

# **GURU KASHI UNIVERSITY**



## **CERTIFICATE COURSE IN FIRE TECHNOLOGY AND INDUSTRIAL SAFETY MANAGEMENT**

**SESSION: 2024-25**

**Department of Mechanical Engineering**

### Programme Structure

Semester-I							
Sr. No	Course code	Course Title	Course Type				Credits
				L	T	P	
1	CFS101	Fire Technology & Management	T	6	0	0	6
2	CFS102	Safety Management	T	5	0	0	5
3	CFS103	Practical-I	P	0	0	20	10
<b>Total</b>				11	0	20	21

Semester-II							
Sr. No.	Course Code	Course Title	Course Type				Credits
				L	T	P	
1	CFS201	Fire Control Technology	T	6	0	0	6
2	CFS202	Industrial Safety	T	5	0	0	5
3	CFS203	Practical-II	P	0	0	20	10
<b>Total</b>				11	0	20	21

#### EVALUATION CRITERIA FOR THEORY COURSES

- A. Continuous Assessment: [25 Marks]
  - CA1- Surprise Test (Two best out of three) (10 Marks)
  - CA2- Assignment(s) (10 Marks)
  - CA3- Term paper/Quiz/Presentations (5 Marks)
- B. Attendance (5 marks)
- C. Mid Semester Exam: [30 Marks]
- D. End Semester Exam: [40 Marks]

**Evaluation Criteria for other courses has been given separately with respective courses.**

**Semester-I**

**Course Title: Fire Technology & Management**  
**Course Code: CFS101**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>6</b>	<b>0</b>	<b>0</b>	<b>06</b>

**Total Hours:90**

**Course Content****UNIT I****25 Hours**

- 1. Basic Physics and Chemistry related to Fire :** Definition of Matter and energy, Physical properties of matter like Density, specific gravity, Relative density, Vapour 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.
- 2. 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.
- 3. 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.
- 4. 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.
- 5.

**UNIT II****20 Hours**

- 1. Hydrant & Fittings:** Introduction of Hydrant and Water supplies, Hydrant Gears and Equipment, Marking, Testing, cares maintenance Operation.
- 2. Foam & Foam Making Equipment:** Water as an extinguishant- 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 extinguishant.

3. **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.

### UNIT III

**20 Hours**

1. **Hydraulics:** Pressure and Head, pressure and Flow, mensuration, Nozzle's discharge, calculation of water capacity of tank, requirement for specific fire size.
2. **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.
3. **Ladders:** Introduction, Types of Ladders, Construction features of conventional Ladders, Operational use, Elementary Knowledge of T.T.L. & Snorkel (As per Bureau of I.S.).

### UNIT IV

**25 Hours**

1. **Breathing Apparatus:** Introduction of Types of B.A. Sets in use, Working principles and Care and maintenance.
2. **Water Tender and Special Appliance** : Introduction to Rescue/ Emergency Tender, CO2 tender, DCP Tender, Hose laying lorry, Water Bouser and High pressure pumps, special appliances.
3. **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

### Suggested Readings

- Fire Technology (Fire Engineering) English, Chetan Prakashan
- Agni Surksha Or Roktham (Fire Engineering) Chetan Prakashan
- Fire Drill (Fire Engineering), Chetan Prakashan
- Fire Services in India: History, Detection, Protection, Management, Environment, Training and Loss Prevention, Mittal Publications

**Course Title: Safety Management****Course Code: CFS102**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>5</b>	<b>0</b>	<b>0</b>	<b>05</b>

**Total Hours: 75****Course Content****UNIT I****20 Hours**

- 1 **First Aid, Resuscitation:** 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.
- 2 **Automatic Fire Detection cum Alarm System:** Introduction of Types of Detectors- Smoke, Heat, Flame/Gas Detectors, Operating principles, Control Panel.

**UNIT II****15 Hours**

1. **Discipline:** Introduction, Importance of Discipline, General Principles of discipline, essentials for discipline and outward Signs.
2. **Hazard and Risk:** Causes, Identification, Evaluation & Control. HAZOP, Sources for Information on Hazard Evaluation. Risk and Risk Analysis.
3. **Accident :** Industrial Accidents, Classification of Accidents, Need for the Analysis of Accidents, Accidents Reports, Methods Adopted for Reducing Accidents, Investigation of Accidents, Safety Slogans, Safety Precautions adopted in the Plant.

**UNIT III****20 Hours**

1. **Safety Concept :** Introduction to Safety Management, Safety Policy, Safety Committee, , Responsibility of Management, Safety Officers Duties & Responsibilities, Safety Targets, Objectives, Standards, Practices and Performances.  
**FACTORIES ACT 1948 (Amended)**
2. **Health –** Cleanness, Disposal of Waste , Ventilation and Temperatures, Dust & Fumes, Drinking Water, Lighting, Latrines & urinals.
3. **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.

**UNIT IV****20 Hours**

4. **Welfare** - Washing facilities in Dry clothing, Storing, Sitting, First Aid Appliances, Canteen, Shelters for rest & lunch, Crèches, Welfare officers, Right & Obligation of workers.
5. **Lighting, Ventilation & Work related stress:** Introduction to Lighting, Ventilation, Heat Stress, Cold Stress, Noise.
6. **Construction Industry:** General Safety Provisions related to construction industry, Safety in the use of Construction Machinery, Safe Access / Egress Importance of Good House Keeping.

### Suggested Readings

- Audhyogik Kanun (Safety Management), Chetan Prakashan
- Fire Safety in Buildings, New Age International

**Course Title: Practical-I**

**Course Code: CFS103**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>

**Total Hours:150**

Importance of course training, Equipments used in the course, types of work done by the trainees in the course. Introduction to safety equipments and their uses. Introduction of first aid, Road safety, operation of Electrical mains. Knowledge of General Safety, Occupational health and hygiene

### UNIT I

**30 Hours**

Demonstration of

- Various acids.
- Alkalis & Gases
- Organic flammable liquids and commonly used industrial chemical-Fire-fighting technique.
- Drill I : Water CO2 Extinguisher Drill 9L
- Drill II :Chemical Foam Extinguishing 9 L
- Drill III : Mechanical Foam Extinguisher 9L
- Drill IV :Stored Pressure Water Extinguisher 9 L
- Drill V : Dry Chemical Powder 5 Kg
- Drill VI : Dry Chemical Powder 10 Kg
- Drill VII : ABC Extinguisher 5 Kg/ 10 Kg
- Drill VIII : CO2 Extinguisher 4.5 Kg

### UNIT II

**40 Hours**

Fire fighting Technique

Familiarization and demonstration of Hose and Hose fittings

- Drill – I : Hose pick up Drill

- Drill – II : Hose Running Drill with one hose
- Drill – III : Hose Running with two hose
- Drill – IV : Hose Running with Three hose

Familiarization and demonstration of Hydrant and its associated equipments

- Hydrant Drill I : Opening of single line of three hoses.
- Hydrant Drill II : Change of burst hose
- Hydrant Drill III : Increase one length hose
- Hydrant Drill IV : Decrease one length hose
- Hydrant Drill V : Use of Collecting, breaching
- Hydrant Drill VI : Disconnect collecting breaching
- Hydrant Drill VII : Use of Dividing Breaching
- Hydrant Drill VIII : Disconnect of Dividing Breaching

### **UNIT III**

**40 Hours**

Techniques to handle various branches

Familiarize with various type of electrical devices used for safety,

Demonstration recognition of electrical hazards

Control measures adopted.

Familiarization of foam making branch

- Use of FB2X, FB5X and FB10X,
- Care and maintenance of foam equipments,

Demonstration of effect of pressure on pump discharge rate and on ground use of pressure pumps.

Calculation of discharge capacity of pump, Demonstration and familiarization of Extension Ladder

- Introduction of parts of extension ladder
- Rescue Operation from buildings.
- Drill I : Pitching of ladder
- Drill II : Climbing the ladder
- Drill III : Use leg Lock
- Drill IV : Ladder Drill with Fireman Lift
- Drill V : L2 Drill

### **UNIT IV**

**40 Hours**

Familiarization and Demonstration of Parts of BA Set.

Drill I : Donning, running and Rescue of casualty through tunnel.

- Familiarization and study First Aid Box
- Stretcher Drill
- Fireman Lift Drill
- Use Bandage
- Standard drills on Ambulance

Techniques of CPR

- ✓ One Sitter
- ✓ Two Sitter
- ✓ Three Sitter
- ✓ Four Sitter
- ✓ Fireman lift
- ✓ CPR drill
- ✓ Choking
- ✓ Shaffer's Method

- ✓ Rescue drill
- ✓ Sylvester's Method
- ✓ Holgar Nielsen Method
- ✓ Eve Rocking Stretcher Method
- ✓ Emerson Method
- ✓ Mouth to Mouth Respiration.

**Familiarization with various types of Fire Fighting Small and Special rescue gear at Fire Service Station**

- Practical Use of equipments like cutting tools
- Lifting tools & Maintenance of tools.

Last Week: Industrial visit

## Semester-II

**Course Title: Fire Control Technology**

**Course Code: CFS201**

L	T	P	Cr.
6	0	0	06

**Total Hours:90**

### Course Content

#### UNIT I

**25 Hours**

1. **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, Automatic Fire Alarms system.
2. **Ropes and Lines :** Construction & Fibers used for rope, types and uses of lines, causes of Deterioration Inspection and tests, methods of testing, care and maintenance, standard knots and their uses.
3. **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 (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, Station Discipline.

#### UNIT II

**20 Hours**

1. **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.
2. **Practical Fireman ship:** Qualities of Fireman and his important duties at a Fire Station and Fire ground.

#### UNIT III

**20 Hours**

1. **Rural Fire:** Fire Hazards in rural areas and cause of fire, Hay stacks, Special appliance & equipment, Method of Fire-fighting in rural areas.



2. **Water Relay:** Types of relay-systems, water distribution System. Advantages and disadvantages- Calculation of hose.
3. **Salvage** - Introduction, Equipment for Salvage and working at Fires.
4. **Disaster Management:** Natural and Man-made Disaster, Preparedness for disaster, use of various agencies, first responders, control of situation, Incident Command System (ICS).
5. **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

**UNIT IV****25 Hours**

1. **Various Rescue techniques:** Rescue technique from lift, Sewer, Collapsed building, motor vehicle accident, Well & river, Special equipment and training requirements for rescue operations.
2. **Means of Escape:** Classification of escape routes with reference to N.B.C.
3. **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
4. **Ship Fires:** Elementary knowledge of ship fire protection.

**Suggested Readings**

1. Fire Technology (Fire Engineering) English, Chetan Prakashan
2. Fire Drill (Fire Engineering), Chetan Prakashan

**Course Title: Industrial Safety****Course Code: CFS202**

L	T	P	Cr.
5	0	0	05

**Total Hours:75****Course Content****UNIT I****25 Hours**

1. **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.
2. **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.

**UNIT II****20 Hours**

1. **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.

**UNIT III****15 Hours**

1. **Material Handling:** Safety related to Mechanical and Manual Material Handling, Lifting Appliances, Transport / Earthmoving & Material Handling Equipments – Cranes, Forklift Truck, Hoists, Conveyors
2. **House Keeping and Waste Disposal:** Introduction of Good House Keeping & Maintenance, Introduction of Disposal of Waste Material.

**UNIT IV****15 Hours**

1. **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.
2. **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

**Suggested Readings**

- Industrial Management (Safety Management) English, Chetan Prakashan
- Industrial Safety Management, Tata McGraw-Hill Education

**Course Title: Practical-II****Course Code: CFS203**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>

**Total Hours:150****Learning Outcomes**

On the completion of the course, the students will be able to

1. Evaluate the analytical frameworks and tools used in marketing mix.
2. Analyze information of a firm's market segmentation to formulate segmentation strategies.
3. Demonstrate the role of marketing channels and identifying major channel alternatives.
4. Acquire skills of communication mix, web marketing and green marketing.

**Course Content****UNIT I****40 Hours**

Familiarization and demonstration of Centrifugal pump.

Drill I : Pen water pump drill (Dry Drill)

Drill II : Lose water pump drill with hard/soft suction.  
 Familiarization and demonstration of Water tender  
 Water tender drill with close water  
 Drill I : L-2 Drill with ladder and water tender  
 Drill II : Foam Drill with FBI0X single delivery  
 Drill III : Foam Drill with FB5X single delivery  
 Drill IV : Wet Drill with double delivery  
 Drill V: Dry Drill with double delivery

## **UNIT II**

**50 Hours**

### **Industrial/ Fire Service Station Visit**

Demonstration of Switch Board. Familiarization and demonstration of equipments involved in salvage Operation

- Drill – I : Hose pick up Drill
- Drill – II : Hose Running Drill with one hose
- Drill – III : Hose Running with two hose
- Drill – IV : Hose Running with Three hose
- 

### **Visit to Fire Service Station.**

Familiarization to Fire Station Writing practices of

- Occurrence Book
- Duty Card/ Register
- Log Book
- Hose Book
- Stock Register

On ground demonstration and practice of ICS,  
 Simulated Practices to control life and properties damages from natural disaster.

Squad Drills in training ground.

Methods of entry into building, Searching for higher location of a trapped causality. Methods of rescue.

Precautions to be observed when working in smoke laden buildings.

## **UNIT III**

**30 Hours**

### **Construction Site Visit**

Familiarization at construction site.

Introduction and identification of building material.

Planning of escape routine.

Familiarization and demonstration of fixed installation at visit to high rise building. Practical training about Care and maintenance of sprinklers.

Use of Automatic fire alarm system.

### **Industrial Visit**

**Visit to Construction Site** for familiarization about escape routes as Ladder & Stair case etc.

- Drill I : Thumb Knots

- Drill II : Figure of 8 knots
- Drill III : Reef Knot
- Drill IV : Chair Knot
- Drill V : Half Hitch, Clove Hitch, Rolling Hitch, Tender Hitch
- Drill VI : Bowline

Familiarization and demonstration of various equipments used in rescue of a causality.

- Ladder Drill with Fireman Lift
- Sewer Rescue drill,
- Stretcher drill

#### **UNIT IV**

**30 Hours**

##### **Visit to Air Port**

Familiarize with various parts of aircraft CFT & Ejection Seat

Fire fighting equipments used in case of accident.

- Drill I : Fighting Hay Stack fire

Fire Extinguisher Drills

- Drill I : Water CO2 Extinguisher Drill 9L
- Drill II : Chemical Foam Extinguishing 9 L
- Drill III : Mechanical Foam Extinguisher 9L
- Drill IV : Stored Pressure Water Extinguisher 9 L
- Drill V : Dry Chemical Powder 5 Kg
- Drill VI : Dry Chemical Powder 10 Kg
- Drill VII : ABC Extinguisher 5 Kg/ 10 Kg
- Drill VIII : CO2 Extinguisher 4.5 Kg

Hazard Evaluation and Risk Analysis exercise.

Practical usages of Safety belt, helmets, gloves, and goggles.

**Visit to industrial unit and adoption of safety Practice.**

**Visit to industrial unit to observe prevailing welfare measures and their condition.**

- Measurement of Heat & Noise

##### **Construction Site Visit**

- Practices of good House Keeping
- Study of egress and safe access.
- Hands on experience with Hand and power tools.

**Construction Site Visit** and identifying of causes of accident during material handling

- Demonstration with fall arrestor, Sewer Rescue, Excavation Site Visit.

Demonstration and use of

- Helmet
- Face Shield
- BA Set
- Body Harness
- Gloves
- Safety Goggles
- Ear Protective Equipment (Ear muffs, Ear Plug)

- Safety Shoes

BA set, donning, running.

Analysis of MSDS and Identification of Chemicals. Practical hand in Laboratory about fumes and vapors.

Preparation of symbols for hazardous chemicals and Physical carriage of chemicals, methods of storage.