REGULATIONS AND SYLLABUS

FOR

DIPLOMA IN FIRE SAFETY ENGINEERING AND MANAGEMENT

Offered by

BHARATHIAR UNIVERSITY, COIMBATORE

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Under The

UNIVERSITY INDUSTRY INTERACTION AND

CONSULTANCY SERVICE CENTER (UIICSC)

COLLABORATIVE PROGRAMME

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. Diploma in Fire Safety Engineering and Management +2/ITI/equivalant

3. ACADEMIC DURATION OF COURSE

1. Diploma in 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 with 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 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 and viva-voce - Will be conducted by the Institution and University

C. INTERNAL ASSESSMENT;

Further the Internal Assessment will be conducted by the institute 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/extra curricular activities	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
Squadron 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
Breathing apparatus	20
Personal Protective equipment	20
UNIT 3 - Viva-voce and record books	Total - 10 Marks
Viva-voce	05
record books	05

Total 100 - Marks

6. SCHEME OF EXAMINATION

Sl.No.	Course code	Course title		Internal	External	Total
01	DFSEM101	Fundamentals of Fire Engineering Science		40	60	100
02	DFSEM102	Fire control Technology	40	60	100	
03	DFSEM103	Principles of Industrial Safety and Accident Prevention	40	60	100	
04	DFSEM104	Leadership and Communication	40	60	100	
05	DFSEM105	Risk Management and hazard control system	40	60	100	
06	DFSEM106	Health, Safety, Environmental Engineering and Construction Safety	40	60	100	
07	DFSEM107	Practical, viva-voce, record book	40	60	100	
	Total				700	

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 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 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
01	DFSEM101	Fundamentals of Fire Engineering Science
02	DFSEM102	Fire control Technology
03	DFSEM103	Principles of Industrial Safety and Accident Prevention
04	DFSEM104	Leadership and Communication
05	DFSEM105	Risk Management and hazard control system
06	DFSEM106	Health, Safety, Environmental Engineering and Construction Safety
07	DFSEM107	Practical, viva-voce, record book

COURSE CODE: DFSEM: 101

COURSE TITLE: DFSEM: FUNDAMENTALS FIRE ENGINEERING SCIENCE

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 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

UNIT - V

- **Fixed fire fighting installations not using water**
- Complete CO2 flooding system
- Complete DCP spraying system
- Complete Halon flooding system
- Investigation of fire
- Point, Time and cause of ignition
- Arson and detection of fires

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

COURSE CODE : DFSEM-102:
COURSE TITLE: FIRE CONTROL TECHNOLOGY

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
- 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 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

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

COURSE CODE : DFSEM-103:

COURSE TITLE: PRINCIPILES 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

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

COURSE CODE : DFSEM-104

COURSE TITLE: LEADERSHIP AND COMMUNICATION

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

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

COURSE CODE : DFSEM-105
COURSE TITLE: RISK MANAGEMENT AND HAZARD CONTROL SYSTEM

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)

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

COURSE CODE : DFSEM-106

COURSE TITLE: 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

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

COURSE CODE : DFSEM-107

COURSE TITLE: PRACTICALS

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.

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