18
		TM Theory	100	20	120	40	12
	Total Marks		**700**	**200**	**900**	**370**	**120**

The minimum pass percent for Trade Practical, TM Practical, Soft Skill Practical Examinations and Formative assessment is 60% & for all other subjects is 40%. There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. While assessing, the major factors to be considered are approaches to generate solutions to specific problems by involving standard/non-standard practices.

Due consideration should also be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising of the following:

- Demonstration of Instructional Skills (Lesson Plan, Demonstration Plan)
- Record book/daily diary
- Assessment Sheet
- Progress chart
- Video Recording
- Attendance and punctuality
- Viva-voce
- Practical work done/Models
- Assignments
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of an ***acceptable standard*** of crafts instructorship with ***occasional*** **guidance** and engage students	• Demonstration of ***fairly good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Average engagement of students for learning and achievement of goals while undertaking the training on specific topic.

by demonstrating good attributes of a trainer.	• A fairly good level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Occasional support in imparting effective training.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***reasonable standard*** of crafts instructorship with ***little* guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Above average engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A***good*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Little support in imparting effective training.
© Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***high standard*** of crafts instructorship with ***minimal or no support*** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***high*** skill level to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Good engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A ***high*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Minimal or no support in imparting effective training.

3. GENERAL INFORMATION

Name of the Trade	**Fire Technology & Industrial Safety Management – CITS**
Trade Code	DGT/ 4042
NCO – 2015	2356.0100, 3119.1000, 5411.9900
NSQF Level	Level-6
Duration of Craft Instructor Training	One Year
Unit Strength (No. Of Student)	25
Entry Qualification	Degree in Fire & Safety Engineering/ Fire Science from recognized Board / University. OR Advanced Post Graduate Diploma (Minimum 2 years) in Industrial Safety Engineering/ Fire and Industrial Safety Engineering / Health, Safety & Environment. OR NTC/ NAC in Fire Technology & Industrial Safety Management/ Fireman or related trade. OR Defence/Paramilitary forces Officer JCOs/NCOs. OR National Examination Board Occupational Safety and Health (NEBOSH)/Occupational Safety and Health Administrator (OSHA) Certification with one-year experience in the relevant field.
Minimum physical requirements	i. Height - 165 cm ii. Weight - 52 kg iii. Chest - Normal 81 cm - Expanded 85 cm A registered MBBS doctor must certify that the candidate is medically fit to undertake the course
Minimum Age	18 years as on first day of academic session.
Space Norms	1000 Sq. m (for practical Training area)
Power Norms	2 KW

Instructor's Qualification for	
1. Fire Technology & Industrial Safety Management (CITS) Trade	B.Voc/Degree in Fire & Safety Engineering/Fire Science from AICTE/UGC recognized university/ college with two years experience in the relevant field. **OR** Advanced Post Graduate Diploma (Minimum 2 years) in Industrial Safety Engineering/ Fire and Industrial Safety Engineering / Health, Safety & Environment or relevant Advanced Diploma (Vocational) from DGT from recognized board of education with five years experience in the relevant filed. **OR** Defence/Paramilitary forces Officer JCOs/NCOs with 10 years of experience in the relevant field. **OR** National Examination Board Occupational Safety and Health (NEBOSH)/Occupational Safety and Health Administrator (OSHA) Certification with two years experience in the relevant field. **OR** NTC/NAC passed in the trade of "Fire Technology and Industrial Safety Management" with seven years experience in the relevant field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in 'Fire Technology & Industrial Safety Management', in any of the variants under DGT.
2. Soft skills	MBA/ BBA / Any Graduate/ Diploma in any discipline from AICTE/ UGC recognized College/ university with Three years' experience and short term ToT Course in Soft Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above).
3. Training Methodology	B.Voc/ Degree in any discipline from AICTE/ UGC recognized College/ university with two years experience in training/ teaching field. **OR** Diploma in any discipline from recognized board / University with five years experience in training/teaching field. **OR** NTC/ NAC passed in any trade with seven years experience in training/ teaching field. **Essential Qualification:**

	National Craft Instructor Certificate (NCIC) in any of the variants under DGT / B.Ed /ToT from NITTTR or equivalent.
4. Minimum Age for Instructor	21 Years

Distribution of training on Hourly basis: (Indicative only)

Total Hrs /week	Trade Practical	Trade Theory	Soft Skills		TM Practical	TM Theory
			Practical	Theory		
40 Hours	16 Hours	6 Hours	2.5 Hours	2.5 Hours	8 Hours	5 Hours

4. JOB ROLE

Brief description of job roles:

Manual Training Teacher/Craft Instructor; Instructs students in ITIs/Vocational Training Institutes in respective trades. Imparts theoretical instructions for the use of tools, mechanical drawings, blueprint reading and related subjects. Demonstrates processes and operations in the workshop; supervises, assesses and evaluates students in their practical work. Ensures availability & proper functioning of equipment & tools in stores.

Fire Fighters, Other; Fire Fighters, other includes all other Fire Fighters engaged in extinguishing or controlling fire not elsewhere classified.

Fire Inspectors, Other; include all other associate professionals engaged in government, industrial and other enterprises, who inspect different structures to ensure compliance with central/state government laws and with approved plans, specifications and standards, or inspect fire prevention systems and investigate fire sites to determine cause of fire not elsewhere classified.

Reference NCO-2015:

(i) 2356.0100 – Manual Training Teacher/Craft Instructor
(ii) 3119.1000 – Fire Fighters
(iii) 5411.9900 – Fire Inspector

5. LEARNING OUTCOMES

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

5.1 TRADE TECHNOLOGY

1. Cultivate the discipline and safety compliance in fire services. Categorize electrical hazards, risk and its mitigation.
2. Demonstrate the application of different types of extinguishers, hoses, hose fittings and explain characteristics of fire fighting agents.
3. Plan and execute the concept of hydraulics in workplace. Demonstrate operation and testing of hydrant and pump system.
4. Demonstrate use of small and special gears used in fire fighting viz. cutting tools, pulley blocks, lifting, lighting and rescue tools etc.
5. Demonstrate use of PPE, its care and maintenance. Execute MFR and Demonstrate elementary treatment at incidental spot.
6. Demonstrate automatic fire detection cum alarm system, fixed fire fighting installations and communication systems.
7. Analyze different fire situations and fire fighting including rural fire. Demonstrate hazard evaluation and risk analysis.
8. Demonstrate safety precautions while working at height, confined places and work permit system.
9. Demonstrate to Plan and execute rescue methods from different locations, disaster response practices, IRS/JRT and salvage techniques including proper use of ladder, knots and hitches.
10. Demonstrate to plan and execute rescue operations associated with different dangerous chemicals, dust, gases, mist, vapours etc.
11. Examine building construction and occupancy to ensure fire and life safety.
12. Analyze the concept of accident cause and prevention, accident investigation, analysis and safety management.
13. Plan and execute fire station administration. Implement provisions related to safety, health and welfare in respect of Factory Act.

6. COURSE CONTENT

FIRE TECHNOLOGY & INDUSTRIAL SAFETY MANAGEMENT – CITS TRADE			
TRADE TECHNOLOGY			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Practical 32 Hrs; Theory 12 Hrs 2 Weeks	Cultivate the discipline and safety compliance in fire services. Categorize electrical hazards, risk and its mitigation.	1. Demonstrate equipment used in the trade, types of work done by the individual in the trade. 2. Demonstrate safety equipment and their uses, first aid, Road safety, operation of Electrical mains, Occupational health and hygiene. 3. Demonstrate various acids. 4. Demonstrate different water reactive substances. 5. Demonstrate Organic flammable liquids and commonly used industrial chemicals, Acids, Alkalis & Gases. 6. Visit/ Video demonstration on thermal power plant and electrical sub-station. 7. Video demonstration on fire fighting in different premises. 8. Case studies of various major fires.	**Discipline**: Importance and General Principles of discipline, essentials for discipline and outward Signs. **Physics and Chemistry related to Fire:** Definition of Matter and energy, Physical properties of matter like Density, specific gravity, Relative density, Vapor density, Melting & Boiling point, flammable limits, latent heat, Effects of density on behavior of gases, oxidizing and reducing agents, Acids. Flammable liquids-classification and types of tanks, Dust and Explosion, Liquid and Gas Fires, LPG. UCVE, BLEVE, Slope-over and Boil over, Gas laws, P-V-T relation for perfect gas. **Anatomy of Fire:** Definition of Combustion, Elements of Combustion, Products of Combustion, Heat of reaction and calorific value, Flash point, Fire point, Ignition temperature and spontaneous combustion.

			Fire Triangle, Tetrahedron and Pyramid, source of heat, Classification of fire, Oxygen and its effects on combustion, Mode of heat transfer. **Electricity:** Common causes of electrical fire and its remedial measures, electrical hazards including static electricity, electrocution and protective measures. Electrical safety and use of electrical equipment in hazardous area.
Practical 48 Hrs; Theory 18 Hrs 3 Weeks	Demonstrate the application of different types of extinguishers, hoses, hose fittings and explain characteristics of fire fighting agents.	9. Demonstrate operation and selection as per suitability of the following extinguishers: (i) water type (ii) foam type (iii) powder type (iv) gas type (v) Trolley mounted 10. Maintenance and inspection of various fire extinguishers. 11. Hose drill (i) hose pick up (ii) hose laying (iii) hose joining (iv) hose replacement at different position (v) Recoiling the hose 12. Care, maintenance and repair of Hoses, hose reel and hose fittings. 13. Standard tests of Delivery Hoses. 14. Demonstrate foam making	**Fire & Extinguishers**: Classification of Fire and types of extinguishers. Techniques of fire extinction - Smothering cooling, starvation and breaking of chain radicals. Halon and its detrimental effect on environment. Alternatives of Halon. Types of fire extinguishing agents, Rating system for portable fire extinguishers, Limitation of fire extinguishers, Inspection requirement. **Hose and Hose Fittings:** Types of Suction and Delivery Hoses, Hose-reel, causes of decay, Marking of Hose, Definition and different groups of Hose Fittings. Types and Construction of Suction; Monitors, Water-cum-foam Monitor, Nozzles & branch holders, collecting head and

		branch: (i) Use of FB2X, FB5X and FB10X. (ii) Care and maintenance of foam equipment. 15. Wet drill using foam and foam making equipment.	suction hose, Fittings; frost valve, Deep lift suction fittings, Breechings, Adaptors and Blank cap suction reduction piece, Hose Ramps. Definition of fire stream, solid tip or stream, special purpose. **Foam & Foam Making Equipment:** Water as an extinguishant- its merits, demerits and modification. Types of foam concentrate, properties of foams and techniques of extinguishment by foam, types of foams, Characteristics of good foam, foam making Equipment- Mechanical, High Expansion and Low Expansion Foam. Storage of foam Compound. Dry Chemical Powder- Types and application. Carbon dioxide as extinguisher. Method of High expansion foam generation and special use.
Practical 64 Hrs; Theory 24 Hrs 4 Weeks	Plan and execute the concept of hydraulics in workplace. Demonstrate operation and testing of hydrant and pump system.	16. Demonstrate Hydrant and its associated equipments. (i) Hydrant Drill I: Opening of single line of three hoses. (ii) Hydrant Drill II: Change of burst hose. (iii) Hydrant Drill III: Increase one length hose. (iv) Hydrant Drill IV: Decrease one length hose. (v) Hydrant Drill V: Use of the collecting breaching.	**Hydrant & Fittings**: Introduction of Hydrant and Water supplies, Hydrant Gears and Equipment, Marking. Source of water supply, Water distribution system, Rural water supply, Determining Static, Residual and Flow Pressure **Pump & Pump Operation**: Classification of common types in use, Methods of

		(vi) Hydrant Drill VI: Disconnect collecting Breaching. (vii) Hydrant Drill VII: Use dividing breaching (viii) Hydrant Drill VIII: Disconnect dividing Breaching. 17. Four men pump drill. 18. Six men pump drill (dry and wet). 19. Operation, testing, cares and maintenance of hydrants and fittings. 20. Testing, repair and Maintenance of pumps. 21. Demonstrate Water volume calculation of different water reservoirs. 22. Demonstrate use of flow meter and different pressure gauges. 23. Fire ground calculation and theoretical calculation.	Priming, centrifugal pump. importance of Atmospheric pressure Cooling systems. **Hydraulics:** Relation between velocity and nozzle discharge, pressure and head, friction loss and height of the jet. Requirement for specific fire size. Composition of Water, Atmospheric Pressure, Weight & Capacity of Water per cu. ft. Practical & Theoretical Suction Lift, Friction Loss, & Water Hammer.
Practical 32 Hrs; Theory 12 Hrs 2 Weeks	Demonstrate use of small and special gears used in fire fighting viz. cutting tools, pulley blocks, lifting, lighting and rescue tools etc.	24. Demonstrate different types of fire fighting small and special rescue gears at fire service station. 25. Drill with different small/special gears and lighting gears. 26. Demonstrate Practical Use of equipments like cutting tools; bolt cutter, door breaker etc. 27. Care & maintenance of equipment and Lifting tools.	**Small & Special gears:** Function & Construction- G.R. Tools, Breaking in and Cutting tools, Pulley blocks, Lighting, Lifting & Rescue tools. Operation of hydraulically operated, diesel operated and electrically operated. Water Tender and Special Appliance: Introduction and description of Rescue/ Emergency Tender, $C0_2$ tender, DCP Tender, Hose laying lorry, Water Bouser and High pressure pumps, special

			appliances; Type & Operation of Foam tender, Multipurpose fire tender, Crash fire tender, Hydraulic Elevated Platform and other special equipment.
Practical 32 Hrs; Theory 12 Hrs 2 Weeks	Demonstrate use of PPE, its care and maintenance. Execute MFR and Demonstrate elementary treatment at incidental spot.	28. Demonstrate PPE and other life saving equipments. 29. Drill: Donning, running and Rescue of casualty through tunnel. i. Familiarization and study First Aid Box. ii. Stretcher Drill. iii. Fireman Lift Drill. iv. Use Bandage. v. Standard drills on Ambulance. 30. Demonstrate Techniques of MFR. (Medical First Responder) 31. Certification from Red Cross/ St. George.	**Personal Protective Equipment;** Need, Selection, Use, Care & Maintenance Respiratory and Non-respiratory PPE, Head, Ear, Face, Eye, Hand, Foot and Body Protection. **First-Aid and MFR;** Standards & regulations First Aid, qualities of first aider, Shock; Signs and Symptoms, Asphyxia; Signs and Symptoms, Wounds and Hemorrhage; Classification of injuries, Signs, Symptoms & management, Burns, Scalds and frost Bite signs, symptoms and management. Causes and types of fractures Sprain & Dislocation; Signs and symptoms, Snake Bite-Treatment.
Practical 80 Hrs; Theory 30 Hrs 5 Weeks	Demonstrate automatic fire detection cum alarm system, fixed fire fighting installations and communication systems.	32. Demonstrate operation, care & maintenance of different fixed fire fighting installations viz., sprinkler system, pump control panel, total flooding system, etc. 33. Demonstrate different Automatic Fire Detection cum Alarm System. 34. Visit to modern control	**Automatic Fire Detection cum Alarm System:** Types of Detectors; Smoke, Heat, Flame/Gas Detectors, Operating principles, F.D.A. Panel M.C.P. & P.A. with talk back. **Fixed Fire Fighting Installations:** Sprinkler System, Elementary requirements of Drenchers,

		room and watch rooms of state fire service/ Industry. 35. Demonstrate Fire affected room searching techniques.	Rising Mains, Hose Reels and Down-comer, Fire pump control panel. Types of fixed fire fighting Installations; water based, non-water based. Fixed Foam installation, Foam pours, foam makers, HVWS, MVWS, Total flooding system CO_2, FM-200, etc. **Communication System:** Watch Room Procedure & Mobilizing: Control Room, Equipment Station Ground, Turn-out area, Area of Topography, and Telephone Call area, Mobilizing boards and maps. The log & occurrence book, Various lines, communication Equipment in Fire Service, Radio Communication and Use of VHF Sets. Method of receiving report of emergencies.
Practical 48 Hrs; Theory 18 Hrs 3 Weeks	Analyze different fire situations and firefighting including rural fire. Demonstrate hazard evaluation and risk analysis.	36. Demonstrate Hazard evaluation and risk analysis exercise. 37. Demonstrate Practical usages of safety belt, helmets, gloves and goggles. 38. Visit to industrial unit and adoption of safety Practice. 39. Visit to industrial unit to observe prevailing welfare measures and their condition.	**Hazard evaluation**; Housekeeping and Waste Disposal, 5'S Concept Hazardous Chemicals; Storage, Transportation and handling of dangerous chemicals and explosives. Interpretation and use of MSDS. Chemical labeling. Fire load calculation **Rural Fire:** Fire Hazards in rural areas and cause of fire, Haystacks, Special appliance &

		40. Demonstrate live fire extinction using all kinds of extinguishers. 41. Demonstrate of rural fire fighting and first aid practices using traditional equipment. 42. Video demonstration of different fire situations viz., ship, submarine, aircraft, airport, lift, refrigeration, Dock, Jetti fire and petrochemical fire etc. 43. Case studies on different fire situations.	equipment, Method of Firefighting in rural areas. Difficulties in dealing with Rural fires. Aircraft Fire and Rescue: fire hazards in Aircraft, Rescue and firefighting, Resource of Fighting Fire in Air Ports. Different types of Aircrafts, Air craft firefighting and rescue procedures, Hangers; types, fire protection and firefighting. Ship Fires: fire protection, fire fighting & rescue from ship. Dock Fires, Fire protection of jetty.
Practical 32 Hrs; Theory 12 Hrs 2 Weeks	Demonstrate safety precautions while working at height, confined places and work permit system.	44. Demonstrate High elevation drill. 45. Confined space rescue. 46. Demonstrate B. A. set and relevant drill. 47. Demonstration & pre-entry test (LP & HP) of Self Contained Breathing apparatus (SCBA) set. 48. Demonstrate Donning & doffing of SCBA. 49. SCBA Operation & Emergency Procedures. 50. Inspection and Maintenance of SCBA.	**Working at Height, Confined Space:** Safety precautions related to Scaffolds, Ladders, and Work at height including Roof Work, fall arrestors, Confined Space, Work Permit System, Excavation. Precautions while working in smoke laden buildings.
Practical 96 Hrs; Theory 36 Hrs	Demonstrate to Plan and execute rescue methods from different locations, disaster response practices, IRS/JRT and salvage	51. Demonstrate methods of using Extension Ladder i. Rescue Operation from buildings. ii. Drill I: Pitching of ladder iii. Drill II: Climbing the ladder iv. Drill III: Use leg Lock	**Ladders:** Types, Construction features of conventional Ladders. **Ropes and Lines:** Rope materials – Natural, synthetic & their characteristics, types and uses

6 Weeks	techniques including proper use of ladder, knots and hitches.	v. Drill IV: Ladder Drill with Fireman Lift vi. Drill V: L2 Drill 52. T.T.L. & Snorkel visit at civil fire stations having these appliances. 53. Demonstrate Practical use of different knots and hitches in rescue & fire fighting. 54. Testing of different type of lines, care and maintenance. 55. Demonstrate methods of rescue from various place viz. collapsed building, vehicle, well, river, lift and sewer, etc. 56. Video Demonstration of rescue from mines, ships, aircrafts, submarines, etc. 57. Simulated Practices to save life and property damages from natural disaster. 58. Water relay drill (All types). 59. Demonstrate Practical use of salvage sheets & equipment, their care & maintenance. 60. Demonstrate Methods of entry into building, Different searching methods to locate & rescue a trapped causality. 61. Demonstrate SOP.	of lines, causes of Deterioration Inspection and tests, methods of testing, care and maintenance, standard knots and their uses. (Method of rope construction- Hauser laid, Braided etc) **Rescue techniques**: Rescue technique from lift, Sewer, Collapsed building, motor vehicle accident, Well & river, Special equipment for rescue operations. Hazards associated with Rescue operations, Search of Burning structure, Extrication from Motor vehicles, Machines, Specialized Rescue Situations. Water Relay: Types of relay-systems, water distribution System. Advantages and disadvantages-Calculation of hose. Spacing of intermediate pumps, important points for carrying out Relay & Study of gauges. **Salvage;** list of Salvage tools & equipment and working at Fires. Safety consideration at the time of salvage. Salvage work- Direct/ indirect loss, Mitigation measures, Salvage seat. **Disaster Management:** Natural and Man-made Disaster, Preparedness for disaster, use of various agencies, first responders,

			control of situation, Incident Command System (ICS)/ IRS/JRT. Classification, significance, causes and effects. Remedy for mitigation.
Practical 32 Hrs; Theory 12 Hrs 2 Weeks	Demonstrate to plan and execute rescue operations associated with different dangerous chemicals, dust, gases, mist, vapours etc.	62. Demonstrate HVAC system and various equipment used in rescue of causality. 63. Ladder Drill with Fireman Lift. 64. Sewer Rescue drill. 65. Stretcher drill.	**Occupational Hazards & Dangerous Chemicals;** Properties of Chemicals, Dust, Gases, Fumes, Mist, Vapours, Smoke and Aerosols. Concepts of threshold limit Values, Classification of Hazards. Hazchem codes, Chemical accidents source and causes, Transportation risk in rail and by road, emergency management for release or leakage of gas/chemicals during transportation.
Practical 48 Hrs; Theory 18 Hrs 3 Weeks	Examine building construction and occupancy to ensure fire and life safety.	66. Demonstrate Building materials and fixed fire fighting installations of high rise building. 67. Care and maintenance of sprinklers. Use of Automatic fire alarm system, 68. Planning of Escape route and Fire exit drill. 69. Visit to multi-occupancy buildings. 70. Video demonstration on multi level parking. 71. Demonstration on Smoke management & HVAC. 72. Video demonstration on Safety in Industries; Machine operations & guarding, Safety precaution while using Hand Tools &	**Building Construction Site**: Classification of Building materials and their behavior under fire conditions, signs of collapse of building, various types of occupancies and firefighting techniques, Importance of fire escapes with respect to their positioning. Places of relative safety, places of ultimate safety, Width of exits requirement and calculations. Reference to NBC Part IV fire construction and provisioning of firefighting measures. NBC Rule 2016; chapter 4, table 7 (Colour codes) Need for selection & Care of

		Power Tools. 73. Topography of the local area.	tools, Types of Guarding IS:8758 – Temporary structure guidelines.
Practical 32 Hrs; Theory 12 Hrs 2 Weeks	Analyze the concept of accident cause and prevention, accident investigation, analysis and safety management.	74. Site visit for post analysis of different incidents. 75. Demonstrate Method of rescue casualty without equipment. - Carry casualty - Dragging casualty 76. Video demonstration on latest monitoring devices; Drone & helicopter. 77. Video demonstration on fire ball & fire robot. 78. Case studies.	**Accident cause and prevention** Classification of Accidents, Need for the Analysis of Accidents, Accidents Reports, Methods for Reducing Accidents, Investigation and analysis of Accidents, Safety Slogans, Safety Precautions adopted in the Plant. Causes and cost of Accident/ incident Passive Fire protection; selection of site, material etc. Fire prevention and life safety measure Acts & guidelines. **Safety Concept:** Introduction to Safety Management, Safety Policy, Safety Committee, , Responsibility of Management, Safety Officers Duties &Responsibilities, Safety Targets, Objectives, Standards, Practices and Performances.
Practical 48 Hrs; Theory 18 Hrs 2 Weeks	Plan and execute fire station administration. Implement provisions related to safety, health and welfare in respect of Factory Act.	79. Demonstrate Water tender drill. Drill I: L-2 Drill with ladder and water tender Drill II: Foam Drill with FBI0X single delivery. Drill III: Foam Drill with FB5X single delivery. Drill IV: Wet Drill with double delivery. Drill V: Dry Drill with double delivery.	**Fire Service Administration:** Fire Service Organization, Executive and Administrative duties of Officer-in-Charge of a Fire Station. Safety, Health and environment legislation. Factories Act 1948 (Amended) related to fire & safety Fire & safety Audit. National Fire Protection

		80. Visit to Fire Service Station and demonstrate Fire Station writing practices of a) Occurrence Book b) Writing of a report c) Hose Card/Register d) Fire reports e) Workshop Orders f) Log books g) Stock Registers h) Orderly Room Registers i) Defaulter Register j) Leave Register 81. Demonstrate observation of provisions of the legislation applicable to different factories. 82. Visit/ video demonstration of industries to observe safety in material handling. 83. Contact local fire service for induction training and equipment.	Association (NFPA) IS:9457-2005 - Emergency signage, Safety colour & safety signages. **Material Handling**: Safety related to Mechanical and Manual Material Handling, Lifting Appliances, Transport / Earthmoving & Material Handling Equipments - Cranes, Forklift Truck, Hoists, and Conveyors**.**
2 Weeks	**Project Work/ Industrial visit/ on the job training**		
2 Weeks	**Revision & Examination**		

SYLLABUS FOR CORE SKILLS
1. Soft Skills (Common for all Non-Engineering CITS trades) (100 Hrs + 100 Hrs)
2. Training Methodology (Common for all trades) (320 Hrs + 200 Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of above Core Skills subjects which is common for a group of trades, are provided separately in www.bharatskills.gov.in

7. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
TRADE TECHNOLOGY	
1. Cultivate the discipline and safety compliance in fire services. Categorize electrical hazards, risk and its mitigation.	Identify the type of acids and their uses in the place.
	Select the suitable acids on the workplace.
	Analyze the effect of acids on the suitable jobs.
	Importance of discipline in fire services.
	Explain common causes of electrical fire
	Identify electrical hazards..
	Select remedial measures
	Apply PPE.
	Follow the electrical document for safety.
	Safe method to rescue the victim from live electrical circuit.
2. Demonstrate the application of different types of extinguishers, hoses, hose fittings and explain characteristics of fire fighting agents.	Install the wall fitting and test it.
	Techniques of fire extinction smoothing cooling and Starvation.
	Observe the safety/precaution during the operation Extinguisher.
	Causes of hose decay & its prevention.
	Use of percolating & non-percolating hose.
	Causes of hose reel decay, its care & maintenance.
	Importance of hose reel hose in first aid firefighting in buildings and industries.
	Plan the work in compliance with standard tests of delivery hoses.
	Standard test of Suction hose.
	Measure deep lifts suction fittings.
	Types of Breechings and its uses.
	Identify the hose ramps, care and maintenance of hose fittings.
	Selection of good fire fighting foam and foam making equipment.

	Use of low, medium and high expansion foam and its utilization in proper and effective way.
3. Plan and execute the concept of hydraulics in workplace. Demonstrate operation and testing of hydrant and pump system.	Knowledge of Water supplies, hydrant gear and equipment.
	Testing of hydrants, care and maintenance
	Methods of priming.
	Select and testing fault finding.
	Working of centrifugal pump.
	Observe care and maintenance of pump.
	Check the hydraulic system.
	Calculate the water capacity of tank.
	Check the working of flow meter.
	Establish the relationship between head and pressure.
	Calculate the pressure loss due to friction.
	Calculate the height of the water jet.
4. Demonstrate use of small and special gears used in fire fighting viz. cutting tools, pulley blocks, lifting, lighting and rescue tools etc.	Select and operate different small and special gears.
	Drill with different small and special gears.
	Identify and select various types of Fire Fighting Small and Special rescue gear at Fire Service Station.
	Practical Use of equipments like cutting tools.
	Lifting tools Maintenance of tools.
5. Demonstrate use of PPE, its care and maintenance. Execute MFR and Demonstrate elementary treatment at incidental spot.	Demonstrate various Personal Protective/life saving Equipments.
	Select and use Respiratory and Non-respiratory Personal Protective Equipment, their Care & Maintenance.
	Observe standard and regulation related to PPE.
	Apply appropriate techniques of MFR.
	Identify and apply Methods for rescue without equipment.
	Donning, running and Rescue of casualty through tunnel.
6. Demonstrate automatic fire detection cum alarm system, fixed fire fighting installations and communication systems.	Demonstrate various types of detectors.
	Select Automatic Fire Detection cum Alarm System as per need.
	Plan Automatic Fire Detection cum Alarm Systems effective utilization.
	Operational Procedure, care and maintenance of Sprinkler

	System.
	Plan and execute fixed firefighting installation.
	Elementary requirements of Drenchers, Rising Mains, Hose Reels and Down-comer, Fire pump control panel.
	Install Fixed Foam.
	Different communication required at various fire service departments.
	Select and apply various lines, communication Equipment in Fire Service.
	Select & use method of receiving report of emergencies.
	Demonstrate use of Radio Communication and VHF.
	Apply fire affected room searching techniques.
7. Analyze different fire situations and fire fighting including rural fire. Demonstrate hazard evaluation and risk analysis.	Perform Live fire extinction using all kind of extinguisher.
	Fire Hazards in rural areas and cause of fire.
	Select and apply method of firefighting in rural areas.
	Difficulties in dealing with Rural fires.
	Demonstrate hazard evaluation and risk analysis.
	Demonstrate use of safety belt, helmets, gloves and goggles.
	Causes, Identification, Evaluation & Control of hazard and risk.
8. Demonstrate safety precautions while working at height, confined places and work permit system.	Perform High elevation drill.
	Perform Confined space rescue.
	Observe safety precaution related to Scaffolds, Ladders, and work at height including roof work.
	Demonstrate and operate BA set and relevant drill
	Donning & doffing of SCBA.
	SCBA Operation & Emergency Procedures.
	Inspection and Maintenance of SCBA.
9. Demonstrate to Plan and execute rescue methods from different locations, disaster response practices, IRS/JRT and salvage techniques including proper use of ladder, knots and hitches.	Select the appropriate ladder.
	Demonstrate Pitching and Climbing of ladder.
	Demonstrate leg Lock.
	Demonstrate use of different knots and hitches in rescue & fire fighting.
	Testing of different type of lines, Care and maintenance.
	Various agencies, first responders, control of situation.

	Different types of disasters.
	Demonstrate simulation to control life and properties damages from natural disaster.
	Perform water relay drill.
	Identify and select Equipment for Salvage & working at Fires.
	Use salvage sheets & equipment, their care & maintenance.
	Select and apply Methods of entry into building.
	Select and apply Different searching methods to locate & rescue a trapped causality.
10. Demonstrate to plan and execute rescue operations associated with different dangerous chemicals, dust, gases, mist, vapours etc.	Demonstrate HVAC system.
	Demonstrate various equipments used in rescue of causality.
	Ladder Drill with Fireman Lift.
	Sewer Rescue drill.
	Stretcher drill.
	Occupational Hazards & Dangerous Chemicals.
	Transportation and handling of dangerous chemicals and explosives.
	Dangerous Properties of Chemicals, Dust, Gases, Fumes, Mist, Vapours, Smoke and Aerosols.
11. Examine building construction and occupancy to ensure fire and life safety.	Demonstrate building materials and their behavior under fire conditions.
	Classification of building.
	Care and maintenance of sprinklers.
	Use of Automatic fire alarm system, fire exit drill.
	Various types of occupancies and firefighting techniques.
	Important fire escapes with respect to their positioning.
12. Analyze the concept of accident cause and prevention, accident investigation, analysis and safety management.	Explain different industrial accidents.
	Prepare accident reports.
	Explain Methods Adopted for Reducing Accidents.
	Investigation and analysis of Accidents.
	Safety Slogans, Safety Precautions adopted in the Plant.
	Apply Safety Management, Safety Policy, Safety Committee, Responsibility of Management,

	Safety Officers Duties & Responsibilities, Safety Targets, Objectives, Standards and Practices.
13. Plan and execute fire station administration. Implement provisions related to safety, health and welfare in respect of Factory Act.	Various important duties of a fire station.
	Drill with ladder and water tender.
	Foam Drill with FBI0X single delivery.
	Foam Drill with FB5X single delivery.
	Wet Drill with double delivery.
	Dry Drill with double delivery.
	Select & apply provisions related to safety.
	Demonstrate writing of Occurrence Book, Duty Card/ Register, Logbook, Hose Book, Stock Register and their maintenance.
	Provisions of the legislation applicable to different factories.

8. INFRASTRUCTURE

LIST OF TOOLS & EQUIPMENT			
FIRE TECHNOLOGY AND INDUSTRIAL SAFETY MANAGEMENT (CITS) (For batch of 25 Candidates)			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Water $C0_2$ Type Fire Extinguisher	9 Liters	08 Nos.
2.	Stored pressure Type Fire Extinguisher	9 Liters	08 Nos.
3.	Chemical Foam type Fire Extinguisher	9 Liters	08 Nos.
4.	Mechanical Foam type Fire Extinguisher	9 Liters	08 Nos.
5.	$C0_2$Type Fire Extinguisher	4.5 Kg	08 Nos.
6.	BCType Fire Extinguisher	5/10 Kg	06 Nos.
7.	ABC Type Fire Extinguisher	5/10 Kg	06 Nos.
8.	Extension Ladder	Size-45/35 ft	03 Nos.
9.	All types of Branches or Nozzles		04 Nos.
10.	Fire Hose	a) 15m	12 Nos.
		b) 30m	05 Nos.
B. SHOP TOOLS, INSTRUMENTS			
Lists of Tools:			
11.	First Aid Box		As required
12.	All Types of small gears		As required
13.	BA Set	Negative & Positive Pressure	02 Nos.
14.	a) Gas Cylinders		02 Nos.
	b) Steel Back Plates		02 Nos.
	c) Face Masks		02 Nos.
15.	Portable Fire Pump/TFP		02 Nos.
16.	All types of couplings		01 Set
17.	Hydrant-Stand Pipe Type		02 Nos.
18.	Fire Trays		02 Nos.
19.	Manual call point		01 No
20.	Entry Suit/ Proximity Suit		02 Nos.
21.	Hose reel system		01 No
22.	Nitrogen Cylinder		01 No
23.	Hose Box		01 No
24.	Fire Fighting Point complete Set		01 No

25.	Suction Hose	10 ft	02 Nos.
26.	Suction Wrench		02 Nos.
27.	Metal Strainer		02 Nos.
28.	Basket Strainer		01 No
29.	Sprinkler		02 Nos.
30.	Ropes	100 ft Long	01 No
31.	Lines 100 ft Long		01 No
32.	Control Panel – Model-Pump		01 No
33.	Personal Protective Equipment		
	a) Helmet	Type A,B,C	24 Nos.
	b) Laser Welding Safety Goggles		12 Nos.
	c) Face Shield		12 Nos.
	d) Welding Shield		12 Nos.
	e) Ear Muff		12 Nos.
	f) Ear Plug		12 Nos.
	g) Canal Caps		12 Nos.
	h) Safety Shoes		24 Nos.
	I) Asbestos Gloves		12 Nos.
	j) Electrical Hand Gloves		12 Nos.
	k) Hand Gloves (Rubber)		12 Nos.
	l) Dust Mask		12 Nos.
34.	Personal Protective Clothing for men		
	a) Safety Shirt		12 Nos.
	b) Safety Trouser		12 Nos.
	c) Safety Jacket		12 Nos.
	d) Cooling Vest		12 Nos.
	e) Gum Boots		12 Nos.
C. LIST OF EQUIPMENT			
35.	Personal Fall Arrest System (PFAS)		02 Nos.
36.	Tripod		02 Nos.
37.	Pulley		02 Nos.
38.	Suspended Scaffold		02 Nos.
39.	Gas Detector		02 Nos.
40.	Plastic Tunnel (Sewer Rescue Drill)		04 Nos.
41.	Body Harness		01 No
42.	Collecting Breeching		02 Nos.
43.	Dividing Breeching (Hand control)		02 Nos.
44.	Hydrant Flange		02 Nos.
45.	Hydrant Key & Bar (With hydrant Spindle)		01 No
46.	Adopter for Air Store Pressure		02 Nos.
47.	Hydraulic Pressure Testing Machine		01 No

48.	Sprinklers Head (Bulb Type, Fusible Type)		02 Nos.
49.	Safety Belt		01 No
50.	Desktop computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software.	08 Nos.
51.	Computer Table		08 Nos.
52.	Computers Chairs		08 Nos.
53.	White Board		01 No
54.	L.C.D. Projectors		02 Nos.
55.	UPS		As required
56.	All types of Detectors 1 Peps. of each		05 Nos.
57.	Cut model of Fire Extinguisher / Fire pump		02 Nos.
58.	Fire Suit		02 Nos.
59.	Fire Tender (one for the Institute)		01 No
60.	Rescue Van (one for the Institute)		01 No.
D. SHOP FLOOR FURNITURE AND MATERIALS			
61.	Instructor's table		01 No.
62.	Instructor's chair		02 Nos.
63.	Metal Rack	100cm x 150cm x 45cm	04 Nos.
64.	Lockers with 16 drawers standard size		02 Nos.
65.	Steel Almirah	2.5 m x 1.20 m x 0.5 m	02 Nos.
66.	Black board/white board		01 No.
67.	Fire Extinguisher		02 Nos.
68.	Fire Buckets		02 Nos.

ANNEXURE - I

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

List of Expert members participated/ Contributed for finalizing the course curriculum of Fire Technology & Industrial Safety Management/ Fireman (CITS) trade			
S No.	**Name & Designation Sh/Mr/Ms**	**Organization**	**Remarks**
1.	C. S. Murthy, JDT	CSTARI, Kolkata	Chairman
2.	R. R. Patel, Regional Deputy Director	DET, Gujarat	Member
3.	J. B. Shetty, Director (Tech. Trg.)	Institute of Fire Safety & Disaster Management Studies (IFSDMS), Vadodara	Member
4.	N. K. Shah, Principal	Govt. ITI Tarsali	Member
5.	P. P. Vaghela, Deputy Director	IFSDMS, Vadodara	Member
6.	K. S. Dubey, Deputy Director	IFSDMS, Vadodara	Member
7.	Om B. Jadeja, Divisional Officer	Vadodara Municipal Corporation, Fire Depratment	Member
8.	Mukesh Joshi, Station Officer	Heavy Water Plant, Vadodara	Member
9.	Vishnu Mishra, Chief (Safety & Fire)	GSFC, Vadodara	Member
10.	Ketan Patel, DDT	RDSDE, Gandhinagar, Gujarat	Member
11.	Bharat Makhwana, Supervisor Instructor	PASS Pvt. ITI, Umreth	Member
12.	K. K. Merai, Principal	Govt. ITI Gorwa	Member
13.	D. J. Varmora, Principal	Govt. ITI Padra	Member
14.	N. H. Patel, Supervisor Instructor	Govt. ITI Tarsali	Member
15.	Danish Aggarwal, ADT	RDSDE, Gandhinagar, Gujarat	Member
16.	D. A. Jadeja, Supervisor Instructor	Govt. ITI Tarsali	Member
17.	S. Bandyopadhyay, Training Officer	CSTARI, Kolkata	Member
18.	Bharat K. Nigam, Training Officer	CSTARI, Kolkata	Member