# SCHEME OF EXAMINATION

# &

# DETAILED SYLLABUS

# For

# Diploma in Fire and Safety (DFS)

## FACULTY OF MANAGEMENT

# Program Outcome for DFS Course

**PO1:** Have a greater awareness of fire and its associated dangers

**PO2:** Understand the generic requirements of a Fire Marshal

**PO3:** Have the skills to initiate emergency procedures and promote a positive response from others

**PO4:** Be able to identify fire safety hazards and risks in the workplace and report deficiencies

**PO5:** Be able to ensure the availability of fire safety resources and equipment

**PO6:** Know how to organise emergency evacuations and fire drills in the workplace and report on their effectiveness

**PO7:** Have the knowledge to select the correct firefighting equipment relative to its contents, capacity and limitations and operate it safely in the event of fire

# Program Specific Outcomes for DFS Course

**PSO1:** The graduates exhibit ability to design, develop and test software applications and project management solutions of real-world problems.

**PSO2:** The graduates possess the ability and skills to deploy IT based solutions in the user environment and recommend appropriate IT infrastructure for project implementation.

**PSO3:** Able to provide socially acceptable technical solutions to complex electrical engineering problems with the application of modern and appropriate techniques for sustainable development.

**PSO4:** Able to apply the knowledge of ethical and management principles required to work in a team as well as to lead a team.

**PSO5:** The knowledge gained during the course of the program from Mathematics, Basic Computing, Basic Sciences and Social Sciences in general and all electrical courses in particular to identify, formulate and solve real life problems faced in industries and/or during research work.

**Kalinga University**
**Diploma in Fire and Safety (DFS)**

| | **SEMESTER –I** | | | | |
|---|---|---|---|---|---|
| **Code No.** | **Paper** | **Credits** | **External Marks** | **Internal Marks** | **Total Marks** |
| DFS 101 | Fire Tech & Design | 3 | 70 | 30 | 100 |
| DFS 102 | Construction Safety | 3 | 70 | 30 | 100 |
| DFS 103 | Industrial safety | 3 | 70 | 30 | 100 |
| DFS 104 | Environmental Safety | 3 | 70 | 30 | 100 |
| DFS 105 | Risk Management and Hazard Control | 3 | 70 | 30 | 100 |
| | **Total** | **15** | **350** | **150** | **500** |
| | | | | | |
| | **SEMESTER –II** | | | | |
| **Code No.** | **Paper** | **Credits** | **External Marks** | **Internal Marks** | **Total Marks** |
| DFS 201 | Safety of People in the event of Fire | 3 | 70 | 30 | 100 |
| DFS 202 | Fire Risk Assessment | 3 | 70 | 30 | 100 |
| DFS 203 | Fundamental of Fire Engineering Science | 3 | 70 | 30 | 100 |
| DFS 204 | Fire Control Technology | 3 | 70 | 30 | 100 |
| DFS 205 | Emergency Planning & First Aid | 3 | 70 | 30 | 100 |
| | **Total** | **15** | **350** | **150** | **500** |

# Detailed Syllabus

## Diploma in Fire and Safety

## Semester: I

## Fire Tech & Design (Code DFS 101)

**Course Objective:** To help the students understand the technique to expand functions of one and two variables and to trace the curves.

**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

**References**


1. V.J.Davies and K.Thomasin "Construction Safety Hand Book" Thomas Telford Ltd., London, 1990.

2. Handbook of OSHA Fire Tech & Design charles D. Reese and James V. Edison

# Construction Safety (Code DFS 102)

**Course Objective:** Students will be able to recognize and evaluate occupational safety and health hazards in the workplace, and to determine appropriate hazard controls following the hierarchy of controls.

**Unit-I**

Site planning and housekeeping, Types of Scaffolds, Scaffold Erection & dismantling, Scaffold Inspection

**Unit-II**

Safety in scaffolding – an overview, Investigation of scaffold accident, Provisions on scaffold under the building other construction workers central rules, 1998, Safety in excavations, trenching and shoring

**Unit-III**

Road work and pilling operation, Ladders, Use of safety nets and fall protection systems, Concrete and concert foams and shoring

**Unit-IV**

Importance of civil work in construction industry, Material handling, Important safety requirements and inspections

**References**

1. Hudson, R.,"Construction hazard and Safety Hand book, Butter Worth's, 1985.
2. JnatheaD.Sime, "Safety in the Build Environment", London, 1988.
3. V.J.Davies and K.Thomasin "Construction Safety Hand Book" Thomas Telford Ltd., London, 1990.
4. Handbook of OSHA Construction safety and health charles D. Reese and James V. Edison

# Industrial Safety (Code DFS 103)

**Course Objective:** It is needed to eliminate accidents causing work stoppage and production loss.

**Unit-I**

Fundamentals of industrial safety, Different types of industries, Different types of safety systems and equipments, Safety policy and safety terminology

**Unit-II**

Work permit systems, Job safety analysis, Hazop study, Fault tree analysis

**Unit-III**

Emergency planning, Safety inventory systems, Safety survey, Occupational health hazards, Safety organization and duties of a safety officer

**Unit-IV**

Accident prevention methods, Safety committee, Accident investigation, Safety management systems, Laws related to safety (Factories ACT 1948 Explosive ACT, Electricity ACT etc.)

**References**

1. Gupta, R.S., "Hand Book of Fire Technology" Orient Longman, Bombay 1977.
2. DinkoTuhtar, "Fire and explosion protection"
3. "Accident Prevention manual for industrial operations" N.S.C., Chicago, 1982.
4. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986

# Environmental Safety (Code DFS104)

**Course Objective:** Identify the various agents that can present potential safety and health hazards in the Process Industry, including process fluids, pressurized equipment, physical agents, and air contaminants.

**Unit I**

Air pollutants – Pollution sources - automobile pollution-hazards of air pollution-concept of clean coal combustion technology, fly ash-control of combustion in combustion chambers- ultra violet radiation, infrared radiation, radiation from sun-hazards due to depletion of ozone - deforestation ozone holes-automobile exhausts-chemical factory stack emissions -CFC

**Unit II**

Water pollutants-health hazards-sampling and analysis of water-water treatment - different industrial effluents and their treatment and disposal -advanced wastewater treatment - effluent quality standards and laws - chemical industries, tannery, textile effluents-common treatment.

**Unit III**

Hazardous waste management in India-waste identification, characterization and classification-technological options for collection, treatment and disposal of hazardous waste selection charts for the treatment of different hazardous wastes-methods of collection and disposal of solid wastes-health hazards-toxic and radioactive wastes incineration and verification - hazards due to bio-process-dilution-standards and restrictions – recycling and reuse.

**Unit IV**

Sampling and analysis – dust monitor – gas analyzer, particle size analyzer – lux meter-pH meter – gas chromatograph – atomic absorption spectrometer, Gravitational settling chambers-cyclone separators-scrubbers electrostatic precipitator - bag filter – maintenance - control of gaseous emission by adsorption, absorption and combustion methods- Pollution Control Board-laws, Pollution control in process industries like cement, paper, petroleum-petroleum products textile-tanneries-thermal power plants – dying and pigment industries – eco-friendly energy

**References**

1. Rao, CS, “Environmental pollution engineering:, Wiley Eastern Limited, New Delhi, 1992.
2. S.P.Mahajan, “Pollution control in process industries”, Tata McGraw Hill Publishing Company, New Delhi, 1993.
3. Varma and Braner, “Air pollution equipment”, Springer Publishers, Second Edition

## RISK MANAGEMENT AND HAZARD CONTROL SYSTEM (Code DFS105)

**Course Objective:** Understanding of Hazard identification and Risk Assessment Framework as per requirements

### Unit I Introduction

Introduction, hazards, hazard monitoring , different stages of process life time – Hazard reduction approaches and inherent safety review-Selection of hazard evaluation techniques - Factors influencing the selection of hazard evaluation techniques - decision making process - hazard review for management changes - combined hazard review - hazard evaluation - Risk issues.

### Unit II Hazard Evaluation Techniques

Non Scenario Based Checklist analysis, safety review, relative ranking, preliminary hazard analysis (PHA),fire explosion and toxicity index (FETI)

### Unit III Hazard Evaluation Techniques

Scenario Based Fault Tree Analysis & Event Tree Analysis –what-if analysis/checklist analysis-hazard operability studies (HAZOP) -Failure Mode and Effect Analysis (FMEA)

### Unit IV Risk Management System Emergency preparedness

Emergency Plans & Staff Training - Safety Management and legislation - Functions of safety management - Factories Act 1948 - Workmen compensation Act 1923.

### Reference

1. Methodologies for Risk and Safety Assessment in Chemical Process Industries, Commonwealth Science Council, UK
2. Hazop and Hazon, by Trevor A Klett, Institute of Chemical Engineering.
3. “Guidelines for Chemical Process Quantitative Risk Analysis”, second edition, Centre for Chemical Process safety, AICHE, 2000
4. Guidelines for Hazard Evaluation Procedures, Third Edition, Centre for Chemical Process safety, AICHE 2008

# Detailed Syllabus

## Diploma in Fire and Safety

## Semester II

## Safety of People in the event of Fire (Code DFS 201)

**Course Objective:** For staff to know how to reduce fire risks, deal with fires if appropriate and escape safely in the event of fire

**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

**Reference**

1. Hazop and Hazon, by Trevor A Klett, Institute of Chemical Engineering.
2. “Guidelines for Chemical Process Quantitative Risk Analysis”, second edition, Centre for Chemical Process safety, AICHE, 2000

# Fire Risk Assessment (Code DFS 202)

**Course Objective:** Identify hazards and people at risk ensuring that all occupants are alerted and can leave the premises safely in the event of a fire

**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

**Reference**

1. Methodologies for Risk and Safety Assessment in Chemical Process Industries, Commonwealth Science Council, UK
2. Hazop and Hazon, by Trevor A Klett, Institute of Chemical Engineering.
3. “Guidelines for Chemical Process Quantitative Risk Analysis”, second edition, Centre for Chemical Process safety, AICHE, 2000
4. Guidelines for Hazard Evaluation Procedures, Third Edition, Centre for Chemical Process safety, AICHE 2008

## Fundamental of fire engineering Science (Code DFS 203)

**Course Objective:** This course will enable students to refresh and understand basic science and gradually introduce them to fire chemistry, ire physics and fundamentals of fire related science.

**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, Frictio

**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 ofheatonmatter,Combustion,Temperature,Specificheatcapacity,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 real 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

**References**

1. Derek, James, “Fire Prevention Hand Book”, Butter Worths and Company, London, 1986.
2. Gupta, R.S., “Hand Book of Fire Technology” Orient Longman, Bombay 1977.
3. “Accident Prevention manual for industrial operations” N.S.C., Chicago, 1982.

4. DinkoTuhtar, “Fire and explosion protection”

## Fire Control Technology (Code DFS204)

**Course Objective:** How to develop emergency policies and a crisis manual. What steps should to be taken to protect your employees and your company in times of crisis

**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 maintenancevariousBAsets,AdvantageanddisadvantageofvariousBAset,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, Co2, DCP and emergencytenders
Detailed

## REFERENCES

April 15, 2010 SFPE Recommendations for a Model Curriculum for a BS Degree in Fire Protection Engineering. “A Proposal for a Model Curriculum in Fire Safety Engineering”, Fire Safety Journal, March, 1995.

# Emergency Planning and First Aid (Code DFS205)

**Course Objective:** Able to understand their new responsibilities of an Occupational First Aider and Able to provide appropriate treatment for the purpose of preserving life

**Unit I On site Emergency Planning**

On-site Emergency Plan- Emergency Alarm System - Emergency Control Room - Key personnel Emergency Control Program

**Unit II Off-site Emergency Plan**

Mutual Aid Scheme Emergency Evacuation- Security and Media management

**Unit III Hazard Communication**

Safe Handling of hazardous substance- Material Safety Data Sheet (MSDS) - Use of hazardous and Toxic substance - Storage and Handling - Transportation of Hazardous substance

**Unit IV First Aid Introduction**

Action at Emergency. Principles of First Aid- Shocks : Electrical Shock - Artificial Respiration - Cardio Pulmonary Resuscitation – Chocking Fainting - Poisoning - Open Wounds - Control of bleeding - Burns and Scalds - Heart Attack - Resuscitation. Disorder of respiratory system. Disorder of Circulation.

**Course Outcome:** Understand the role and responsibilities of a First Aider

**Reference**

1. Methodologies for Risk and Safety Assessment in Chemical Process Industries, Commonwealth Science Council, UK
2. Hazop and Hazon, by Trevor A Klett, Institute of Chemical Engineering.
3. “Guidelines for Chemical Process Quantitative Risk Analysis”, second edition, Centre for Chemical Process safety, AICHE, 2000
4. Guidelines for Hazard Evaluation Procedures, Third Edition, Centre for Chemical Process safety, AICHE 2008