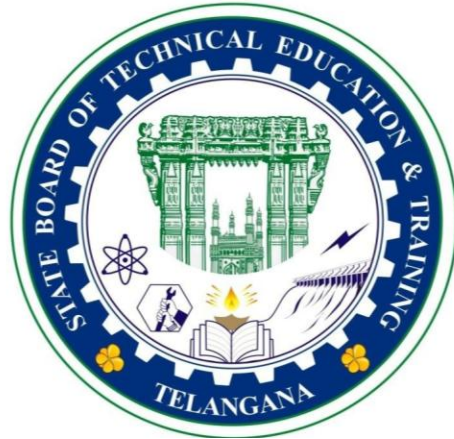


**CERTIFICATE COURSE IN FIRE SAFETY  
(6 MONTHS)**



**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING  
SANKETHIKA VIDHAHA BHAVAN, MASAB TANK,  
TELANGANA, HYDERABAD**

**INFRASTRUCTRE RECOMMENDED**

<b>1</b>	One Acre Land for the Squad Drills and Fire Fighting Drills
<b>2</b>	Fire Hydrant System with 7kg Pressure Pumps, Dedicated Water Reservoir
<b>3</b>	One class room with projector

### CERTIFICATE COURSE IN FIRE SAFETY

<b>Duration of the Course</b>	<b>:</b>	<b>6 Months</b>
<b>Standard of Admission</b>	<b>:</b>	<b>A pass in 10+2 or equivalent</b>
<b>Periods per week</b>	<b>:</b>	<b>5 days/ 20 Periods</b>
<b>Periods/semester</b>	<b>:</b>	<b>360</b>

### SCHEME OF INSTRUCTION AND EXAMINATION

Subject Code	Name of the Subject	Total Periods	Scheme of Examination			
			Duration	Internal Examination	End exam marks	Total Marks
<b>FS-101</b>	<b>Fire Safety Science &amp; Engineering</b>	<b>40</b>	<b>3 HRS</b>	<b>-</b>	<b>100</b>	<b>100</b>
<b>FS-102</b>	<b>First aid and Industrial Safety</b>	<b>46</b>	<b>3 HRS</b>	<b>-</b>	<b>100</b>	<b>100</b>
<b>FS-103</b>	<b>Construction &amp; Electrical Safety</b>	<b>45</b>	<b>3 HRS</b>	<b>-</b>	<b>100</b>	<b>100</b>
<b>FS-104</b>	<b>Fire Fighting Practical's</b>	<b>144</b>	<b>3 HRS</b>	<b>40</b>	<b>60</b>	<b>100</b>
<b>FS-105</b>	<b>Project work</b>	<b>85</b>	<b>3 HRS</b>	<b>40</b>	<b>60</b>	<b>100</b>
	<b>Total</b>	<b>360</b>	<b>--</b>	<b>80</b>	<b>420</b>	<b>500</b>

### FIRE SAFETY SCIENCE & ENGINEERING

**Subject Title : FIRE SAFETY SCIENCE & ENGINEERING**

**Subject Code : FS-101**

**Periods / weeks : 20**

**Periods / Year : 40**

### TIME SCHEDULE

S.No	Topic	No. of Periods	No. of Short Questions	No. of Essay type Questions
1	Basic Fire Safety & Combustion	5	1	2
2	Fire Fighting System	5	1	1
3	Fire Extinguishers (Co2, DCP and Foam)	8	1	1
4	Fire Detection and Alarm System	8	1	1
5	Hydraulics	8	1	1
6	Fire Protection	6	1	2
	Total	40	8	8

## COURSE CONTENTS

CHAPTER	CONTENTS
1	<p><b>BASIC PHYSICS &amp; CHEMISTRY OF FIRE</b></p> <ul style="list-style-type: none"> <li>Definitions: Fire – Fire Triangle – Tetrahedron of fire; Classification of fires – types of extinguishing media or agent – Principles of fire extinguishing methods – cooling – starvation – smothering (Blanketing)</li> </ul> <p><b>COMBUSTION</b></p> <ul style="list-style-type: none"> <li>Combustion and its types – Oxygen content in air by weight and volume – Combustion of solid, liquid and gases – Exothermic and endothermic reactions – Jet and Flash – Flames and its types – Premixed, diffusion, turbulent, stationary and propagating flames – Burning velocity – Flash Point - Fire point – Transmission of heat by conduction, convention and Radiation.</li> </ul> <p>Common causes of industrial fires</p>
2	<p><b>FIRE-FIGHTING SYSTEM</b></p> <ul style="list-style-type: none"> <li>Different types of portable fire extinguishers, selection criteria, their installation, periodic inspection - Preventive Maintenance Program for Portable and Fixed firefighting equipment, Extinguisher Card</li> <li>Fire hydrant system (Underground and above ground) - Inspection, Testing and Maintenance -Internal Fire Hydrant - Underground Static Water / Terrance tanks - Fire pumps and pump house - Risers (Dry riser / Wet riser)- Down comer - Fire service inlet - Inspection, Check and Maintenance</li> <li>Fire monitors, sprinkler systems and deluge system.</li> </ul>
3	<ul style="list-style-type: none"> <li>FOAM - Types of foam concentrate – Protein – AFFF- Fluoro protein – Alcohol type – Low, Medium and High expansion foam – Physical and chemical properties of foam; Foam pourer system</li> <li>DRY CHEMICAL POWDER - Various types of dry chemical powders and their uses, Periodical Inspection, Maintenance and Testing</li> <li>Carbon dioxide – Types (CO<sub>2</sub> and Water CO<sub>2</sub>) – Various types, their uses, Application, Periodical Inspection, Maintenance and Testing; Carbon-dioxide flooding system.</li> <li>Halons and FM 200 and similar extinguishers agents</li> </ul>
4	<p>Fire Detection and Alarm System:</p> <ul style="list-style-type: none"> <li>Various types of fire detection and alarm system. Need of detection system in fire service – Automatic fire detectors – General principles of working of common detectors – Various types of detectors viz. heat detectors, Smoke detectors - Photoelectric relay detectors – Ionization</li> </ul>

	<p>chamber, their operational principles – Infra-red heat detectors – General test for heat detector</p> <ul style="list-style-type: none"> <li>• Fire alarm System inspection, Testing &amp; Maintenance</li> <li>• Automatic Sprinkler System – Inspection, Testing and maintenance</li> <li>• Medium Velocity Water Spray system – Inspection, Testing and Maintenance (as per IS 13325)</li> </ul>
5	<p>HYDRAULICS:</p> <ul style="list-style-type: none"> <li>• Flow of water through pipes – Calculation of velocity and flow friction loss – Velocity and pressure – Water hammer – Discharge through fire nozzle – Nozzle velocity – Jet reaction and back pressure</li> </ul>
6	<p>Fire Protection:</p> <ul style="list-style-type: none"> <li>• Design of building, Plant, exits, etc. for fire safety. Fire resistance of building materials, Fire doors and firewalls.</li> <li>• Determination of fire load.</li> <li>• Dow Fire and Explosion Index, Salient features of fire explosion and toxicity index.</li> <li>• Active Fire Protection and Passive Fire Protection</li> </ul>

## FIRST AID AND INDUSTRIAL SAFETY

**Subject Title : FIRST AID AND INDUSTRIAL SAFETY**

**Subject Code : FS-102**

**Periods / weeks : 20**

**Periods / Year : 46**

### SCHEME

<b>Chapter No.</b>	<b>Chapter name</b>	<b>Total Periods</b>	<b>Short Questions (5 Marks each)</b>	<b>Long Answer Questions (12 Marks each)</b>
<b>1</b>	Basic First Aid	10	2	2
<b>2</b>	Fire Control and Documentation	8	1	1
<b>3</b>	Permit to work systems	8	1	1
<b>4</b>	Personal protective Equipment	6	1	1
<b>5</b>	Chemical Safety	8	1	2
<b>6</b>	Legislations	6	2	1
<b>Total</b>		<b>46</b>	<b>8</b>	<b>8</b>

## COURSE CONTENT

CHAPTER	CONTENTS
1	<b>BASIC FIRST AID</b> <ul style="list-style-type: none"> <li>• Define First Aid, Purpose, Principles of First aid, First Aider-Role &amp; Responsibilities and Qualities</li> <li>• Fundamentals of First Aid for thermal burns, Chemical burns, Fractures, Fainting, Shock, Insects and animal bites, Suffocation, Toxic Ingestion, Bleeding wounds and bandaging</li> <li>• first aid box and its contents.</li> <li>• Artificial respiratory, Cardiopulmonary Resuscitation (CPR) Techniques: Methods of artificial Respiration like – Holger Nielson Method. Schaefer’s Method, Sylvester’s Method, Mouth to Mouth, Eve’s rocking stretcher Method, Emerson Method</li> <li>• Victim transportation, Rescue Techniques - Lift rescue, Rescue by Hydraulic Platform, Rescue by Chutes, rescue from sewers, road, railway and highway accidents, rescue from collapsed building, rescue of animals, rescue from debris, rescue from wells, rivers. Rescue from train and aircraft accidents.</li> </ul>
2	<b>Fire Control and Documentation</b> <ul style="list-style-type: none"> <li>• Fire Risk Assessment (Key Elements), Fire Documentation</li> <li>• Fire Safety Audit as per NBC 2016 / Fire Safety Adequacy Study</li> <li>• Emergency Preparedness and Response Plans: Onsite Emergency Response Plan as per MSIHC Rules, 1989, Off-site emergency Response Plan as per MSIHC Rules, 1989, Mutual Accident Response Group (MARG); Disaster management Act &amp; Rules</li> <li>• Emergency Evacuation Drill and Instructions - Fire Drills as per MSIHC Rules, 1989 - Mock Drills as per MSIHC Rules, 1989</li> </ul>
3	<b>PERMIT TO WORK SYSTEMS:</b> Types of Work permit – Hot Work, Cold Work, working at height, Electric Isolation, Confined Space entry, Excavation, Working on Fragile roof; Contents of work permits, Process for execution and closure of work permit; Lock Out and Tag Out (LOTO) System
4	<b>Personal Protective Equipment:</b> <ul style="list-style-type: none"> <li>• Need for personal protective equipment, selection, applicable standards - Supply, use, care &amp; maintenance respiratory and non- respiratory personal Protective Equipment. Non-respiratory personal protective devices: Head protection, Ear protection, Face and Eye protection, Hand protection, Hand protection, Foot protection, Body protection.</li> <li>• Respiratory personal protective devices: Classification of hazards, Classification of respiratory Personal protective devices, Selection of</li> </ul>



	<p>respiratory personal protective devices. Instructions and training in the use, maintenance and care of self-containing breathing apparatus. Training in the use of breathing apparatus (Open Circuits and Close Unit) - Testing procedure and standards</p>
5	<p>Chemical Safety</p> <ul style="list-style-type: none"> <li>• Handling and Storage of dangerous materials &amp; their classification (UN);</li> <li>• HAZCHEM Code;</li> <li>• TREM Cards;</li> <li>• Material Safety Data Sheet - Use of Material Safety Data sheets (MSDS) and understanding the terminology used in MSDS</li> <li>• Chemical Leak: Prevention and protective measures to be taken in case of Gas/ Liquid leak from Chlorine tonner, LPG tanker, Ammonia container</li> </ul>
6	<p><b>LEGISLATIONS</b></p> <ul style="list-style-type: none"> <li>• National Building Code 2016 – Chapter IV – Fire and Life Safety code The Telangana Fire Service Act 1999 and Rules framed under Rules prescribed under the Telangana Factories Rules, 1950 w.r.to Fire Safety</li> <li>• Relevant Indian Standards</li> <li>• Fire Service Day / Week – Importance</li> </ul>

### CONSTRUCTION & ELECTRICAL SAFETY

<b>Subject Title</b>	<b>CONSTRUCTION &amp; ELECTRICAL SAFETY</b>
<b>Subject Code</b>	<b>FS-103</b>
<b>Periods / weeks</b>	<b>20</b>
<b>Periods / Year</b>	<b>45</b>

### SCHEME

<b>Chapter No.</b>	<b>Chapter name</b>	<b>Total</b>	<b>Short Questions (5 Marks each)</b>	<b>Long Answer Questions (12 Marks each)</b>
<b>1</b>	Hazards in Construction Sector and their Preventive measures	7	1	1
<b>2</b>	Types of Construction Activity	7	2	2
<b>3</b>	Construction Site – applicable laws	8	1	1
<b>4</b>	Electrical Hazards at workplace	10	2	2
<b>5</b>	Static Electricity	6	1	1
<b>6</b>	Electrical Safety – applicable laws	7	1	1
<b>Total</b>		<b>45</b>	<b>8</b>	<b>8</b>

## COURSE CONTENT

Chapter No.	Contents
1	<p><b>Hazards in Construction Sector and their Preventive measures</b></p> <ul style="list-style-type: none"> <li>• Basic Philosophy - Peculiarities and Parameters governing the Safety In construction such as site planning and design layout, Safe Access, Good Housekeeping</li> <li>• Safety in use of Construction Machinery and transport equipment's, Signs and Indication</li> <li>• Accidents and Hazards – their causes and effects Good Safety practices / Initiatives in Construction Safety</li> <li>• Safety with regards to Storage, Stacking and Handling of Materials of Construction - Hazards- Health ill effects while handling construction material and chemicals – Safety measures with respect materials such as cement, limes, aggregates, fly ash, timber, steel, glass, paints, varnishes, petroleum products, chemicals used in construction, plastics &amp; PVC material etc.</li> </ul>
2	<p><b>Types of Construction Activity</b></p> <p><b>Working at Height:</b> Scaffolding, shuttering / form work, ladders, concrete, cofferdams and special operation connected with irrigation work. Safety in use and portion of related machinery and equipment safety on working on fragile roof; Precautions on tower cranes, temporary installation and structures.</p> <p><b>Working below ground level:</b> Excavation, drilling and blasting. Pneumatic trenching, excavation equipment, shoring, strutting, tunneling, piling and safety in using and operating machinery and equipment relating to the above works.</p> <p>Foundations: Plant and machinery and structure</p> <p><b>Safety in Demolition Operation-</b> Planning and Permit: - Precautions prior to Demolition – Protection of the Public – Precautions during demolition – Sequence of demolition operations from Safe angle; Safety while carrying out repairs, additions and alterations</p>
3	<p>Construction Site – applicable laws</p> <ul style="list-style-type: none"> <li>• The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996</li> <li>• The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules , 1998;</li> <li>• The Building and Other Construction Worker's Welfare Cess Act, 1996 Cess Rules, 1998.</li> <li>• National Building Code 2016</li> <li>• Local building &amp; Development by laws</li> <li>• Relevant Indian Standards</li> </ul>

4	<p><b>Electrical Hazards at workplace</b> - Hazards of electrical energy</p> <ul style="list-style-type: none"> <li>- Safe limits of amperages, Voltages - Safe distance from lines - Capacity and protection of conductor. Joints and connections. Means of cutting off power - Overload and short circuit protection - No load protection - Earth fault protection</li> <li>- Earth insulation and continuity tests</li> </ul> <p>Earthing Standards.</p> <p>Protection against surge and voltage fluctuation.</p> <p>Types of Protection for electrical equipment in hazardous atmosphere - Electrical area classification. Criteria in their selection, installation, maintenance and use</p>
5	<p><b>Static Electricity:</b> - Introduction, Electro-static charge; Electrostatic dissipaters; Electrostatic hazards and their control (earthing and bonding) – Recommended earthing resistance</p>
6	<p><b>Legislations w.r.to Electrical safety</b></p> <ul style="list-style-type: none"> <li>• Indian Electricity Act, 2003 and Rules;</li> <li>• Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010 as amended</li> <li>• Rules Prescribed under the Telangana Factories Rules, 1950 (pertaining to Electrical Safety)</li> <li>• Relevant Indian Standard</li> </ul>

### **FIRE FIGHTING PRACTICALS**

**Subject Title : FIRE FIGHTING PRACTICALS**

**Subject Code : FS-104**

**Periods / weeks : 08**

**Periods / Year : 144**

**Internal -- 40 Marks, External -- 60 Marks**

**The internal practical examination must be assessed by three persons, one from Industry, second from Institution having chemical Engg Background, Safety Management and the third internal examiner.**

#### **TIME SCHEDULE**

<b>S.No</b>	<b>Topic</b>	<b>No. of Periods</b>	<b>Weightage of marks</b>
<b>1</b>	To perform the Squad Drill and to verify its applications; To identify and perform the movements of Squad	<b>30</b>	<b>10</b>
<b>2</b>	To study the use of ropes and lines in Fire service; to study different types of Knots	<b>25</b>	<b>10</b>
<b>3</b>	Identification, Selection, Operation and Maintenance of Fire Extinguishers	<b>25</b>	<b>10</b>
<b>4</b>	Fire Hydrant Drill and Perform Fire Fighting Hose Drill	<b>25</b>	<b>10</b>
<b>5</b>	Confined Space Entry training – Rescue Drill; Working at heights (Scaffolding training) – Rescue Drill	<b>20</b>	<b>10</b>
<b>6</b>	SCBA (Self Contained Breathing Apparatus) – Donning; Transportation of Victim, Rescue of Victim, Bandaging, CPR	<b>14</b>	<b>10</b>
	<b>Total</b>	<b>144</b>	<b>60</b>

## **COURSE CONTENTS**

### **PRACTICAL:**

#### **1) TO PERFORM THE SQUAD DRILL AND TO VERIFY Its APPLICATIONS & TO IDENTIFY AND PERFORM THE MOVEMENTS OF A SQUAD**

- IN FIRE SERVICES: Identification of Squad Drill, Working of Squad Drill, Importance of Squad Drill. What is Squad, Procedure for Formation of Squad, File, Rank, Sizing, fall in, Fall Out, Various types of Cautions given to the Squad.
- Attention, stand at ease, stand easy, Mark time, Double mark time, Right dress, left dress, dress up, Open order march, Close order march, Forward march, Backward march, Steps to the right, Steps to the left, Directions of a Squad, turning to the left, Turing to the right, Right about turn, From the right number, As you were, Proving of Parade.
- Quick march, Double march, Slow march, Right turn, left turn, Halt, Forward, break up, change direction, change formation, Reformation of Squad, Saluting, Reporting, Getting on Parade, Inspection Parade, Guard of honor.

#### **2) TO STUDY THE USE OF ROPES AND LINES IN FIRE SERVICE & TO STUDY DIFFERENT TYPE OF KNOTS**

- Types and construction, material used in construction of ropes and lines. Different types of lines used in fire service for different purposes like rescue, lifting, lowering. Care and maintenance of ropes and lines.
- Rescue knots: Bow line, running bow line, Bow line on the bight, Chair knot. Self-rescue knots: Slippery hitch, draw hitch. Other knots: Loop, half hitch, Thumb knot, figure of eight, Clove hitch, Rolling hitch, Round turn two half hitch, fisherman's hitch, waterman's hitch, Cat's paw, Sheep shank, Single sheet bend, Double sheet bend, Reef knot, midshipman hitch. Construction and application of guide lines

#### **3) IDENTIFICATION, SELECTION, OPERATION AND MAINTENANCE OF FIRE EXTINGUISHERS:**

- Identification of different types of Fire Extinguishers {Water Expelling type, Foam type, DCP type, CO2 type} With respect to constructional feature, capacity

operation and use. in fires, It's effective application in extinguishment, Recharging procedure, Care and Maintenance, Performance test, Hydraulic test Inspection procedure -Weekly, monthly, quarterly, half yearly, yearly

**4) PERFORM HYDRANT DRILLS & PERFORM FIRE FIGHTING HOSE DRILL**

- 3 -man Hydrant Drill: Drill procedure with application of Hose and Hydrant Fittings: Add one length of hose, remove one length of hose, Replace the burst Hose, divide one line into two line using Dividing Breeching, collect two line into one line using Collecting Breeching, Hydrant Gears and its operation.
- Hose Drill Actions: Lifting hose, lowering hose, carrying hose, laying hose, connect hose, disconnect hose, under running, Remove the kink, Rolling. Identification of different types of hose fittings and their uses.

**5) CONFINED SPACE ENTRY TRAINING – RESCUE DRILL; WORKING AT HEIGHTS (SCAFFOLDING TRAINING) – RESCUE DRILL**

**6) SCBA (SELF CONTAINED BREATHING APPARATUS) – DONNING; TRANSPORTATION OF VICTIM, RESCUE OF VICTIM, BANDAGING, CPR**

## PROJECT WORK

<b>Subject Title</b>	<b>: Project Work</b>
<b>Subject Code</b>	<b>: FS-105</b>
<b>Periods/ weeks</b>	<b>: 15</b>
<b>Periods/ year</b>	<b>: 85</b>

**Internal -- 40 Marks, External -- 60 Marks**

**The external practical examination must be assessed by three persons, one from Industry, second from Institution having chemical Engg. Background, Safety Management and the third internal examiner.**

### **External Exam (Marks – 60)**

	<b>Marks Secured</b>
<b>1) Data Collection</b>	<b>-- 10</b>
<b>2) Analytical Applications</b>	<b>-- 10</b>
<b>3) Result</b>	<b>-- 10</b>
<b>4) Report</b>	<b>-- 10</b>
<b>5) Viva Voice</b>	<b>-- 20</b>
	<b>-----</b>
<b>Total</b>	<b>60</b>
	<b>-----</b>

**“Pass marks in Project Work: 50% in external exam No minimum for Internal Exam”**



<b>REFERENCE BOOKS</b>	
<b>1</b>	Handbook on Industrial Fire Safety (First Edition) – DD Purandare, Abhay D Purandare – P&A Publication
<b>2</b>	Fire Fighting & Fire Safety Concepts, Methods, Tools and Techniques – Dr. SK Rathore –Sublime Publications, Jaipur India
<b>3</b>	Fundamentals of Industrial Safety – Dr. K U Mistry
<b>4</b>	Electrical Safety, Fire Safety Engineering and Safety Management – S. Rao, Prof. HL Saluja , Khanna Publishers
<b>5</b>	Fire Fighting, The Essential Handbook Volume-1, Barendra Mohan Sen , UBS Publishers Distributors pvt Ltd
<b>6</b>	Manual of Fire Safety – N Sessa Prakash – CBS Publishers & Distributors Pvt Ltd
<b>7</b>	Principles of Fire Safety Engineering: Understanding Fire and Fire Protection by DAS, AKhil Kumar - PHI Learning
<b>8</b>	The Factories Act, 1948 and Rules framed under (Model Rules and Telangana Factories Rules, 1950)
<b>9</b>	Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
<b>10</b>	Relevant Indian Standards E.g. <ul style="list-style-type: none"> <li>• IS 884 – Specification for First aid Hose Reel for Fire fighting</li> <li>• IS902 – Specification for Suction hose couplings for firefighting purposes</li> <li>• IS 3844 - Code of practice for installation and maintenance of internal fire hydrants and hose reels on premises</li> <li>• IS 4861 - Specification for dry powder for fighting fires in burning metals</li> <li>• IS 10933 - Functional requirements for 2000 kg dry powder tender for fire brigade use</li> <li>• IS 10460 - Specification for Higher Capacity Dry Powder Fire Extinguisher (Trolley Mounted)</li> <li>• IS 11360 - Specification for smoke detectors for use in automatic electrical fire alarm system</li> <li>• IS 13039 - External hydrant systems - provision and maintenance - Code of practice</li> <li>• IS 14609 - Dry Chemical Powder for Fighting A,B,C, Class Fires - Specification</li> <li>• IS 14851 - Maintenance of Fire Hose - Code of Practice</li> <li>IS 2190 - SELECTION, INSTALLATION AND MAINTENANCE OF FIRST-AID FIRE EXTINGUISHERS -- CODE OF PRACTICE</li> </ul>