

**BHARATHIAR UNIVERSITY : COIMBATORE 641 046**  
**CENTRE FOR COLLABORATION OF INDUSTRIES AND INSTITUTIONS (CCII)**  
**DIPLOMA IN FIRE SAFETY ENGINEERING AND MANAGEMENT**  
 (For the CCII students admitted from the academic year 2015-16 onwards)

**SCHEME OF EXAMINATION**

Course title	Total Marks
<b>Semester -1</b>	
Paper I – Fundamentals of Fire Engineering Science	100
Paper II –Fire control Technology	100
Paper III -Principles of industrial safety and Accident Prevention	100
Paper IV –Leadership and Communication	100
<b>Semester -2</b>	
Paper V – Risk Management and Hazard Control system	100
Paper VI –Health, Safety, Environmental Engineering and Construction Safety	100
Practical, viva-voce, record book	100
<b>TOTAL</b>	<b>700</b>

**ELIGIBILITY FOR ADMISSION**

Diploma in Fire Safety Engineering and Management	+2/ITI/equivalent
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**DURATION OF COURSE**

Diploma in Fire Safety Engineering and Management	One year (2 semesters)
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**REFERENCE BOOKS AND JOURNALS REQUIRED FOR THE PROGRAMME**

Name of book	Author
1. Industrial Safety Management	N.K. Tara Fdar, K.J Tara Fdar
2. Fire Service First Responder IFSTA Senior Editor-Michael A Wieder	Daniel Limmer, Michael Grill,
3. Safety A personal Focus	David L Bever
4. Fire Equipment	David L. Bever
5. Industrial Safety	National Safety Council of India
6. Hand book of fire and Explosion Protection Engineering Principles for Oil, Gas, Chemical and Related	Facilities- Dennis. P. Nolan, PE
7. Engineering Chemistry	Jain & Jain
8. Industrial Management	Jain & Bawa
9. Thermodynamics	Aroma & Domkundwar
10. Hand book of Hazardous Air pollutions	Dennis P Nolan P.E
11. Remediation and Treatment Technologies.	Dennis P Nolan P.E
12. Fire Technology	R.S. Gupta
13. Major hazard control	Inter National Labor Office
14. Encyclopedia of occupational health and safety	Inter National Labor Office
15. Safety, health and working condition in the transfer of technology	Inter National Labor Office
16. Radiation protection	Inter National Labor Office
17. Fire service Manual (4 volumes)	
18. TAC and NBC rules.	Kerala Fire Force
19. Publications from Inter National standard Organizations like ISO, OSHA, IOSH, NEBOSH etc.	
20. Industrial Safety, Health and environment Management system	RK Jain and Sunil S Rao

**Semester -1**

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**PAPER I - FUNDAMENTALS FIRE ENGINEERING SCIENCE**

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**COURSE OBJECTIVE**

This course will enable students to refresh and understand basic science and gradually introduce them to fire chemistry, fire physics and fundamentals of fire related science. The students will have a strong foundation in basic fire engineering and various fire control measures on completion of this course.

**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

### UNIT - V

- **Fixed fire fighting installations not using water**
- Complete CO<sub>2</sub> flooding system
- Complete DCP spraying system
- Complete Halon flooding system
- Investigation of fire
- Point, Time and cause of ignition
- Arson and detection of fires

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**PAPER II - FIRE CONTROL TECHNOLOGY**

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**COURSE OBJECTIVE**

This course will enable the students to various fire prevention methods, fire protection method and the modern equipments used for fire prevention and fire protection. That includes working principle, design and construction, operation, maintenance, transportation and safe custody etc. with appropriate practicals in related equipments and systems.

**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

**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 relays**
- Introduction, definition
- Different types of pumps
- Different 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 emergency tenders

#### **UNIT -V**

- **Fire alarm**
- Introduction of Electronics and Electricity:-
- Semi conductor Physics
- Circuit Control And Protective Devices
- Transistors
- Principles of fire detectors
- Parts of fire alarm unit
- Control panel
- Type of detectors
- Automatic fire detection
- Classification of detector
- Control and indicating equipment
- Trouble shooting and maintenance
- Intruder alarms

**PAPER III - PRINCIPLES OF INDUSTRIAL SAFETY AND ACCIDENT PREVENTION****COURSE OBJECTIVE**

This course will enable the students to various industrial safety organization and their function. Also industrial related accidents their occurrence, their effect and causation of accident, strategies applied for accident prevention etc. It also includes study about various industrial hazards and hazard control measures and technology applied.

**UNIT I**

- **Introduction to Safety**
- Goals, Need, History of Safety.
- Importance of Industrial Safety
- Accident Causation
- Definition
- Case study

**UNIT II**

- **Theories and principles of accident Causation**
- The effect of accident,
- Unsafe Act
- Unsafe condition,
- Unpredictable performance,
- Consequences of accident.
- Accident prevention programmes

**UNIT III**

- **Cost analysis and Accident Prevention**
- Direct accident,
- Indirect accident,
- Accident Prevention Methods
- Accident Investigation
- Accident Reporting
- Accident Investigation,
- Accident Investigation Report

**UNIT IV**

- **Promotion Role**
- Pre- accident Strategy and Health Policy
- Safety Department
- Safety Committee and Function
- House keeping and Importance
- Advantages of good house keeping
- Post Accident strategy
- First Aid
- Fire fighting
- Accident Investigation.
- Role of government, Management, workers and trade unions
- promoting safety in industry

**UNIT V**

- **First Aid**
- Introduction
- Body structure and functions
- Position of causality
- The unconscious casualty
- Fracture and dislocation

- Injuries to muscles and joints
- Resuscitation
- Bleeding
- Management of shock
- Burns, scalds and accidents caused by electricity
- Rescue and transport of casualty

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## **PAPER IV - LEADERSHIP AND COMMUNICATION**

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### **COURSE OBJECTIVE**

This course will enable the students to improve their communication skills and leadership quality to implement, maintain and enforce the safety measures through safety management systems. Also the course targets to prepare students to effectively communicate and improve written and oral communication, improve presentation capabilities, improve office documentation etc.

### **UNIT I**

- Introduction
- Definition of leadership
- Function of leadership
- Qualities of leadership

### **UNIT II**

- Organization:
- Definition
- Elements of good organization
- Principles of organization
- Advantages of organization

### **UNIT III**

- Communication
- Methods of Communication
- Barriers to Communication
- Oral Communication
- Speaking skills
- Listening skills
- Non verbal communication
- Interviews

### **UNIT IV**

- Written communication
- Letter writing skills
- Internal Communications
- Formal and Informal reports
- Notice
- Agenda
- Minutes

### **UNIT V**

- Safety communication
- Managerial communication
- Communication with employees with conducting training
- Emergency communication
- Meeting documentation
- Communication documents



**Semester -2**

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**PAPER V - RISK MANAGEMENT AND HAZARD CONTROL SYSTEM**

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**COURSE OBJECTIVE**

This course will enable the students to know about various industries and hazards involved and safety measures to be taken (hazard control technology). Also learns about to understand the risk involved in various industrial systems, equipments and processing etc. Also to understand various risk assessment methods, procedures to reduce or eliminate the risk involved.

**UNIT I**

- **Hazards**
- Definition
- Glossary of Terms
- Risk Management
- Hazards Control System
- System safety
- Job Hazard analysis
- Hazop
- Fault tree Analysis
- Failure mode and effect Analysis

**UNIT II**

- **Physical and chemical properties of hazardous materials**
- Introduction
- Major industrial hazards
- Types and consequences of major industrial hazard
- Effects on human body
- Precautions while fire fighting
- Stages of combustion
- Hazards of combustion
- Stability and inflammability
- BLEVE
- Fire extinguishment

**UNIT III**

- **Flammable Solids, Liquids and Gas**
- Petrochemicals and other hydrocarbons
- Tank fire – storage tank, trucks, service stations
- High pressure pipe lines
- Pressurized and liquefied gases
- Natural gas
- Petroleum gases
- Refrigerants etc.
- Acetylene
- Metals
- Non metals

**UNIT IV**

- **Other hazardous properties**
- Harmful contamination of air and water
- Toxicity
- Corrosiveness

- Radioactive hazards
- Special precaution for handling
- Emergency preparedness
- Pesticides
- Explosion
- Deflagration and detonation of gas
- Dust explosion
- Confined and unconfined vapor cloud explosion

#### UNIT V

- **Safety Management and legislation**
- Functions of safety management
- Factories Act 1948 (chapter 3,4,5)
- Workmen compensation Act 1923 (objectives and coverage's)

### PAPER VI

## HEALTH, SAFETY , ENVIRONMENT ENGINEERING AND CONSTRUCTION SAFETY

### COURSE OBJECTIVE

This course will enable the students to know about the industry related health hazards and deceases and various methods and process implementation to avoid and eliminate health hazards. Also gives a good theoretical and practical understanding on various safety measures in construction industry. The students can have a thorough knowledge about various hazards involved in the construction industry and hazard control methods, their engineering and management.

#### UNIT I

- **Safety, Health and Environment**
- Occupational Health Hazards
- Control of occupational deceases
- OSHA,
- ILO
- Ergonomics
- Introduction
- Definition
- Objectives
- Advantages

#### UNIT II

- **Principles of Environmental Engineering**
- Pollution Prevention
- Waste treatment
- Disposal of waste
- Standards of Environmental Management System
- Engineering Control Health Hazards
- Material handling safety
- Personal protective Equipments
- Electrical Hazards and safety.

#### UNIT III

- **Introduction of construction industry**
- Construction Safety Organization
- Work permit system

- Hot permit
- Electrical permit
- Vessel entry permit
- Excavation permit
- Confined space entry permit
- Acid area entry permit
- Safety at work
- Machine guarding
- Ventilation
- Lighting

#### **UNIT- IV**

- **Safety at construction site**
- Hazards
- Scaffolding and working platform
- Welding and cutting
- Rigging and hoisting
- Handling and storage of compressed gas
- Excavation work
- Concreting and cementing work
- Transportation of men and material
- Lock out and tag out
- Shoring
- Waste control disposal

#### **UNIT-V**

- **Building construction, TAC and NBC rules**
- Inspection of site, high rise building
- Fire protection introduction to TAC norms
- Earth quake
- Lightning and electrical hazard protection
- Building construction
- Building materials
- Plan reading and method
- Standard, symbols, designation
- Personal hazards
- Fire escape structural precaution
- Floor openings, staircase, escalators etc .
- Fire hazard in a building
- Building collapse and symptoms
- Fire tower/fire escape

## **PRACTICAL**

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### **DRILLS AND PRACTICAL SCHEDULE**

#### **OBJECTIVE**

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

#### **UNIT-I**

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

#### **UNIT-II**

- **Practical training**
- First Aid Fire Fighting Equipments
- Breathing apparatus
- Hydraulic pressure testing
- Industrial exposure training

#### **UNIT-III**

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

#### **NOTE:**

- 1) Drills and practical training will continue through out the year according to unit wise.
- 2) Industrial exposure training may conducts at various industries and organizations.