



## Course Name: Diploma in Fire Safety (DFS)

### 1<sup>st</sup> Semester

| PAPERS CODE  | PAPERS NAME             | INTERNAL   | EXTERNAL   | TOTAL      |
|--------------|-------------------------|------------|------------|------------|
| DFS101       | Fire Tech & Design      | 40         | 60         | 100        |
| DFS102       | Construction Safety     | 40         | 60         | 100        |
| DFS103       | Industrial Safety       | 40         | 60         | 100        |
| DFS104       | Environmental Safety    | 40         | 60         | 100        |
| DFS105       | DESIGN AND INSTALLATION | 40         | 60         | 100        |
| <b>Total</b> |                         | <b>120</b> | <b>180</b> | <b>300</b> |

### 2<sup>nd</sup> Semester

| PAPERS CODE  | PAPERS NAME                              | INTERNAL   | EXTERNAL   | TOTAL      |
|--------------|--|------------|------------|------------|
| DFS201       | Safety of People in the event of Fire    | 40         | 60         | 100        |
| DFS202       | Fire Risk Assessment                     | 40         | 60         | 100        |
| DFS203       | Fundamentals of Fire Engineering Science | 40         | 60         | 100        |
| DFS204       | Fire Control Technology                  | 40         | 60         | 100        |
| DFS205       | TRAINING & PROJECT                       | 40         | 60         | 100        |
| <b>Total</b> |  | <b>120</b> | <b>180</b> | <b>300</b> |

### Detailed Syllabus

#### Course: Diploma in Fire Safety

#### Semester: I; Fire Tech & Design (Code DFS 101)

##### Unit-1

Fire, change of state and latent heat, thermal expansion of solids, liquids and gases. Transmission of heat, combustion, Fire tetrahedron, and combustible solid, liquids and gases.

Classification of Fire and different fire extinguishing methods, portable fire extinguishers, types and operating procedure. Fundamental Principles of Hydraulics, Atmospheres pressure and suction lift, use of Nozzle discharges. Advantages and disadvantages of Centrifugal pumps. Types of pumps and primers. Operation of pumps and primers, Types of ladders and trolleys. Pitching and climbing hints.

##### Unit-2

Maintenance of ladders and trolleys. Design of turntable ladders, water tender and special equipment. Types of water relay system. Arrangements of water relay system. Capacity of hoses, ropes, lines and knots. Hose reel and hose fittings. Types and construction and maintenance of hoses. Hose drying cabinets. Repairing of hoses. Hose fittings, Branches and nozzles. Collecting head, Suction hose fittings and stand pipe. Branches, Adaptors. Miscellaneous hose fitting, Hose clamp.

##### UNIT-3

Strainers and maintenance of hose fitting. Foam and foam making equipments, Synthetic based foam concentrates, Foam concentration and induction and ignition equipments. Pressure

control valve. Fire protective clothing, technical description and specifications of protective clothing. Breathing apparatus, types of breathing apparatus, care and maintenance of breathing apparatus. Life line signals, small gears and hand tools, conventional tools, non conventional tools, non powered equipments. Maintenance of small gears.

#### **UNIT-4**

Practical: Conducting wet and dry drills using various Nozzles, Identification Rehearsals of Portable extinguishers, Filling of DCP powder in Portable Extinguisher and wearing Protective clothing, Mock drills, Positioning of ladder and Demonstration of Ropes and lines, Laying out and Rolling of fire hoses, Priming of water from fire tenders using suction hose, static tank Hydrant fire drills, Site visit.

#### **Suggested Readings:**

1. Fire Protection And Prevention By: Brendra Mohan San ED. 1ST Year of Publication: 2008  
Publishers: UBS Publishers & Distributor Pvt Ltd.
2. Hand Book Of Fire Technology By: R.S. Gupta Edition: 2nd Edition Year of Publication: 2005  
Publishers: Orient Longman Publishers
3. Hand Book Of Fire And Explosion Protection Engineering By: Dennis P Nolan 1ST ED. 2007  
Publishers: Crest Publishing House

#### **Unit-I**

Classification of fire, Portable fire extinguishers, Pumps and primers, Foam and foam making equipments

#### **Unit-II**

Hose and hose fittings, Water relay systems, Breathing apparatus, Small gears

#### **Unit-III**

Fire protective clothing, Ladders, Ropes and lines, bends & hitches, Fire prevention

#### **Unit-IV**

Special appliances, Fire fighting codes and standards, Electrical fire hazards, Structures under fire

### **Subject Code: DFS102; Subject Name: CONSTRUCTION SAFETY**

#### **Unit-1**

Safety during project construction, Training to project staff and operation staff, stages of project construction, safety during receiving, unloading, shifting and storage, safety guidelines for storage, general safety facilities at construction sites, interface between civil and erection works, definition on construction safety, soil classification system, general precaution, hazardous atmosphere and materials, emergency rescue equipment, exhaust gases.

#### **Unit-2**

Hydraulic shoring for trenches, timber shoring for trenches. Safety in cutting and brazing, gas welding oxy acetylene equipment and use, gases- storage of cylinders, handling of cylinders, Inspecting equipment, Projective measures for electric arc welding, welding and cutting in tank vessels and drums, confined spaces, personal protection, health hazards. Safety in Concrete, Concrete forms and shoring, reinforcing steel, concrete placement, general requirements for vertical and tubular welded frame shoring, tube and coupler shoring, vertical slip forms, electrical safety in constructions, work on live equipment, over head and underground cables, safety in use of power tools, hand tools, pneumatic tools, electrically operated tools, cartridge, individual tools and precautions.

#### **Unit-3**

Form works-Types, assembling and dismantling and their safety. Scaffolding, Types of scaffold, design and inspection of scaffold, terminology of scaffold, scaffold construction materials,

scaffold erection procedure, safety precaution while erecting scaffold, dismantling of scaffold, material handling, investigation of scaffold accident, causes of hazard in scaffold, safety in scaffold, provision of scaffold for the building and other construction. Study of safety standards and ILO (International Labour Organization) recommendation. Case studies (Accidents in different construction sites.)

### **Unit-3**

practical's Visit to construction site ,Erecting and dismantling scaffolding for single storied , Multi storied buildings ,Demonstration of Safety harness and ladders ,Showing how to use power tools and hand tools safely, Conducting Tool box meeting, Mock drill (Falling from height) ,Awareness about site evacuation plan ,Safe way to material handling ,How to wear personal protective equipment's.

### **Suggested Readings:**

1. Electrical Safety, Fire Safety Engineering and Safety Management Rao.S /Saluja H.L. Publishers: Khanna Publishers Year: 1998 Edition: First edition
2. Safety Management In The Construction Industry Publishers: A Guide Published by National Institute of Construction Year: 2005 Edition: Second edition
3. Construction Technology By: Grundy. J. Publishers: Viva Books Pvt. Ltd. Year: 2006 Edition: First Edition

**Industrial Safety (Code DFS 103) Subject Name: INDUSTRIAL SAFETY, Subject Code: DFS103**

### **Unit-1**

Importance of Safety, health and environment. Health safety and environmental policy, fundamentals of safety, classification of accidents, Managements responsibility, objectives of safety management, National safety council, Employees state insurance act 1948, approaches to prevent accidents, principles of safety management, safety organization, safety auditing, maintenance of safety, measurements of safety performance, industrial noise and noise control, Industrial Psychology, Industrial accidents and prevention. Introduction to OSHAS 18001 AND OSHA.

### **Unit-2**

Process safety management (P.S.M) as per OSHA, legal aspects of safety, safety with respect to plant and machinery, the explosive act 1884, Petroleum act 1934, personal protective equipment, classification of hazards, protection of respiratory system, work permit system, hazards in refineries and process plants, safety in process plants, pollution in some typical process industry. Safe working practices, housekeeping, safe working environment, safety device and tools, precaution in use of ladders, safety instruction during crane operation, safety instruction for welding, burning and cutting and gas welding equipment, electrical safety, case studies, safety in use of electricity, electric shock phenomena, Occurrence of electric shock, medical analysis of electric shock and its effect, safety procedures in electric plants, installation of Earthing system.

### **Unit-3**

Safety in hazardous area, hazard in industrial zones, classification of industrial Enclosures for gases and vapors. Mechanical, Chemical, Environmental and Radiation hazards, Machine guards and safety devices, slings, load limits, lifting tackles and lifting equipment, hydrostatic test, Chemical hazards, industrial toxicology, toxic chemicals and its harmful effects on humans, factors influencing the effect of toxic materials, Units of concentration, control measure, environmental hazards, devices for measuring radiation, safety analysis and risk analysis, risk management, First aid, Safety measures to avoid occupational diseases.

### **Unit-4**

practical's Demonstration and training how to use breathing apparatus, Emergency evacuation drill, Train students how to rescue employees using emergency rescue equipments inside confined space.

With the help of gas detector train students check the level of oxygen and other, Gases in industries  
Training of using of windo meter to measure speed level of wind, Train students use noise level  
meter and find out different level of noise of different equipments and teach them how to be safe,  
Train students how to use personal protective equipment ,First Aid training and demonstration.

**Suggested Readings:**

1. Industrial safety management By: L.M. Deshmukh Publishers: Tata Megraw Hill ,New Delhi  
Year: 2006
2. Industrial safety health and environment Management system By: R.K. Jain & Sunil S. Rao  
Publishers: Khanna Publishers Year: 2008 Edition: Second

**Subject Code: DFS104; Subject Name: ENVIRONMENTAL SAFETY**

**Unit-1**

Scope and Importance; need for public awareness about our environment; Economic and social security; Environment impact of transportation and Mining. Environmental impact assessment (EIA) — purpose, procedure and benefits of EIA; Biodiversity and its conservation; Sustainable development. Global warming and greenhouse effect, urbanization, acid rain, ozone layer depletion, nuclear accident and holocaust.

**Unit-2**

Case studies, population explosion, family welfare programmers-HI V/AIDS, women and child welfare, Environmental pollution — causes, Effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution and nuclear hazards, Solid waste management-urban and industrial waste-causes, effects and control measures.

**Unit-3**

Renewable and non-renewable natural resources — Forest resource, Water resource, Mineral wealth / resource, Food resource, Energy resources, Growing energy needs, renewable and non-renewable energy sources, Use of alternate energy sources, Land resource and land degradation, Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles.

**Unit-4**

Role of Government in environment protection, legal aspects of environment protection, NGO initialization, National Committee on environmental Planning (NCP), Environmental Appraisal Committee (EAC), central and state boards for prevention and control of pollution, goals of environment impact policy, case studies, Disaster management floods, earth quake, cyclone, landslides, role of individual in prevention of pollution.

**Suggested Readings:**

1. Benny Joseph (2005) Environmental Studies — Tata McGraw Hill - Publishers.
2. Rao CS (2006) - Environmental Pollution Control — New Age International Ltd Publishers.
3. ManjunathD..L (2007) - Environmental Studies - Pearson Education Publishers.
4. Yaji R.K (2006) - Text Book of Environmental Studies - United Publishers
5. Centre for Environmental Education (1990) - Essential learning's in Environmental education.
6. Venugopal Rao P (2006) - Principles of Environmental Science and Engineering — Prentice Hall.

**Subject Code: DFS107; Subject Name: DESIGN AND INSTALLATION**

**Unit-1**

Fire extinguishing appliances. Selection, requirements, installation and maintenance of hand appliances. Mechanically driven fire engines and trailer pumps. Hydrant system, pumps, Fuel System, Fixed monitors, Hose pipes and Nozzles, Maintenance of pumps, Hydrants hose pipes and nozzles. Sprinkler system, installation of sprinkler system, piping and fittings. Pressure gauges, Installation of control valves,

Maintenance of sprinkler installation, Fire protection requirements for buildings and riser system. Classification of buildings based on occupancy. Fire protection, static water storage tanks. Preparation of plans, Signs and symbols used in the drawing, Drawing instruments and their uses.

### **Unit-2**

Fire alarm Systems, Automatic fire detection, Principles of automatic fire detection, Types of system, definition of detector, Classification of detector, Success or failure operation, Fire Products, smoke detectors, optical detector, Radiation detector, infra-red detector, ultra violet detector, heat detector, advantages and disadvantages of detector.

### **Unit-3**

Linear heat detectors., Radio based systems. Automatic fire detection circuits. Theory of open circuit and closed circuit, Detector and alarm circuits. Wiring and power supplies. Control and indicating equipment, general, Zones, Power supplies, Faults, Developments, Monitoring the system, Maintenance, Visual display, Examples of control and indicating equipment, Event location message, Remote manned centre. Detector positioning, Manually operated fire alarms. Block diagram of a fire alarm systems. Case studies (examples of fire hazard in India ).

### **Unit-4**

Practical: Hydrant fire drills, study operation, Maintenance, Visit to sprinkler fitted buildings/houses. Study of Fire Protection plan and drawings Emergency Evacuation mock drills, Periodically showing the method of operation by dismantling and assembling, smoke detector and sprinkler, Practical explanation by showing circuit and Fire alarm, Site Visit to visualize the installation of Fire extinguishing appliances in multi storied buildings, hotels etc..

### **Suggested Readings:**

1. Fire Safety In Building By: V.K. Jain Publishers: New Age International Publishers Edition: 2nd First Print – 1996 Re-print – 2002
2. Electrical And Mechanical Service In High Rise Buildings ,Design and Estimation Manual By: A.K. Mittal Edition: 1st Edition Year of Publication: 2007 Publishers: CBS Publishers
3. Design of Water Based Fire Protection Systems Edition: 1st Edition Year of Publication: 2006 By: Robert M. Gagnan Publishers: South Western Dujebury
4. NFPA 17, 17A
5. UL300
6. NFPA Handbook
7. SFPE Hand book of Fire Protection Engineering

## **Course: Diploma in Fire Safety**

### **Semester II , Safety of People in the event of Fire ; (Code DFS 201)**

#### **Unit-I**

Recognition of possible fire sources and emergency procedures in the event of a fire, the course also offers an in-depth study of fire investigation and the construction techniques for eliminating fires, History of fires, types of detecting devices and extinguishing agents and systems, construction techniques, and fire investigation, National Fire Protection Association and Occupational Safety and Health Administration standards

#### **Unit-II**

Devising procedures in the event of fire, How people perceive and react to fire danger, The measures needed to overcome behavioural problems and to ensure the safe evacuation of people in the event of fire, Assisting disabled people to escape

#### **Unit-III**

Safety goals and objectives, Monitoring safety progress, Identifying hazards and risks, Safety and financial benefits, Safety and the balanced scorecard, Setting targets and ensuring

commitment, Developing safe work systems, Policies and procedures, Safety values and principles

#### **Unit-IV**

Allocating responsibility and authority, Rehabilitation after an incident, Workplace inspections, Measuring and reporting, Developing and effective safety culture, Building an incident free workplace, Removing obstacles to safety, Safety and accountability, Developing safety habits in the workplace, Fire Protection and Analysis

### **Fire Risk Assessment ; (Code DFS 202)**

#### **Unit-I**

Introduction, Understanding fire: How and why people die in fires , Human behaviour in fire: How people behave in emergencies, Legislative requirements: The Regulatory Reform (Fire Safety) Order 2005, Fire hazards & risks, Plan Drawing, Brief look at drawing to scale, and how plans can be used to good effect

#### **Unit-II**

Fire risk assessment structure and layout, Means of escape principles: Basic requirements and what to look for, Fire signage: National requirements, Fire Alarms & fire detection: Basic components, and testing, Emergency lighting: When it is required, Basic components, and testing, Alternatives to emergency lighting

#### **Unit-III**

Emergency Plans & Staff Training, Highly Flammables & LPG, Fire fighting equipment requirements, Fire resisting construction & compartmentation, Active fire safety for building protection: Sprinklers & Automatic roof vents

#### **Unit-IV**

The process of fire risk assessment, Fire risk assessment recording and review procedures, The potential for pollution arising from fires, Measures to prevent and reduce fire pollution

### **Fundamentals of fire engineering Science ; (Code DFS 203)**

#### **Unit I**

History of fire service, Basic physics, Units, Guidelines for writing the units, Force, resultant force, Laws of force, Laws of motion, Mass and weight, work, power, energy, Law of conservation of energy, Mechanics – rest and motion, Distance and displacement, Speed and velocity, Acceleration, retardation, Acceleration due to gravity, Newton laws of motion, Machines and engines, Efficiency, Friction

#### **Unit II**

Basic Chemistry and physics of fire, Atomic structure, Elements, compounds, Pure substance and mixture, Physical and chemical changes, Condition for the changes, Energy changes, Effects of heat on matter, Combustion, Temperature, Specific heat capacity, Catalyst, Neutralization, Sublimation, Heat of decomposing, Chemical reaction, Exothermic reaction and endothermic reaction, Transmission of heat, Flash and fire point, Ignition temperature, Flammables and combustible chemicals, Spontaneous combustion, Triangle of combustion, Tetrahedron fire, Spread of fire .

#### **Unit III**

Classification of fire, General Causes of fire, Detection of fire, Extinguishing methods, First aid fire fighting equipments, Fire bucket, Fire beater, hose reel hose, Portable extinguisher, depends on weight, depends on operating method, depends on content, Depends on position of nozzle, Construction, Operation, Maintenance, Refilling.

#### **Unit IV**

Fixed fire fighting installations using water, Hydrant or fire water system, Classification of hydrant system, Sprinkling system, Major foam pourer system, Steam drenching system, Emulsification, Special fires and fire fighting, Air craft fire, Ships fire

## **Fire Control Technology ; (Code DFS 204)**

### **Unit I**

Hose, Types of hose, Characteristic, Frictional lose, Material used, Cause and prevention of mildew, Causes and prevention of shock, Causes and prevention of rubber acid, Care and maintenance, Types of hose fittings, Couplings, Component parts of inter locking couplings, Suction coupling wrenches, Branches, nozzles and branch holders, Foam making branches, Nozzles, Collecting head and suction hose fittings, Breechings, Adapters, Maintenance of hose fittings 10

### **Unit II**

Rope, Lines, knots and ladders, Introduction, Manufacturing materials, Types of ropes and size, Cordage, Causes of deterioration of ropes and lines, Different type of knots, Different type of lines, Purpose of knots, Ladders, Introduction, Hook ladder, escape ladder, turn table and extension ladder, Hook ladder belts

### **Unit III**

SCBA and foam making equipments, Introduction, Physiology of respiration, Effects of respiration, Essential fetchers of BA set , Description and technical details, Care and maintenance various BA sets, Advantage and disadvantage of various BA set, Foam & foam making equipments, Definition, Different type of foam concentrate, Storage, Characteristics, Foam branch and its type, Mechanical foam generator

### **Unit IV**

Pumps, primers, tenders and water relay, Introduction, definition, Deferent types of pumps, Deferent types of primers, Working principle of various pumps primers, Maintenance and trouble shooting, Testing of pumps, Advantages and disadvantages, Water relay system, Open circuit system, Closed circuit system, Different type of tenders and Fire alarm system, Operation and maintenance of various tenders, Water, foam, Co<sub>2</sub>, DCP and emergency tenders Detailed

**Subject Code: DFS205; Subject Name: TRAINING & PROJECT**

### **DRILLS AND PRACTICAL SCHEDULE OBJECTIVE**

To provide entire practical related with safety and fire management according to the syllabus prescribed.

#### **Unit-1**

Drills

- Squad drill
- Hose drill
- Knots and lines
- Hydrant drill
- MTU drill
- Ladder drill
- Picking up drill

#### **Unit-2**

Practical training

- First Aid Fire Fighting Equipment's
- Breathing apparatus

- Hydraulic pressure testing
- Industrial exposure training

### **Unit-3**

#### Practical training

- Personal Protective equipment
- Fire alarm
- First aid
- Smoke chamber/confined space
- Industrial exposure training

NOTE: 1) Drills and practical training will continue throughout the year according to unit wise.

2) Industrial exposure training may conduct at various industries and organizations.

PROJECT REPORT: - Project report will be submitted after completion of training.

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