GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

FIRE TECHNOLOGY AND INDUSTRIAL SAFETY MANAGEMENT

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4

SECTOR – SAFETY AND SECURITY

FIRE TECHNOLOGY AND INDUSTRIAL SAFETY MANAGEMENT

(Non-Engineering Trade)

(Revised in 2018)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,

Kolkata – 700 091

ACKNOWLEDGEMENT

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 following 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 held on 06.06.2017 at CSTARI, Kolkata			
S No.	**Name & Designation Sh/Mr./Ms.**	**Organization**	**Remarks**
1.	H. V. Samvatsar Director	CSTARI, Kolkata	Chairman
1.	L.K. Mukherjee, DDT	-Do-	Coordinator
2.	Soumitra Chatterjee, MD	Dhruvsatya Centre for personal Transformation Pvt. Ltd.	Expert
3.	Purna Chandra Barad, Chief Manager- HR & Admin	Dhruvsatya Centre for personal Transformation Pvt. Ltd.	Expert
4.	Mr. Kanailal Biswas, Ex- Plant in charge	Zamil Steel Tower and Galvanizing factory, Dumman, Soudi Arabia	Expert
5.	Mr. Krishnendu sarkar, Director	Akass Infrastructure pvt. Ltd., Kolkata	Expert
6.	Dipak Rungta, Manager	Lalit Hardware, Expert in Disaster Management power tools & Equipments, Kolkata-1	Expert
7.	N.B. Reshamwal, Asst. Director	Regional Labour Institute, Kolkata	Member
8.	Sourashis Mitra, Junior Assistant	Indian Institute of Engineering, Science and Technology, Shibpur (IIEST), Howrah- 711103	Member
9.	Sujay Banerjee, Senior Instructor	West Bengal Fire & Emergency Services, Seal Para, Kolkata	Expert
10.	Shyam Chandra Mondal, Officer In Charge	West Bengal Fire & Emergency Services, Serampore, Mahesh Hoogly	Expert
11.	R.N. Bandhopadhaya, OSD	Directorate of Industrial Training-Govt. of West Bengal, Kolkata	Member
12.	Shri Alok Sharma, Chief General Manager	Indraprastha Gas Limited, New Delhi	Expert
13.	Shri Santokh Singh, Ex-Chief Fire Officer	Delhi Fire Services, New Delhi	Expert
14.	Capt. Krishan Kumar, Chairman	Delhi Institute of Fire Engineering, New Delhi-77	Expert

15.	Shri Praveen Choudhari, Emergency Response Officer	Dolphin Energy Ltd., Quatar	Expert
16.	Lt. Col. RC Shukla, Principal	Delhi Institute of Fire Engineering, New Delhi-77	Expert
17.	Shri P S Bhadana, Dy. Director	-do-	Expert
18.	Shri B L Chauhan, Senior Instructor	-do-	Expert
19.	Bhagwati Prasad Ojha, HSE Engineer	-do-	Expert
20.	Praveen Kumar Garg, Sr. Manager HSE	Ouippo Oil & Gas Infrastructure Ltd., Gurgaon, Haryana	Expert
21.	Devki Nandan, HSE Expert	Indraprastha Ltd.	Expert
22.	Sanjay Kumar, JDT/HOO	CSTARI, Kolkata	Member
23.	A.K. Mandal, ADT	-Do-	Member
24.	M.K. Batabyal, TO	-Do-	Member

CONTENTS

1. COURSE INFORMATION

During the one-year duration of "Fire Technology and Industrial Safety Management" trade a candidate is trained on professional skill, professional knowledge and Employability skill. In addition to this a candidate is entrusted to undertake project work, extracurricular activities and on job training to build up confidence. The broad components covered related to the trade are categorized in two semester of six months duration each. The semester wise course coverage is categorized as below:-

1st Semester – In the first semester trainee learns about the following:-

- Chemistry of Combustion- Triangle of fire, Fire tetrahedron, classification of fire, fire behavior, stages of fire, method of fire extinguishment and some important definitions like, flash point, fire point- ignition temperature, Auto-ignition temperature, flammability Range etc.
- Discipline: - introduction, importance of discipline, General principles of discipline, essentials for discipline and outward signs.
- Fire Extinguishers; - Types of fire extinguishers, method of operation and care & maintenance.
- Hose & hose fittings: types of hose-suction hose, delivery hose, and hose reel hoes, decay and prevention method of hosed, care & maintenance. Marking & repairing of hose, standard test of suction hose, types & construction of suction hose. Types of hose fittings and its use. Branches & nozzles, adapters, breaching, couplings, hose ramps, collecting heads and other miscellaneous tools and equipment.
- Hydrant & Fittings: - types of water supply, water distribution system, types of hydrants, hydrant gears, and equipment marking, testing care & maintenance & Operation.
- Pump & Primers:- classification of pump, why centrifugal pump is suitable for firefighting- types of primers, testing , fault finding, care and maintenance and standard test.
- Foam & Foam Making equipment: - water as an extinguishant -its merits and demerits, introduction to all types of foam concentrations, 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. Foam compatibility with Dry chemical powder.
- Extension Ladder: - types of ladders, construction features of conventional ladders, operational use, elementary knowledge of TTL. & snorkel.
- Breathing Apparatus set:-introduction of types of BA Sets in use, working principles and care and maintenance.

- Anatomy of Fire: Definition of combustion, elements of combustion, production of combustion, heat of reaction an calorific value.
- Basic Physics:- Definition of matter and energy, physical properties of matter like density, vapour density, melting & boiling point latent heat, effects of density on behaviour of gases, basics of oxidizing and reducing agents Acids, Classification of flammable liquids, dust & explosion, liquid and gas fire, LPG.
- Small & Special gears:- Function & Construction of small gears, function & construction of -breaking in and cutting tools, Pulley blocks, function & construction-Lighting and rescue tools, operation of hydraulically operated, diesel operated and electrically operated tools, care & maintenance.
- Hydraulics
- Electricity
- First Aid & Resuscitation,
- Hazards & Risk
- Hydrocarbon & industrial fires & fire prevention.
- Accident Prevention
- Safety Concept
- Factory Act- 1948
- Health
- Safety
- Welfare
- Construction industry
- Lighting ventilation & work related stress).

2nd Semester – In the second semester trainee learns about the following:-

- Fixed firefighting equipment
- Fire Detection & suppression systems
- Rescue Procedures
- Ropes & Lines
- Rural Fire
- Water Relay
- Salvage
- Practical fireman ship
- Ventilation
- Watch room procedure & mobilizing
- Disaster management
- Prevention, Public education and Pre-incident planning

- Personal Protective Equipment
- Means of Escape
- Aircraft Fire and Rescue
- Ship & Dock Fires
- Building Construction
- Occupational hazards & dangerous chemicals
- Working at height, confined space
- Material handling
- Housekeeping and waste disposal
- Hazardous chemicals
- Safety in Engineering industries.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

'Fire Technology and Industrial Safety Management' trade under CTS is one of the popular courses delivered nationwide through network of ITIs. The course is of one year (02 semester) duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) impart professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Trade Certificate (NTC) by NCVT having worldwide recognition.

Candidates need broadly to demonstrate that they are able to:

- Read and interpret technical parameters/ documents, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge & employability skills while performing jobs.
- Document the technical parameters related to the task undertaken.

2.2 CAREER PROGRESSION PATHWAYS

- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year (02 semesters): -

S No.	Course Element	Notional Training Hours
1.	Professional Skill (Trade Practical)	1290
2.	Professional Knowledge (Trade Theory)	258
3.	Employability Skills	110
4.	Extracurricular activities	62
5.	Project work	120
6.	Revision & Examination	240
	Total	**2080**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of the course and at the end of the training program as notified by the Government of India (GoI) from time to time. The employability skills will be tested in the first two semesters itself.

a) The **Internal Assessment** during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NTC will be conducted by NCVT at the end of each semester as per the guideline of Government of India. The pattern and marking structure is being notified by Govt. of India from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The 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 REGULATION

The minimum pass percentage for practical is 60% & minimum pass percentage of theory subjects is 40%. For the purposes of determining the overall result, 50% weightage is applied to the result of each semester examination.

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. Due consideration should 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 the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester 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 produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • Below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% tolerance dimension achieved while

regard for safety procedures and practices	undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% tolerance dimension achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

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) 3119.1000- Fire Fighters
(ii) 5411.9900- Fire Inspector

4. GENERAL INFORMATION

Name of the Trade	**FIRE TECHNOLOGY AND INDUSTRIAL SAFETY MANAGEMENT**
NCO - 2015	3119.1000, 5411.9900
NSQF Level	Level 4
Duration of Craftsmen Training	1 Year (2 Semesters)
Entry Qualification	**a.** Passed class 10th class Examination under 10+2 system of Education or its equivalent. **b. The minimum physical requirements are** i. Height - 165 cm ii. Weight - 52 kg iii. Chest - Normal 81 cm - Expanded 85 cm iv. A registered MBBS doctor must certify that the candidate is medically fit to undertake the course
Unit Strength (No. of Student)	20 (Max. supernumeraries seats: 6)
Space Norms	1000 Sq. m (for practical Training area)
Power Norms	2 KW
Instructors Qualification for:	
(i) Fire Technology and Industrial Safety Management Trade	Degree in Fire & Safety Engineering/ Fire Science with one year experience in the relevant field. **OR** Advanced Post Graduate Diploma in Industrial Safety Engineering/ Fire and Industrial Safety Engineering / Health, Safety & Environment with two year experience in the relevant filed. **OR** Defence / Para military 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 one year post qualification experience in the relevant field. **OR** NTC/NAC passed in the trade of Fire Technology and Industrial Safety Management with 3 years post qualification experience in the relevant field.

	Desirable: *Preference will be given to a candidate with Craft Instructor Certificate (CIC).* ***Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.***
(ii) Employability Skill	MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGT institutes. **AND** Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above. **OR** **Existing Social Studies Instructors duly trained in Employability Skills from DGT institutes.**
List of Tools and Equipment	As per Annexure – I

Distribution of training on Hourly basis: (Indicative only)

Total Hrs /week	Trade Practical	Trade Theory	Physical Training	Employability Skills	Extra-curricular Activity
40 Hours	25 Hours	6 Hours	5 Hours	2 Hours	2 Hours

5. NSQF LEVEL COMPLIANCE

NSQF level for **'Fire Technology and Industrial Safety Management'** trade under CTS: **Level 4**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge
c. professional skill
d. core skill
e. Responsibility

The Broad Learning outcome of **'Fire Technology and Industrial Safety Management'** trade under CTS mostly matches with the Level descriptor at Level- 4.

The NSQF level-4 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 4	Work in familiar, predictable, routine, situation of clear choice	Factual knowledge of field of knowledge or study	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	Language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning.

6. LEARNING/ ASSESSABLE OUTCOME

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

6.1 GENERIC LEARNING OUTCOME

1. Apply safe working practices.
2. Comply environment regulation and housekeeping.
3. Interpret & use company and technical communication
4. Understand and apply the concept in productivity, quality tools, and labour welfare legislation in day to day work to improve productivity & quality.
5. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
6. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
7. Utilize basic computer applications and internet to take benefit of IT developments in the industry.

6.2 SPECIFIC LEARNING OUTCOME

SEMESTER-I

8. Select suitable chemicals (industrial, inflammable liquid) usable on the workplace.
9. Identify, select & execute the application of different types of extinguisher, hose & hose fittings.
10. Select and prepare the hydrant and pump system for proper application.
11. Plan and execute the concept of hydraulics in work place.
12. Select and categorize electrical hazard and risk & its mitigation.
13. Methods of using ladder in practical field.
14. Select the BA set and its application in appropriate place.
15. Identify and use of small and special gears.
16. Plan and execute elementary treatment at any incidental spot.
17. Utilization of knots and hitches in different special job and fire.

18. Plan and execute to up lift various gears with proper techniques. Introduction to Hazard and Risk evaluation & the proper method of rescue & F.F.
19. Analyze the concept of accident caused and prevention, accident investigation, analysis and safety management.
20. Select & apply provisions related to safety, health and welfare in respect of Factory Act, 1948.
21. Assessment of available resources and their proper use.
22. Interpret appropriate techniques of CPR.
23. Identify the importance of lighting, ventilation, work related stress and its measurement.

SEMESTER-II

24. Plan and execute fixed fire fighting installations for their effective utilization.
25. Select and use PPE, its care and maintenance.
26. Select Automatic Fire Detection cum Alarm System to plan their effective utilization.
27. Plan and execute fire station administration.
28. Identify communication system in different organization and their scope of use.
29. Accustomed with different fire situations and fire fighting using extinguishers.
30. Plan and execute disaster response practices, IRS/JRT and salvage technique.
31. Select and apply correct rescue method.
32. Categorize building construction that can ensure fire and life safety.
33. Plan and execute fire protection measures based on construction and occupancy.
34. Plan and survey Airport & Aircraft, port and ship for rescue system and fire fighting system on it.
35. Identify occupational hazards associated with different dangerous chemicals, dust, gases, mist, vapours etc. to plan and execute rescue operations in these cases.
36. Observed safety precautions while working at height, confined place and work permit system.
37. Identify the characteristics of various fire suppression agents including water. Understand safety in manual and mechanical handling of materials.
38. Analysis hazard evaluation and risk analysis exercise.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
1. Apply safe working practices	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to policy.
	1.2 Recognize and report all unsafe situations according to policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to work policy and procedures.
	1.4 Identify, handle and store / dispose-off dangerous goods and substances according to policy and procedures following safety regulations and requirements.
	1.5 Identify and observe policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to accident/injury procedures.
	1.8 Identify and observe evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
2. Comply environment regulation and housekeeping	2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.
	2.2 Deploy environmental protection legislation & regulations.
	2.3 Take opportunities to use energy and materials in an environmentally friendly manner.
	2.4 Avoid waste and dispose waste as per procedure.
	2.5 Recognize different components of 5S and apply the same in the working environment.
3. Interpret & use company and technical	3.1 Obtain sources of information and recognize information.
	3.2 Use and draw up technical drawings and documents.
	3.3 Use documents and technical regulations and occupationally

communication.	related provisions.
	3.4 Conduct appropriate and target oriented discussions with higher authority and within the team.
	3.5 Present facts and circumstances, possible solutions &use English special terminology.
	3.6 Resolve disputes within the team
	3.7 Conduct written communication.
4. Understand and apply the concept in productivity, quality tools, and labour welfare legislation in day to day work to improve productivity & quality.	4.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.
	4.2 Applications will be assessed during execution of assessable outcome.
5. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	5.1 Semester examination to test knowledge on energy conservation, global warming and pollution.
	5.2 Their applications will be assessed during execution of assessable outcome.
6. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	6.1 Semester examination to test knowledge on personnel finance, entrepreneurship.
	6.2 Their applications will be assessed during execution of assessable outcome.
7. Utilize basic computer applications and internet to take benefit of IT developments in the industry.	7.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services.
	7.2 Their applications will be assessed during execution of assessable outcome.

SPECIFIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
SEMESTER-I	
8. Identify and Select suitable chemicals (industrial, inflammable liquid) usable on the workplace.	8.1 Identify various types of acids in the trade.
	8.2 Identify the type of acids and their uses in the place.
	8.3 Select the suitable acids on the workplace.
	8.4 Analyzed the effect of acids on the suitable jobs
9. Identify, select & execute the application of different types of extinguisher, hose & hose fittings.	9.1 Identify of fire and types of extinguishers.
	9.2 Install the wall fitting and test it.
	9.3 Technique of fire extinction smoothing cooling and Starvation.
	9.4 Observe the safety/precaution during the operation Extinguisher.
	9.5 identify type of suction and delivery hoses.
	9.6 Causes of hose decay & its prevention
	9.7 Use of percolating & non-percolating hose
	9.8 Identify of hose reel, causes of decay and its care & maintenance.
	9.9 Importance of hose reel hose in first aid fire fighting in buildings and industries.
	9.10 Plan of work in compliance with standard tests of delivery hoses.
	9.11 Standard test of Suction hose
	9.12 Identify the different groups of hose fitting.
	9.13 Measure of deep lift suction fittings.
	9.14 Type of Breechings and its uses.
	9.15 Identify the hose ramps, care and maintenance of hose fittings.
10. Select and prepare the hydrant and pump system for proper application.	10.1 Knowledge of Hydrant and Water supplies,
	10.2 Identify the hydrant gear and equipment.
	10.3 Observe the making of hydrants and testing.
	10.4 Prepare the care and maintenance of operation.
	10.5 Identify the common type in use.
	10.6 Methods of priming.
	10.7 Select and testing fault finding.
	10.8 Working of centrifugal pump.
	10.9 Observe care and maintenance of pump.

11. Plan and execute the working of hydraulics system in work place.	11.1 Check the hydraulic system
	11.2 Check the pressure
	11.3 Calculate the water capacity of tank
	11.4 Check the working of flow meter
12. Select and categorize electrical hazard and risk & its mitigation.	12.1 Identify common causes of electrical fire
	12.2 Select remedial measures
	12.3 Identify electrical hazards
	12.4 Apply PPE
	12.5 Follow the electrical document for safety.
13. Methods of using ladder in practical field.	13.1 Select the appropriate ladder.
	13.2 Pitching of ladder.
	13.3 Pitching of ladder.
	13.4 Climbing the ladder.
	13.5 Use leg Lock.
14. Select the BA set and its application in appropriate place.	14.1 Identify and operate B. A. set and relevant drill
	14.2 Donning & doffing of SCBA.
	14.3 SCBA Operation & Emergency Procedures.
	14.4 Inspection and Maintenance of SCBA.
15. Identify and use of small and special gears.	15.1 Identify, select and operate different small and special gears.
	15.2 Drill with different small and special gears.
16. Plan and execute elementary treatment at any incidental spot.	16.1 Donning, running and Rescue of casualty through tunnel.
	16.2 Apply Sylvester's Method, Holgar Nielsen Method, Rocking Stretcher Method, Emerson Method
	16.3 Perform Mouth to Mouth Respiration.
17. Utilization of knots and hitches in different special job and fire.	17.1 Practical use of different knots and hitches in rescue & fire fighting
	17.2 Testing of different type of lines.
	17.3 Care and maintenance.
18. Plan and execute to up lift various gears with proper techniques. Introduction to Hazard and Risk evaluation & the proper method of rescue & F.F.	18.1 Causes, Identification, Evaluation & Control of hazard and risk.
	18.2 Hauling up gears and combined drill

19. Analyze the concept of accident caused and prevention, accident investigation, analysis and safety management.	19.1 Identify different industrial accidents.
	19.2 Prepare accident reports.
	19.3 Identify Methods Adopted for Reducing Accidents.
	19.4 Investigation and analysis of Accidents.
	19.5 Safety Slogans, Safety Precautions adopted in the Plant.
	19.6 Apply Safety Management, Safety Policy, Safety Committee, , Responsibility of Management, Safety Officers Duties & Responsibilities, Safety Targets, Objectives, Standards, Practices and Performances in work place.
20. Select & apply provisions related to safety, health and welfare in respect of Factory Act, 1948.	20.1 Select & apply provisions related to safety.
	20.2 Observation of provisions of the legislation applicable to different factories.
21. Assessment of available resources and their proper use.	21.1 Identify and select various types of Fire Fighting Small and Special rescue gear at Fire Service Station.
	21.2 Practical Use of equipments like cutting tools
	21.3 Lifting tools Maintenance of tools.
22. Interpret appropriate techniques of CPR.	22.1 Identify techniques of CPR.
	22.2 Apply appropriate techniques of CPR.
	22.3 Identify and apply Methods for rescue without equipment
23. Identify the importance of lighting, ventilation, work related stress and its measurement.	23.1 Measurement of illumination by Photo meter.
	23.2 Measurement of number of air changes in a room
	23.3 Measurement of vibration of machine and equipments.
SEMESTER-II	
24. Plan and execute fixed fire fighting installations for their effective utilization.	24.1 Identify Sprinkler System and their care and maintenance and operational Procedure
	24.2 Plan and execute fixed fire fighting installation.
	24.3 Utilize fixed fire fighting
	24.4 Identify Elementary requirements of Drenchers, Rising Mains, Hose Reels And Down-comer, Fire pump control panel.
	24.5 Install Fixed Foam.
25. Select and use PPE, its care and maintenance.	25.1 Identify various Personal Protective Equipments.
	25.2 Select and use Respiratory and Non-respiratory Personal

		Protective Equipment, their Care & Maintenance.
	25.3	Observe standard and regulation related to PPE.
26. Select Automatic Fire Detection cum Alarm System to plan their effective utilization.	26.1	Identify various types of detectors.
	26.2	Select Automatic Fire Detection cum Alarm System as per need.
	26.3	Plan Automatic Fire Detection cum Alarm Systems effective utilization.
27. Plan and execute fire station administration.	27.1	Identify various important duties of a fire station.
	27.2	Drill with ladder and water tender
	27.3	Foam Drill with FBI0X single delivery.
	27.4	Foam Drill with FB5X single delivery.
	27.5	Wet Drill with double delivery.
	27.6	Dry Drill with double delivery.
28. Identify communication system in different organization and their scope of use.	28.1	Identify different communication required at various fire service departments.
	28.2	Identify, select and apply Various lines, communication Equipment in Fire Service.
	28.3	Select & use Method of receiving report of emergencies.
	28.4	Identify and use Radio Communication and VHF.
	28.5	Practices Writing of Occurrence Book, Duty Card/ Register, Log Book, Hose Book, Stock Register and their maintenance.
	28.6	Apply fire affected room searching techniques.
29. Accustomed with different fire situations and fire fighting using extinguishers.	29.1	Perform Live fire extinction using all kind of extinguisher.
	29.2	Identify Fire Hazards in rural areas and cause of fire.
	29.3	Identify, select and apply Method of Fire-fighting in rural areas.
	29.4	Identify Difficulties in dealing with Rural fires.
30. Plan and execute disaster response practices, IRS/JRT and salvage technique.	30.1	Identify Natural and Man-made Disaster.
	30.2	Use various agencies, first responders, control of situation.
	30.3	Identify different types of disasters.
	30.4	Simulated Practices to control life and properties damages from natural disaster.
	30.5	Perform Water relay drill (All types).
	30.6	Identify and select Equipment for Salvage & working at Fires
	30.7	Use salvage sheets & equipments and there care & maintenance.
	30.8	Identify, select and apply Methods of entry into building.
	30.9	Identify, select and apply Different searching methods to locate & rescue a trapped causality.

31. Select and apply correct rescue method.	31.1 Observe safety Precautions when working in smoke laden buildings.
	31.2 Identify, select and apply various Emergency methods of rescue.
	31.3 Identify hazards associated with various rescue operations.
	31.4 Select & apply various rescue equipments.
32. Categorize building construction that can ensure fire and life safety.	32.1 Familiarization at construction site.
	32.2 Identify building materials.
	32.3 Plan escapes routine.
	32.4 Practical training about Care and maintenance of sprinklers.
	32.5 Use of Automatic fire alarm system, fire exit drill
33. Plan and execute fire protection measures based on construction and occupancy.	33.1 Classification of building in the country
	33.2 Identify Building materials and their behavior under fire conditions
	33.3 Identify and apply various types of occupancies and fire fighting techniques.
	33.4 Identify Important fire escapes with respect to there positioning.
34. Plan and survey Airport & Aircraft, port and ship for rescue system and fire fighting system on it.	34.1 Identify Different types of Air-crafts, Air craft fire fighting and rescue procedures.
	34.2 Identify types of emergencies and apply method of dealing with each emergency.
	34.3 Recognize ship fire protection and fire fighting & rescue from ship.
35. Identify occupational hazards associated with different dangerous chemicals, dust, gases, mist, vapours etc. to plan and execute rescue operations in these cases.	35.1 Identify HVAC system.
	35.2 Identify various equipments used in rescue of causality.
	35.3 Ladder Drill with Fireman Lift.
	35.4 Sewer Rescue drill.
	35.5 Stretcher drill.
	35.6 Identify Occupational Hazards & Dangerous Chemicals.
	35.7 Identify Dangerous Properties of Chemicals, Dust, Gases, Fumes, Mist, Vapours, Smoke and Aerosols.
36. Observed safety precautions while working at height, confined place and work permit system.	36.1 Perform High elevation drill.
	36.2 Perform Confined space rescue.
	36.3 Observe safety precaution related to Scaffolds, Ladders, and Work at height including Roof Work.

37. Identify the characteristics of various fire suppression agents including water. Understand safety in manual and mechanical handling of materials.	37.1 Identify the characteristics of various fire suppression agents including water.
	37.2 Perform Mechanical and Manual Material Handling.
	37.3 Observe Safety related to Mechanical and Manual Material Handling, Lifting Appliances, Transport / Earthmoving& Material Handling Equipments.
38. Analysis hazard evaluation and risk analysis exercise.	38.1 Perform exercise on Hazard evaluation and risk.
	38.2 Use safety belt, helmets, gloves and goggles.
	38.3 Identify Transportation and handling of dangerous chemicals and explosives.

8. SYLLABUS

SYLLABUS - FIRE TECHNOLOGY & INDUSTRIAL SAFETY MANAGEMENT			
FIRST SEMESTER – 06 Months			
Week No.	**Ref. Learning outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
1	Apply safe working practices.	1. Familiarization with the Institute, Documentation of Student, Issuance of Dress, Books, Hostel Accommodation (If required) and Store. (06 hrs) 2. Importance of trade training, Equipments used in the trade, types of work done by the trainees in the trade. (07 hrs.) 3. Introduction to safety equipments and their uses. Introduction of first aid, Road safety, operation of Electrical mains. (05 hrs) 4. Knowledge of General Safety, Occupational health and hygiene. (07 hrs.)	**Discipline:** Introduction, Importance of Discipline, General Principles of discipline, essentials for discipline and outward Signs. Meaning & Definitions of Discipline
2	Identify and Select suitable chemicals (industrial, inflammable liquid) usable on the workplace.	5. Demonstration of Various acids. (20hrs) 6. Demonstration of different water reactive substances. (05 hrs)	**Basic 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,, Basics of 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.
3	-do-	7. Organic flammable liquids and commonly used industrial chemicals. (20 hrs) 8. Alkalis & Gases. (05 hrs)	**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(chemical, mechanical. Electrical & Nuclear), Classification of fire and methods of fire extinguishment, Oxygen and its effects on combustion, Mode of heat transfer(Conduction, Convection & Radiation),
4-5	Identify, select & Execute the application of different types of extinguisher, hose & hose fittings.	9. Identification and selection according to suitability of following extinguishers: (i) water type (ii) foam type (iii) powder type (iv) gas type (v) Trolley mounted (25 hrs) 10. Hose drill (i) hose pick up (ii) hose laying (iii) hose joining (iv) hose replacement at different position (25 hrs)	**Classification of Fire & Extinguishers** - Classification of Fire and types of extinguishers, maintenance, method of operation. Techniques of fire extinction-Smothering cooling and starvation. 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, Care and Maintenance, Marking of Hose, Repair of hose, Standard tests of Delivery Hoses, Definition and different groups of Hose Fittings. Types and Construction of Suction; Monitors, Water-cum-

			foam Monitor, Nozzles & branch holders, collecting head and suction hose, Fittings; frost valve, Deep lift suction fittings, Breechings, Adaptors and Blank cap suction reduction piece, Hose Ramps, Care & Maintenance of Hose Fittings. Definition of fire stream, solid tip or stream, special purpose.
6	-do-	11. Familiarization of foam making branch i. Use of FB2X, FB5X and FB10X, ii. Care and maintenance of foam equipments, (12 hrs) 12. Wet drill using foam and foam making equipments. (13 hrs)	**Foam & Foam Making Equipment:** Water as an extinguish ant- its merits, demerits and modification. Introduction to all 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. Methods of foam applications
7	Select and prepare the hydrant and pump system for proper application.	13. Familiarization and demonstration of Hydrant and its associated equipments. i. Hydrant Drill I : Opening of single line of three hoses.(03 hrs) ii. Hydrant Drill. II :Change of burst hose.(03 hrs) iii. Hydrant Drill. III: Increase one length hose. (03 hrs) iv. Hydrant Drill. IV: Decrease one length hose. (03 hrs) v. Hydrant Drill. V: Use of	**Hydrant & Fittings:** Introduction of Hydrant and Water supplies, Hydrant Gears and Equipment, Marking, Testing, cares maintenance Operation. **Source of water supply, Water distribution system, Rural water supply, Determining Static, Residual and Flow Pressure**

		the collecting breaching. (03 hrs) vi. Hydrant Drill.VI: Disconnect collecting Breaching. (04 hrs) vii. Hydrant Drill.VII: Use dividing breaching (04 hrs) viii. Hydrant Drill. VIII: Disconnect dividing Beaching. (02 hrs)	
8	-do-	14. 4 men pump drill. (10 hrs) 15. 6 men pump drill (dry and wet both) (15 hrs)	**Pump & Pump Operation** : Classification of common types in use, Methods of Priming, Testing and Fault-finding, care and Maintenance and standard Test, Introduction of centrifugal pump, care and maintenance. Advantages and disadvantages of centrifugal pump, Importance of Atmospheric pressure Cooling systems
9	Plan and execute the working of hydraulics system in work place.	16. Water volume calculation of different water reservoirs.(06 hrs) 17. Practical use of flow meter and different pressure gauges. (08 hrs) 18. Fire ground calculation and theoretical calculation.(11 hrs)	**Hydraulics:** Pressure and Head, pressure and Flow, mensuration, Nozzle's discharge, calculation of water capacity of tank, 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
10	Select and categorize electrical hazard and risk & its mitigation.	19. Visit to thermal power plant and electrical sub-station. (25 hrs)	**Electricity**: Fundamentals of electricity, Generation and Distribution, Common causes of electrical fire and its remedial measures, electrical hazards including static electricity and protective measures and fire-fighting procedure, Elementary knowledge of Fire Protection and fire-fighting in different premises,

			electrocution. Electrical safety in non-industrial installation, Industrial Installation and mines. Hazardous area classification and use of electrical equipment in hazardous area, Case studies etc.
11	Methods of using ladder in practical field.	20. Demonstration and familiarization of Extension Ladder i. Introduction of parts of extension ladder (02 hrs) ii. Rescue Operation from buildings. (03 hrs) iii. Drill I: Pitching of ladder (04 hrs) iv. Drill II: Climbing the ladder (04 hrs) v. Drill III: Use leg Lock (04 hrs) vi. Drill IV: Ladder Drill with Fireman Lift (04 hrs) vii. Drill V: L2 Drill (04hrs)	**Ladders:** Introduction, Types of Ladders, Construction features of conventional (terminology and parts) Ladders, Operational use, Elementary Knowledge of T.T.L. & Snorkel visit at regular fire service having these appliances. (As per Bureau of I.S.). Method of ladder pitching and climbing, use of Arm-Hold and Leg-Lock
12	Select the BA set and its application in appropriate place.	21. Familiarization and demonstration of B. A. set and relevant drill. (05 hrs) 22. Donning & doffing of SCBA. (05 hrs) 23. SCBA Operation & Emergency Procedures. (10 hrs) 24. Inspection and Maintenance of SCBA. (05 hrs)	**Water Tender and Special Appliance** : Introduction and description of Rescue/ Emergency Tender, C02 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.)
13	Identify and use of small and special gears.	25. Familiarization and demonstration of different small and special gears. (13 hrs) 26. Drill with different small and special gears. (12 hrs)	**Small & Special gears:** Function & Construction-G.R. Tools; Function & Construction-Breaking in and Cutting tools, Pulley blocks; Function & Construction-Lighting Function & Construction-Lifting & Rescue tools; Operation of hydraulically operated, diesel operated and electrically operated tools,. Care

			& maintenance of equipment.
14	Plan and execute elementary treatment at any incidental spot.	27. Drill I: Donning, running and Rescue of casualty through tunnel. i. Familiarization and study First Aid Box (02 hrs) ii. Stretcher Drill (02 hrs) iii. Fireman Lift Drill (02 hrs) iv. Use Bandage (02 hrs) v. Standard drills on Ambulance (05 hrs) 28. Rescue drill (02 hrs) 29. Sylvester's Method (02 hrs) 30. Holgar Nielsen Method (02 hrs) 31. Eve Rocking Stretcher Method (02 hrs) 32. Emerson Method (02 hrs) 33. Mouth to Mouth Respiration. (02 hrs)	**First Aid:** Definition of First-Aid, Qualities of first aider, Shock-Signs and Symptoms, Asphyxia-Signs and Symptoms, Wounds and Hemorrhage -Classification of injuries, Signs, Symptoms and management, Burns, Scalds and frost Bits signs and symptoms and management. Causes and types of fractures Sprain & Dislocation-Signs and symptoms, Snake Bite-Treatment.
15	Utilization of knots and hitches in different special job and fire.	34. Practical use of different knots and hitches in rescue & fire fighting. (06 hrs) 35. Testing of different type of lines. (07 hrs) 36. Care and maintenance. (12 hrs)	Ropes and Lines : Construction & Fibers used for rope(Rope materials-Natural and synthetic & their characteristics), types and uses 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)
16	Plan and execute to up lift various gears with proper techniques. Introduction to Hazard and Risk evaluation & the proper method of rescue & F.F.	37. Hauling up gears and combined drill. (25 hrs)	**Hazard and Risk:** Causes, Identification, Evaluation & Control. HAZOP+HIRA Sources for Information on Hazard Evaluation. Risk and Risk Analysis confined space.
17	Analyze the concept of accident caused and prevention,	38. Site visit for post analysis of different incidents. (25 hrs)	Accident : Industrial Accidents (Definition), Classification of Accidents, Need for the Analysis of Accidents(Objective of

	accident investigation, analysis and safety management.		accident prevention), Accidents Reports, Methods Adopted for Reducing Accidents, Investigation and analysis of Accidents, Safety Slogans, Safety Precautions adopted in the Plant.(Causes and cost of Accident/ incident, Accident prevention technique Safety Concept : Introduction to Safety Management, Safety Policy, Safety Committee, , Responsibility of Management, Safety Officers Duties & Responsibilities, Safety Targets, Objectives, Standards, Practices and Performances.
18-19	Select & apply provisions related to safety, health and welfare in respect of Factory Act, 1948.	39. Visit to factories. (25 hrs) 40. Observation of provisions of the legislation applicable to different factories. (25 hrs)	Safety, Health and environment legislation. 1. FACTORIES ACT 1948 (Amended) & relevant statutory rules :- Health - Cleanness, Disposal of Waste , Ventilation and Temperatures, Dust & Fumes, Drinking Water, Lighting, Latrines & urinals. **Safety** - Fencing of machineries, Work on or near machinery in motion, Hoists and lifts, Pressure plants, Floors, Stairs and means of escape, Protection against fumes & gases, Safety offers. **Welfare** - Washing facilities in Dry clothing, Storing, Sitting, First Aid Appliances, Canteen, Shelters for rest & lunch, Crèches, Welfare officers, Right & Obligation of workers. 2. Workmen compensation act and rules.

			3. ESI Act and rules. 4. Contract labour act. 5. Indian boiler act. 6. Static and mobile (unfired) pressure vessel rules. 7. BOCW act and rules. 8. Introduction to Fire & safety Audit.
20	Assessment of available resources and their proper use.	41. Familiarization with various types of Fire Fighting Small and Special rescue gear at Fire Service Station. (08 hrs) 42. Practical Use of equipments like cutting tools (08 hrs) 43. Lifting tools Maintenance of tools. (09 hrs)	**Construction Industry:** General Safety Provisions related to construction industry, Safety in the use of Construction Machinery, Safe Access / Egress Importance of Good House Keeping.
21	Interpret appropriate techniques of CPR.	44. **Techniques of CPR** i) One Sitter (03 hrs) ii) Two Sitter (03 hrs) iii) Three Sitter (03 hrs) iv) Four Sitter (03 hrs) v) Fireman lift (03 hrs) vi) CPR drill (03 hrs) vii) Choking (03 hrs) viii) Shaffer's Method (04 hrs) Above said methods sl. No I to viii are rescue procedures. Methods for rescue without equipment	Resuscitation Resuscitation means' Artificial Respiration and following methods are being used. i. Holger Neilson ii. Silvestor iii. Shepherd iv. Mouth to mouth and v. Nose to mouth Cardio Pulmonary Resuscitation method is different.
22	Identify the importance of lighting, ventilation, work related stress and its measurement.	44. Measurement of illumination by Photo meter. (07 hrs) 45. Measurement of number of air changes in a room by velometer. (07 hrs) 46. Measurement of sound level. (05 hrs) 47. Measurement of vibration of machine and equipments. (06 hrs)	**Lighting, Ventilation & Work related stress:** Introduction to Lighting, Ventilation, Heat Stress, Cold Stress, Noise, vibration and color codes. Difference between Flux and Lux (lumen), Measurement and Management of work related stress, Heat stress, and cold stress.
23	Project Work: Broad Areas:		

	a) Identification and selection according to suitability of following extinguishers (i) Water type (ii) Foam type (iii) Powder type (iv) Gas type (v) Trolley mounted b) Wet drill using foam and foam making equipments. c) Mouth to mouth respiration.
24-25	Revision
26	Examination

Note: -

1. *Physical training and squad drill at the starting of everyday shall be incorporated for one hour in each day to develop physical fitness, mental alertness and discipline among the trainees.*
2. *Guest faculty (Expert in particular field like air craft fire, Ship Fire, First Aid, Fire station/ service related etc) may be provided.*
3. *Expert may be engaged in examination.*
4. *Some of the sample project works (indicative only) are given against each semester.*
5. *Instructor may design their own project and also inputs from local industry may be taken for designing such new project.*
6. *The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, work to be assigned in a group (Group of at least 4 trainees). The group should demonstrate Planning, Execution, Contribution and Application of Learning. They need to submit Project report.*
7. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*

SYLLABUS - FIRE TECHNOLOGY & INDUSTRIAL SAFETY MANAGEMENT			
SECOND SEMESTER – 06 Month			
Week No.	**Ref. Learning outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
27	Plan and execute fixed fire fighting installations for their effective utilization.	48. Familiarization and demonstration of fixed fire fighting installations. (25 hrs)	Fixed Fire Fighting Installations: Introduction of Sprinkler System and their care and maintenance and operational Procedure, Elementary requirements of Drenchers, Rising Mains, Hose Reels And Down-comer, Fire pump control panel. Types of F F F Installations- water based, non water based. Fixed Foam installation, Foam poures, foam makers, HVWS, MVWS ,Total flooding system CO2, FM-200 etc.
28	Select and use PPE, its care and maintenance.	49. Familiarization and demonstration of PPE and other life saving equipments. (25 hrs)	Personal Protective Equipment : Need for Personal Protection Equipment, Selection, Use, Care & Maintenance Respiratory and Non-respiratory Personal Protective Equipment, Head Protection, Ear Protection, Face and Eye Protection, Hand Protection, Foot Protection, Body Protection. Standards & regulations
29	Select Automatic Fire Detection cum Alarm System to plan their effective utilization.	50. Familiarization and demonstration of different Automatic Fire Detection cum Alarm System. (25 hrs)	**Automatic Fire Detection cum Alarm System:** Introduction of Types of Detectors- Smoke, Heat, Flame/Gas Detectors, Operating principles, F.D.A. Panel M.C.P. & P.A. with talk back.
30	Plan and execute fire station administration.	51. Water tender drill. Drill I: L-2 Drill with ladder and water tender (05 hrs) Drill II: Foam Drill with FBI0X single delivery. (05 hrs) Drill III: Foam Drill with FB5X	**Fire Service Administration** : Fire Service Organization, Executive duties of Officer-in-Charge of a Fire Station, Administrative duties of Officer-in-Charge of a station a) Writing of a report,

		single delivery. (05 hrs) Drill IV: Wet Drill with double delivery. (05 hrs) Drill V: Dry Drill with double delivery. (05 hrs)	b) Occurrence Book, 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, k) Station Discipline.
31	Identify communication system in different organization and their scope of use.	**Industrial/ Fire Service Station Visit** 52. Visit of modern control room and watch rooms of state fire service/ Industry. (25 hrs)	Watch Room Procedure & Mobilizing: Identification of communication requirement of Fire Service, Watch Room, Control Room, Equipment Station Ground, Turn-out area, Area of Topography, and Telephone Call area, Mobilizing boards and maps. The log & occurrence book, introduction to Various lines, communication Equipment in Fire Service, Introduction to Radio Communication and Use of VHF Sets. (Method of receiving report of emergencies,)
32	-do-	53. **Visit to Fire Service Station.** A. Familiarization to Fire Station Writing practices of i) Occurrence Book ii) Duty Card/ Register iii) Log Book iv) Hose Book v) Stock Register B. fire affected room searching techniques. C. SOP, SDP. (25 hrs)	Practical Fireman ship: Qualities of Fireman and his important duties at a Fire Station and Fire ground. Duties of fireman on the way to fire scene, on the fire ground, and after returning from the fire call.
33	Accustomed with different fire situations and fire fighting using extinguishers.	54. Live fire extinction using all kind of extinguisher. (25 hrs)	Rural Fire: Fire Hazards in rural areas and cause of fire, Hay stacks, Special appliance & equipment, Method of Fire-fighting in rural areas. Difficulties in dealing with Rural fires.

34-35	Plan and execute disaster response practices, IRS/JRT and salvage technique.	55. Simulated Practices to control life and properties damages from natural disaster. (12 hrs.) 56. Water relay drill (All types). (05 hrs) 57. Practical use of salvage sheets & equipments and there care & maintenance. (13 hrs) 58. Methods of entry into building, Different searching methods to locate & rescue a trapped causality. (10 hrs) 59. SOP, SDP (10 hrs)	**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 - Introduction, Equipment for Salvage and working at Fires. list of Salvage tools and equipment, Safety consideration at the time of salvage 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. Understanding disasters, classification, significance, causes and effects. Remedy for mitigation.
36	Select and apply correct rescue method.	60. Precautions to be observed when working in smoke laden buildings. (5 hrs.) 61. Emergency methods of rescue.(20 hrs)	Various Rescue techniques: Rescue technique from lift, Sewer, Collapsed building, motor vehicle accident, Well & river, Special equipment and training requirements for rescue operations. Hazards associated with Rescue operations, Search of Burning structure, Extrication from Motor vehicles, Machines, Specialized Rescue Situation and tools.
37	Categorize building construction that can ensure fire and life safety.	**Construction Site Visit** 62. Familiarization at construction site. (05 hrs) 63. Introduction and identification of building material. (05 hrs) 64. Planning of escape routine.	Means of Escape: Classification of escape routes with reference to N.B.C. Fire exit drill. What is fire exit?, places of relative safety, places of ultimate safety, Width of exits requirement and calculations.

		(05 hrs) 65. Familiarization and demonstration of fixed installation at visit to high rise building. (05 hrs) 66. Practical training about Care and maintenance of sprinklers. Use of Automatic fire alarm system, fire exit drill. (05 hrs)	
38	Plan and execute fire protection measures based on construction and occupancy.	67. Visit to buildings with different types of construction& occupancy. (25 hrs)	**Building Construction** : Introduction, highlighting importance of the subject, Classification of building in the country, Building materials and their behavior under fire conditions, signs of collapse of building, various types of occupancies and fire fighting techniques, Importance's of fire escapes with respect to there positioning, Reference to NBC part II fire construction and provisioning of fire fighting measures. Smoke management & HVAC .
39-40	-do-	68. Construction Site Visit i. Practices of good House Keeping (20hrs) ii. Study of egress and safe access. (20 hrs) iii. Hands on experience with Hand and power tools. (10 hrs)	Safety in Engineering Industries: Machine Operations & Guarding, Safety in the use of Machines, Safety precaution while using Hand Tools & Power Tools, Need for selection & Care of tools. Types of Guarding
41	Plan and survey Airport & Aircraft, port and ship for rescue system and fire fighting system on it.	69. Industrial Visit: airport, aircraft, helicopter etc. (25 hrs)	Aircraft Fire and Rescue : Some common terminology including 'Ejection Seats' etc, Preliminary about fire hazards in Air-Craft and action required for Rescue and fire-fighting, Resource of Fighting Fire in Air Ports. Different types of Air-crafts, Air craft fire fighting and rescue

			procedures, types of emergencies, and method of dealing with each emergency. Hagers- types, fire protection and fire fighting.
42	-do-	70. Visit to port Site and ships. (25 hrs)	Ship Fires: Elementary knowledge of ship fire protection and fire fighting & rescue from ship. Risk and fighting fires in ship, Types of emergencies, Dock Fires, Fire protection of jetti.
43	Identify occupational hazards associated with different dangerous chemicals, dust, gases, mist, vapours etc. to plan and execute rescue operations in these cases.	71. Familiarization HVAC system and demonstration of various equipments used in rescue of causality. (06 hrs) 72. Ladder Drill with Fireman Lift (8hrs.) 73. Sewer Rescue drill, (06 hrs) 74. Stretcher drill (05 hrs)	Occupational Hazards & Dangerous Chemicals. Introduction to Occupational Health Hazards & Dangerous 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.
44	Observed safety precautions while working at height, confined place and work permit system.	75. High elevation drill. (12 hrs) 76. Confined space rescue.(13 hrs)	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.
45	Identify the characteristics of various fire suppression agents including water. Understand safety in manual and mechanical handling of	77. Visit to industries to observe safety in material handling. (25 hrs)	Material Handling: Safety related to Mechanical and Manual Material Handling, Lifting Appliances, Transport / Earthmoving& Material Handling Equipments - Cranes, Forklift Truck, Hoists, and Conveyors.

	materials.		
46-47	Analysis hazard evaluation and risk analysis exercise.	78. Hazard evaluation and risk analysis exercise. (15 hrs) 79. Practical usages of safety belt, helmets, gloves and goggles. (10 hrs) 80. Visit to industrial unit and adoption of safety Practice. (10 hrs) 81. Visit to industrial unit to observe prevailing welfare measures and their condition. (15 hrs)	House Keeping and Waste Disposal: Introduction of Good House Keeping & Maintenance, Introduction of Disposal of Waste Material. Japanese concept of 5 "S". Hazardous Chemicals: Dangerous Chemicals and substances, Introduction to Transportation and handling of dangerous chemicals and explosives, Storage of hazardous chemicals, Fire Safety and fire fighting. Interpretation and use of MSDS. Chemical labeling.
48-49	**Project Work** **Broad Areas:** a) Water tender drill. (i) Drill I : L-2 Drill with ladder and water tender (ii) Drill II : Foam Drill with FBI0X single delivery (iii) Drill III: Foam Drill with FB5X single delivery. (iv) Drill IV: Wet Drill with double delivery. (v) Drill V: Dry Drill with double delivery. b) Precaution to be observe when working in smoke laden buildings. c) Familiarization HVAC system and demonstration of various equipment used in rescue of causality.		
50-51	**Revision**		
52	**Examination**		

Note: -

8. *Physical training and squad drill at the starting of everyday shall be incorporated for one hour in each day to develop physical fitness, mental alertness and discipline among the trainees.*
9. *Guest faculty (Expert in particular field like air craft fire, Ship Fire, First Aid, Fire station/ service related etc) may be provided.*
10. *Expert may be engaged in examination.*

11. *Some of the sample project works (indicative only) are given against each semester.*
12. *Instructor may design their own project and also inputs from local industry may be taken for designing such new project.*
13. *The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill. Emphasis should be on Teamwork: Knowing the power of synergy/ collaboration, work to be assigned in a group (Group of at least 4 trainees). The group should demonstrate Planning, Execution, Contribution and Application of Learning. They need to submit Project report.*
14. *If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce components/ sub-assemblies in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.*

9. SYLLABUS - CORE SKILLS

CORE SKILL – EMPLOYABILITY SKILL	
First Semester	
1. English Literacy	**Duration: 20 Hrs.** **Marks : 09**
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. IT Literacy	**Duration: 20 Hrs.** **Marks : 09**
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks),

	Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills	**Duration: 15 Hrs.** **Marks : 07**
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude.
Second Semester	
4. Entrepreneurship Skills	**Duration: 15 Hrs.** **Marks : 06**
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation

	to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, and The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	**Duration : 10 Hrs.** **Marks : 05**
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education	**Duration: 15 Hrs.** **Marks : 06**
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.

First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.	
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.	
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.	
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.	
Energy Conservation	Conservation of Energy, re-use and recycle.	
Global warming	Global warming, climate change and Ozone layer depletion.	
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.	
Environment	Right attitude towards environment, Maintenance of in -house environment.	
7. Labour Welfare Legislation		**Duration : 05 Hrs.** **Marks : 03**
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.	
8. Quality Tools		**Duration : 10 Hrs.** **Marks : 05**
Quality Consciousness	Meaning of quality, Quality characteristic.	
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.	
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.	
Quality Tools	Basic quality tools with a few examples.	

ANNEXURE-I

LIST OF TOOLS & EQUIPMENT			
FIRE TECHNOLOGY AND INDUSTRIAL SAFETY MANAGEMENT			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit sl. 1-10 is required additionally)			
1.	Water $C0_2$ Type Fire Extinguisher	9 Liters	06 Nos.
2.	Stored pressure Type Fire Extinguisher	9 Liters	06 Nos.
3.	Chemical Foam type Fire Extinguisher	9 Liters	06 Nos.
4.	Mechanical Foam type Fire Extinguisher	9 Liters	06 Nos.
5.	$C0_2$Type Fire Extinguisher	4.5 Kg	06 Nos.
6.	BC Type Fire Extinguisher	5/10 Kg	04 Nos.
7.	ABC Type Fire Extinguisher	5/10 Kg	04 Nos.
8.	Extension Ladder *	Size-45/35 ft	02 Nos.
9.	All types of Branches or Nozzles *		04 Nos.
10.	Fire Hose *	a) 15 m	10 Nos.
		b) 30 m	04 Nos.
B. SHOP TOOLS, INSTRUMENTS – For 2 (1+1) units no additional items are required			
Lists of Tools:			
11.	First Aid Box *		
12.	All Types of small gears *		
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 *		1 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	20 Nos.
	b) Laser Welding Safety Goggles		10 Nos.
	c) Face Shield		10 Nos.
	d) Welding Shield		10 Nos.
	e) Ear Muff		10 Nos.
	f) Ear Plug		10 Nos.
	g) Canal Caps		10 Nos.
	h) Safety Shoes		20 Nos.
	I) Asbestos Gloves		10 Nos.
	j) Electrical Hand Gloves		10 Nos.
	k) Hand Gloves (Rubber)		10 Nos.
	l) Dust Mask		10 Nos.
34.	Personal Protective Clothing for men		
	a) Safety Shirt		10 Nos.
	b) Safety Trouser		10 Nos.
	c)Safety Jacket		10 Nos.
	d) Cooling Vest		10 Nos.
	e) Gum Boots		10 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.	Computer System *		06 Nos.
51.	Computer Table *		06 Nos.
52.	Computers Chairs *		06 Nos.
53.	White Board		01 No
54.	L.C.D. Projectors		02 Nos.
55.	UPS 650 VA offline		06 Nos.
56.	All types of Detectors 1 Peps. of each		04 Nos.
57.	Flux meter		06 Nos.
58.	Dosi meter		01 No
59.	Cut model of Fire Extinguisher / Fire pump *		02 Nos.
60.	Fire Suit		02 Nos.
61.	Fire Tender (one For the Institute) *		01 No
62.	Rescue Van (one For the Institute) *		01 No.
D. Shop Floor Furniture and Materials - For 2 (1+1) units no additional items are required.			
63.	Instructor's table		1 No.
64.	Instructor's chair		2 Nos.
65.	Metal Rack	100cm x 150cm x 45cm	4 Nos.
66.	Lockers with 16 drawers standard size		2 Nos.
67.	Steel Almirah	2.5 m x 1.20 m x 0.5 m	2 Nos.
68.	Black board/white board		1 No.
69.	Fire Extinguisher		2 Nos.
70.	Fire Buckets		2 Nos.

Note:

In the above list of Tools and Equipment, the items bearing star mark (*****) are meant to be used for two courses viz Fire Technology and Industrial Safety Management, Health Safety and Environment. If the institute is running both the trades, items bearing star mark are not required to be purchased separately.

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
S No.	**Name of the Equipment**	**Quantity**
1	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 nos.
2	UPS - 500Va	10 nos.
3	Scanner cum Printer	1 no.
4	Computer Tables	10 nos.
5	Computer Chairs	20 nos.
6	LCD Projector	1 no.
7	White Board 1200mm x 900mm	1 no.
Note: *Above Tools & Equipment are not required, if computer LAB is available in the institute.*		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor:		**Year of Enrollment:**
Name & Address of ITI (Govt./Pvt.):		**Date of Assessment:**
Name & Address of the Industry:		**Assessment location: Industry/ ITI**
Trade Name:	**Semester:**	**Duration of the Trade/course:**
Learning Outcome:		

S No.	**Candidate Name**	**Father's/Mother's Name**	Safety Consciousness	Workplace Hygiene	Attendance/ Punctuality	Ability to Follow Manuals/ Written Instructions	Application of Knowledge	Skills to Handle Tools & Equipment	Economical Use of Materials	Speed in Doing Work	Quality in Workmanship	VIVA	**Total Internal Assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														