

**REGULATIONS AND SYLLABUS
FOR
PG DIPLOMA FIRE SAFETY ENGINEERING AND MANAGEMENT**

Offered by

**BHARATHIAR UNIVERSITY, COIMBATORE
FROM 2007-2008**

Under The

**UNIVERSITY INDUSTRY INTERACTION AND
CONSULTANCY SERVICE CENTER (UIICSC)
COLLABORATIVE PROGRAMME**

BHARATHIAR UNIVERSITY

PG DIPLOMA IN FIRE SAFETY ENGINEERING AND MANAGEMENT

COURSE CURRICULUM

REGULATIONS AND SYLLABUS

(EFFECTIVE FROM ACADEMIC YEAR 2007 ONWARDS)

1. DESCRIPTION OF THE COURSE/OBJECTIVE OF THE COURSE

Along with the developments of science and technology the calamities related to industries and environmental pollutions also increased. "Chernobyl and Bhopal" tragedies are a few examples for industry related calamities. The above- mentioned incidents are sufficient enough to understand the importance of industrial safety and other calamities including natural. Due to rapid technological and sophisticated developments globally, safety protection and risk assessment have become essential in the area of environment, health and safety and has become the concern of every government and society. To eliminate accidents in various industries, absolute law and orders, various acts and standardization are in force and are being revised time to time as and when the situation arises. It is a fact that the safety in industries and other related calamities can be made possible not with the laws alone. It absolutely requires proper engineering, education, implementation, enforcement and time based evaluation. The ultimate aim of the safety programme is to prevent accidents or incidents which causes loss of life, injuries to health and damages to property. The reason of an accident can be of much form like natural calamity, fire, explosion, toxicity etc. But the exact cause factors behind of any accident can be of man made from the situation aroused by unsafe act, unsafe condition and casual proximate or contribution of all. Obviation of an unsafe environment is most important for any sort of development.

Every sector possibility of accident is involved especially in this era of ever increasing technology, sophisticated and complicated industrial environment. To promote safety by elimination or prevention of accidents and also if an accident occur, to reduce the severity by all means, various measures are to be taken for both prevention and occurrence. This highlights the functioning of a safety system and has equaled or more importance like any other functioning of day today life where ever it may be. That is why both safety engineering and safety management field is extensively demanding well trained and qualified professionals. The new Safety and Fire legislation code in various nations has made mandatory for the installation of safety, and fire related equipments which clearly indicates the demand of safety professionals.

This can be made possible only by developing safety professionals for both engineering and management through systematic and quality based study programmes. Here the requirements exist for well equipped and quality stringent institutions comparable to international standard.

Keeping the present scenario in mind, NCPT students are exposed to comprehensive and rigorous training events covering all areas of safety and fire engineering and their management and control techniques.

CAMPUS HIGH LIGHTS.

In the new era of exponential growth in industry, agriculture, commerce sector, and the present strategy of investor friendly atmosphere, exploration of newer marketing strategy, globalization etc..., the extensive need of well- trained, qualified and experienced manpower comparable to the international standard has become significant. To develop highly qualified professional manpower the basic requirement lies on systematic, rigorous, and value based coaching and training in advanced science and modern technologies. It is also equally important that while gaining professional skills one should get trained enough to thrust his professional potentiality into the system he trained for.

To achieve excellence in professional education and to make this as a tool for social change for the betterment of the society, NCPT successfully accomplished an eco-friendly campus environment enriched with all required amenities for teaching and learning with quality based and controlled methodology. This extraordinary intellectual, physical, academic, emotional and physical growth environment and other ample opportunities will definitely drive an ambition to great success.

2. ACADEMIC ELIGIBILITY FOR ADMISSION

1. PG Diploma in Fire Safety Engineering and Management Degree in any discipline/
three year diploma in any discipline

3. ACADEMIC DURATION OF COURSE

1. PG Diploma Fire Safety Engineering and Management One year

4. COURSE OF STUDY

The course of study shall contain the subjects as defined in section - 6.

Candidates will be required to undergo learning in theory, practical, project development and workshop subjects in the institution. Candidates will be exposed to real time projects / live practical related safety engineering and management. Candidates also will be exposed to Industrial Exposure visits in related industries in order to get industrial safety and safety management familiarization.

5. EXAMINATION

The student will be undergoing a continuous assessment through out his period of study. The evaluation will consists of Internal assessment (internal examinations), External examination, Viva – voce and practical examination, for each subject based on the specific requirement of the respective subject and is detailed in section -6.

A. ASSESSMENT OF MARKS

Internal	40%
External	60%

B. EVALUATION SYSTEM

Methods of evaluation

- a. Internal Assessment will be conducted by the institution.

b. The External examination will be conducted by the university at the end of the year for subjects mentioned.

c. Practical examination, viva-voce and Project evaluation will be conducted by the institution and University

C. INTERNAL ASSESSMENT;

Further the Internal Assessment will be conducted for 100 marks for all subjects and scaled to 40%

100 Marks is divided as follows

Written Tests	75 Marks
Practical assessments	15 Marks
Record book	05 Marks
Assignments	05 Marks
Total	100 Marks (Scaled to 40%)

D. EXTERNAL EXAMINATION/ASSESSMENT:

The External examination shall be conducted by the university for 100 marks and will be converted to 60% of total marks.

E. PATTERN OF QUESTION PAPER WITH MARKS (FINAL WRITTEN EXAMS)

Theory examination will be for 100 marks with the following components which will be converted into 60 marks.

- Multiple choice / one word answers : 20 x 1 = 20 marks (no choice)
- Short notes (100 words/ one paragraph) : 5x6 = 30 marks (either/or type)
- Elaborate (300 words or 1½ paper) : 5x10 = 50 marks (either/or type)

F. PATTERN OF FINAL PRACTICAL EXAMINATION WITH MARKS

UNIT 1 - Fire Ground Training	Total - 30 Marks
Squad and Hose drill	10
Knots and lines	10
Hydrant/MTU drill	10
UNIT 2 - Practical training	Total - 60 Marks
First Aid Fire Fighting Equipments	20
BA set, Hydraulic pressure test	20
Personal Protective Equipment	20
UNIT 3 - Viva-voce and record books	Total - 10 Marks
Viva-voce	05

6. SCHEME OF EXAMINATION

Sl.No.	Course code	Course title	Internal	External
Total				
01	PGDFSEM101 60 100	Safety and Accident Prevention		40
02	PGDFSEM102 60 100	Fire Technology and Fire loss control		40
03	PGDFSEM103 40 60	Organizational leadership and Safety communication		100
04	PGDFSEM104 100	Safety at Work Place	40	60
05	PGDFSEM105 40 60	Occupational Health and Industrial Pollution control		100
06	PGDFSEM106 60 100	Safety in Construction Industry		40
07	PGDFSEM107 60 100	Fire Prevention in Petrochemical Industries		40
08	PGDFSEM108 60 100	Safety Management and Law		40
09	PGDFSEM109 100	Industrial Project work	40	60
10	PGDFSEM110 100	Practical and viva-voce	40	60
-	-	Total Marks	-	- 1000

7. REQUIREMENTS TO APPEAR FOR THE EXTERNAL EXAMINATION

A candidate will be permitted to appear for the university examination of any year if he / she secures not less than 90% of attendance in the number of instructional days / practical at industry during the calendar year, failing which he/ she should redo that course of study.

8. MEDIUM OF INSTRUCTION AND EXAMINATION

The medium of instruction and examination for the all the papers shall be in English.

9. PASSING REQUIREMENTS

a. A candidate shall be declared to have passed the examination in a subject if he / she secured not less than 50% in the university examination and 50% both internal and external examination (overall).

b. A candidate who successfully completes the course and passes the examinations prescribed in all the subjects of study shall be declared to have been qualified for the PG Diploma in Fire Safety Engineering and Management.

c. If a candidate does not complete the course successfully within a period of 2 years from the date of his / her joining he / she will not be eligible to receive the PG Diploma in Fire Safety Engineering and Management.

10. CLASSIFICATION OF SUCCESSFUL CANDIDATES

a. All candidates securing not less than 75% of the aggregate marks shall be declared to have passed in FIRST CLASS with DISTINCTION provided they have passed the examination in every subject without failure in anytime within the course of study.

b. All the candidates securing not less than 60% of the aggregate marks shall be declared to have passed in FIRST CLASS provided they have passed the examination in every subject

c. Other successful candidates shall be declared to have passed the examinations in SECOND CLASS

12. SYLLABUS

Detailed syllabus for the course is as follows.

NO OF YEARS-1

Sl.No.	Course code	Paper Name/Course title
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01	PGDFSEM101	Safety and Accident Prevention
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02	PGDFSEM102	Fire Technology and Fire loss control
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03	PGDFSEM103	Organizational leadership and Safety communication
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04	PGDFSEM104	Safety at Work Place
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05	PGDFSEM105	Occupational Health and Industrial Pollution control
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06	PGDFSEM106	Safety in Construction Industry
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07	PGDFSEM107	Fire Prevention in Petrochemical Industries
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08	PGDFSEM108	Safety Management and Law
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09	PGDFSEM109	Industrial Project work
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10	PGDFSEM110	Practical and viva-voce
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COURSE CODE - PGDFSEM 101

COURSE TITLE - SAFETY AND ACCIDENT PREVENTION

OBJECTIVE :

To create a strong foundation in basic aspects of industrial safety and accident prevention. Also targets to effectively understand about Various theories and methodology and policies applied by the industries to reduce and eliminate accidents.

UNIT - I

- Introduction to industrial safety
- Importance of safety in industry
- Definitions: Safety, Accident, Injury, Hazards etc.

- Cause of accident
- Cost of accident – direct & indirect
- Social cost
- Near miss accident
- Reportable accident
- Dangerous occurrence.

UNIT - II

- Principles of accident prevention

- Accident prevention programmes.
- Safety policy
- Safety organization
- Safety department
- Safety committees

UNIT – III

- Duties and responsibilities of safety officer.
- Safety promotion role by:
- Government
- Management
- Supervisor
- Workers
- Trade union.

UNIT – IV

- Theories of accident occurrences
- Accident Ratio Study
- Domino theory
- multiple causation theory
- Epidemiological theory.
- Investigation of accident – process
- preparation of accident Investigation Report
- Accident Reporting.

UNIT - V

- First Aid – Fundamentals
- Burns
- Fractures
- Suffocation
- Bleeding wounds
- Bandaging and artificial respiration
- Handling and transportation of injured person
- CPR.

1. Courseware to be provided by the institution
2. Reference books are enclosed in annexure 1

COURSE CODE - PGDFSEM 102

COURSE TITLE - FIRE TECHNOLOGY AND FIRE LOSS CONTROL

OBJECTIVE

This course teaches the basic fire chemistry, principles of fire, structural approach to various fire fighting equipments, systems and process. The course will also emphasis working principle, operation, maintenance, transportation and safe custody of modern and sophisticated fire fighting appliances and systmes Course also targets to understand various fire prevention measures.

UNIT - I

- Chemistry of Fire
- Oxidation
- Slow – rapid – spontaneous combustions
- chain reaction
- Flash point & Fire point
- ignition temperature
- Classification of Fire
- Methods of extinguishment
- First aid fire fighting arrangement
- Types of fire extinguishers

UNIT - II

- Fixed Installation:
- External hydrant
- Ring mains
- Hose reels
- wet and dry riser
- Automatic sprinkler system
- Deluging system
- Drencher system
- Pre-mixed foams solutions
- Fire alarm system
- Flooding system.

UNIT - III

- Hydrostatic: Hydrostatic pressure
- Absolute and gauge pressure
- Pressure reassurances
- hydrostatic forces
- Hydro dynamics : Introduction
- Basic parameters of flow
- Newton's Laws applied to fluids
- Work, energy and power
- Law of conservation.
- Flow in pipes and fire loses
- Hydraulic and energy guide lines
- Friction losses in pipes and loses
- Rule of hump computations

UNIT - IV

- Pumps and classification
- Discharge and suction head
- Pressure and power requirements
- Starting and trouble shooting
- Pump testing and relay operation.
- water hammer
- Parallel and series connections
- Branching lines, local losses

UNIT - V

- Fire streams
- Introduction
- discharge from a nozzle
- range of a good fire stream
- Fire loss control :
- Principles of fire loss prevention
- fire protection manual.
- Fire safety data sheet

1. Courseware to be provided by the institution
2. Reference books are enclosed in annexure 1

COURSE CODE - PGDFSEM 103

**COURSE TITLE - ORGANIZATIONAL LEADERSHIP AND SAFETY
COMMUNICATION**

OBJECTIVE

Course targets at preparing the student to effectively communicate, improve written and oral communication, improve listening and comprehensive skills the student would understand etiquettes and improve presentation skills. By improving these skills students can achieve very good leadership qualities and ability to implement safety rules and regulations effectively in an organization and will be able to conduct safety training including various safety documentation.

UNIT I

- **Leadership, Role, Function and Style.**
- Qualities of a good and effective leader
- Different roles and function of a leader.
- Different leadership styles.

UNIT II

- **Communication**
- Introduction, Definition of Communication.
- Definition of Organization
- Key stages in the communication cycle.
- Barriers on Communication.
- Principles of effective Communication.
- Systems or Management Communication.
- Impact of Information Technology on Communication

UNIT III

- **Oral communication and written communication**
- Oral communication practice
- Face to face communication.
- Telephonic conversation
- Interviews, employment interview.
- Non- verbal communication, With visible codes.
- Speaking skills
- Listening skills.
- Written communication
- Features, Choice and Phrases
- Writing skills
- Letter writing, Business letter, Characteristics parts etc....

UNIT IV

- **Internal communication**
- Reports, Preparatory steps, Structure or parts of report, Types of report, Circular,
- Endorsement, Memorandum.
- Meeting documentation
- Meeting in business
- Notice
- Agenda
- Minutes

UNIT V

- **Managerial communication**
- Communication as a tool of management
- Frustrations.
- Conflicts
- Attitude towards safety
- Communication with employees
- Conducting training
- Important of role playing in training.

1. Courseware to be provided by the institution
2. Reference books are enclosed in annexure 1

COURSE CODE - PGDFSEM 104

COURSE TITLE - SAFETY AT WORK PLACE

OBJECTIVE

This course will covered extensively about, how safety can be achieved through engineering control measures at various work places. On completion of this course the student will have clear risk analysis capacity, correct and effective safety engineering approaches towards risk and hazards at any place of work.

UNIT - I

- Introduction
- Work place design concepts
- Purchasing policy
- Personal protective equipment,
- Respiratory and non respiratory
- Machinery guard:
- Types of machine guard fixed and removal type

UNIT - II

- Housekeeping: Definition – Advantage of house keeping
- 5's concept of house keeping
- Industry hygiene's
- Material handling
- Safety steps of manual handling
- mechanical handling
- types of mechanical handling.

UNIT - III

- Ventilation
- Natural ventilation
- Delusion ventilation
- Mechanical ventilation
- Local exhaust ventilation
- Advantages of ventilation
- Lighting
- Artificial lighting
- Types of artificial lighting
- Advantage of illumination

UNIT - IV

- Ergonomics
- Office ergonomics
- Definition
- Objectives
- Physical aspects of muscular work
- Work place design
- Remedies

UNIT - V

- Work permit and NOC
- Definition
- Types of work permit
- Hot permit
- Cold permit
- Excavation permit
- Confined space entry permit
- Acid entry permit

- Preparation of work permit.
- 1. Courseware to be provided by the institution
- 2. Reference books are enclosed in annexure 1

COURSE CODE - PGDFSEM 105

**COURSE TITLE - OCCUPATIONAL HEALTH AND INDUSTRIAL POLLUTION
CONTROL**

OBJECTIVE

The object of the course is to understand the health related problems and disease related with various occupation. It also included the measures which are to be taken to avoid occupational related health problems. It is also aimed a detailed study about environmental engineering and various pollution control methods adopted by various industries.

UNIT - I

- Introduction
- Industrial Hygiene and Environmental Engineering
- Occupational Health

- Common occupational diseases – Mode of causation and effects.
- Prevention and control
- Evaluation of injuries
- Medical Examinations
- ILO recommendations concerning occupational health services
- Health records.
- Work Physiology
- Classification of work load – work capacity and man – job alignment.

UNIT - II

- Industrial Hygiene
- Physical hazards: Noise
- Vibration
- Improper illumination
- Thermal radiation
- X-rays and UV radiations
- Ionizing & non ionizing radiations
- Effects of exposure
- Maximum permissible exposure limits
- Preventive & control measure

UNIT - III

- Chemical hazards
- Dangerous properties of chemicals
- Dusts
- Gases
- Fumes
- Mists
- Vapours
- Smoke
- Threshold limit values material safety data sheets

UNIT - IV

- Environmental Engineering
- Pollution prevention
- Air pollution
- Nature of pollution
- Control devices
- Wet & dry scrubbers
- Filters
- Electrostatic precipitators
- Absorption and incineration process.
- Water pollution
- Physical & Chemical pollutants
- Biological
- Radio active pollutants and sources of water pollutants

UNIT - V

- Industrial waste control
- Stream pollution
- Liquid waste solid waste
- Gaseous waste and their harmful effects
- Waste control
- Waste treatment

- Physical treatment
 - Sedimentation
 - Flotation and filtration
 - Chemical treatment
 - Neutralization of acidic or alkaline waste
 - biological treatment
 - Trickling filters
 - Ultimate disposal of waste
1. Courseware to be provided by the institution
 2. Reference books are enclosed in annexure 1

COURSE CODE - PGDFSEM 106

COURSE TITLE - SAFETY IN CONSTRUCTION INDUSTRY

OBJECTIVE

The target of this course is to create extensive and thorough knowledge on safety aspects to be observed and implemented through engineering methods and management concepts in any construction industry. It also elaborates various hazards involved in the industry and hazard control measures. On completion of this course students will be capable enough to work with safety department of any construction industry.

UNIT - I

- Introduction
- Building material
- Floor
- Opening
- Joints

- Stares
- Symptoms of building collapse
- Building plan
- Plan reading
- Symbols and abbreviation.
- Site layout
- site tidiness

UNIT - II

- Work at height
- Scaffolding
- Types of scaffold
- hoisting and lifting work
- falls and flying objects
- ladder safety
- concreting and cement work
- Shoring

UNIT - III

- Material handling:
- Manual handling
- Mechanical handling
- cranes and fork lifts
- powered equipments
- other material handling machinery
- Rigging

UNIT - IV

- Lock out and Tag out
- Personal protective equipment
- Construction house keeping
- Electrical safety
- Excavation
- confined space entry
- welding and cutting operation

UNIT – V

- Special fire safety in construction field
- Fire prevention
- Fire protection
- Site organization
- Emergency communication
- Escape plan and emergency meeting station
- Storage and handling of explosives and compressed gas

1. Courseware to be provided by the institution
2. Reference books are enclosed in annexure 1

COURSE CODE - PGDFSEM 107
COURSE TITLE - FIRE PREVENTION IN PETROCHEMICAL INDUSTRIES

OBJECTIVE

Since the hydro-carbon related industries are more prone to fire, explosion and other hazards, an extensive and thorough knowledge about petrochemical industry is required. Through this course students will achieve well awareness about the safety measures in petro-chemical industry including knowledge about modern equipments and systems used in the industry.

UNIT - I

- Introduction
- Toxic Chemicals
- Dusts, gases, fumes, vapours and smoke

- various exposure
- Effects
- Threshold limits
- Health hazards, health disorders.
- Static electricity, earthing
- Non sparking tools
- Spark arrestors etc.

UNIT - II

- Receiving and storing chemicals
- UN and other classifications of chemicals
- Transportation of chemicals
- Hazchem code
- Storage work permit systems
- Hot work
- Confined space work permit
- Flammable gas, dust, vapour etc.

UNIT - III

- Pipe lines in chemical factories
- Colour coding
- Air sampling
- Pressure vessels steam lines
- Toxic releases
- BLEVE.

UNIT - IV

- Inspection techniques for plants
- Reaction of vessel
- Reliability of vessels, test, corrosion
- Precautions in explosives
- Flammable solids liquids gases & vapours
- Vapours cloud formations and combating.

UNIT - V

- Petrochemical Industries
- Fire & explosion hazards
- Control facilities and their uses
- Petroleum refineries and oil rigs
- Refinery fires
- Tank fires and explosions, control facilities
- Rescue operations.

1. Courseware to be provided by the institution
2. Reference books are enclosed in annexure 1

COURSE CODE – PGDFS 108

COURSE TITLE - SAFETY MANAGEMENT AND LAW

OBJECTIVE

The purpose of this course is to make the students to understand the handling of various safety management techniques and planning's to achieve complete safety. It also teaches different safety laws, acts and statutory matters concern with safety department.

UNIT - I

- Introduction
- Safety Management
- Roll and functioning
- Risk

- Hazard

UNIT - II

- Risk assessment
- Risk control
- Risk avoidance
- Risk retention
- Risk transfer
- Risk reduction
- Risk assessment process
- Probabilistic Risk assessment

UNIT - III

- Damage control
- Total loss control
- System safety analysis
- Hazard operability study
- Failure mode effect analysis
- Fault tree analysis
- Job safety analysis

UNIT - IV

- Emergency planning and disaster management
- Natural calamities
- Fire explosion
- Toxic gas release
- Industrial explosion
- On site emergency plan
- Off site emergency plan
- Mock drills
- Compensations and fire insurance

UNIT - V

- Laws on safety (Introduction and objectives):
- Factory act
- Workmen compensation act
- Indian boilers act
- Indian Electricity act and rules
- Indian explosives act
- Gas cylinder rules
- Environmental protection act
- Insurance laws

1. Courseware to be provided by the institution
2. Reference books are enclosed in annexure 1

COURSE CODE - PGDFSEM 109

COURSE TITLE - INDUSTRIAL PROJECT WORK

OBJECTIVE

One month in-company training programme for the purpose of study, familiarization and preparation of industrial safety and fire management system.

COURSE CODE - PGDFSEM 110

COURSE TITLE - PRACTICAL

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.

16. 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	Daniel Limmer, Michael Grill, IFSTA Senior Editor-Michael A Wieder
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 systems.	RK Jain and Sunil S Rao