

BHARATHIAR UNIVERSITY : COIMBATORE-641046

B.Sc. FIRE SAFETY & HAZARD MANAGEMENT

(For the CCII students admitted from the academic year 2017-18 onwards)

SCHEME OF EXAMINATION - CBCS PATTERN

Part	Course Title	Ins. Hrs/ Week	Examination				Credits
			Dur. Hrs	CIA	UnitExam	Total Marks	
Semester -I							
I	Language I	6	3	25	75	100	4
II	English – I	6	3	25	75	100	4
III	Core -1 - Safety Management	4	3	25	75	100	4
III	Core - 2 - Fire Science	6	3	25	75	100	4
III	Core - 3- Fire Technology - Part - I	3	3	25	75	100	4
III	Core - 4- Industrial Safety	4	3	25	75	100	4
III	Allied 1- Organization & Administration Management	4	3	25	75	100	4
IV	Environmental Studies #	2	2	-	50	50	2

Semester -II							
I	Language - II	6	3	25	75	100	4
II	English –II	6	3	25	75	100	4
III	Core - 5- Fire Technology Part -II	4	3	25	75	100	4
III	Core - 6- Emergency Planning& First Aid	4	3	20	30	50	2
III	Core - 7- Controlling of Environmental Pollution	5	3	25	75	100	4
III	Core - 8- Practical - Squadron & Hose Drill	2	2	20	30	50	2
III	Allied 2- Security Management of Industrial Plants	4	3	25	75	100	4
IV	Value Education- Human Rights #	2	2	-	50	50	2

Semester - III							
III	Core - 9- Chemical & Environmental Hazards	4	3	25	75	100	4
III	Core - 10- Industrial Safety Analysis	6	3	25	75	100	4
III	Core - 11- Industrial Noise & Its Control	4	3	25	75	100	4
III	Elective –I	6	3	20	55	75	3
III	Elective –II	6	3	20	55	75	3
III	Allied 3- Industrial Psychology, Ergonomics & Accidents	4	3	25	75	100	4
IV	Skill based subject 1- Construction Industrial safety Part - I	2	2	20	55	75	3
IV	Tamil@/ Advanced Tamil# or Non -Major Elective -I Yoga for human excellence# / Women's Rights# / Constitution of India	2	3	-	50	50	2

Semester – IV							
III	Core - 12- Safety Training for Employees & Human Resource Development	6	3	25	75	100	4
III	Core -- Practical - Knots & Lines and Fire Extinguisher, Hose Drill	3	2	20	30	50	2
III	Core - 13- Social security in industry	6	3	25	75	100	4
III	Elective- III	5	3	20	55	75	3
III	Allied 4 - Communication & soft skills	4	3	25	75	100	4
IV	Skill based subject 2- Safety in Power Plant	3	2	20	55	75	3
IV	Tamil @/-Advance Tamil or Non Major Elective II General Awareness #	3	3	-	50	50	2
Semester – V							
III	Core - 14- Radiation Hazards	6	3	25	75	100	4
III	Core - 15- Occupational Health Hazard & Preventive Measures	6	3	25	75	100	4
III	Core - 16- Disaster Management	6	3	25	75	100	4
III	Core - 17- Energy Conservation & Sustainable Development	4	3	25	75	100	4
III	Elective – IV	2	2	20	55	75	3
IV	Skill based subject 3-Construction Industrial Safety Part – II	2	2	20	55	75	3
IV	Skill based subject 4- Personal Protective Equipments	2	2	20	55	75	3
Semester – VI							
III	Core - 18* Practical - Ladder and BA set & Small Gear			40	60	100	4
III	* Project & Viva					150	6
Total						3500	140

List of Electives

College can choose any one of the paper as electives

SUBJECT	TITLE
Elective I	Safety Management of Plants during commissioning & Maintenance
	Principles of Risk Management
Elective II	Nuclear Radiation Hazards
	Fire Polices & Indian Legislative act in Industrial safety
Elective III	Lay out & Design of Fire Detection System
	Plan Lay out and Design of hydrants
Elective IV	Design & Lay out of automatic Extinguishing system
	study on sprinklers

@ No University Examinations. Only Continuous Internal Assessment (CIA)

No Continuous Internal Assessment (CIA). Only University Examinations.

* project works practical & Viva Voce for report 80% marks & Viva Voce 20% marks

* Self contained breathing apparatus

PROJECT WORK (ON JOB TRAINING) – MARKS – 150

On successful completion of five semesters- the students proceed to their final semester where they will undertake six months On Job Training related to on site Safety Management- Risk Assessment- Inspections- Supervision- Fire fighting etc. They will be carrying out this project at small/medium/heavy construction sites or Industries.

During this period the students will perform various activities related to Safety management like conducting the Tool Box Talks- performing Risk Assessment & developing control strategies- implement Safe Systems of Work- develop work method statements thereby gaining professional hands-on experience in their chosen area. This enables the students to attain the level of competency required for entry into the Safety Management stream. It also empowers the students to shoulder higher responsibilities within the Safety Management System at a younger age. This Project can also result into enhancing the employability of the student, thus a placement in the same site/company can also be achieved by the students if they perform better in their role.

Core -1 - Safety Management

Objective: The objective of safety management is to minimize the chances of risks, injuries and accidents. This is achieved by implementing risk management techniques and safety management operations, improving the standard of health of employees, monitoring the operating systems and bolstering the safety measures adopted by various industries. As natural disasters are happening quite often across the globe the significance of human life, importance of protecting and conserving the environment. With the rise of natural disasters in and around our world, awareness regarding the importance of the safety of human capital, protection of the environment and conservation of existing assets of an industry is also increasing. As a result, more and more students are enrolling for courses on safety management.

UNIT I

Fundamentals of Safety - Need for Safety- Definition : Accident, Near miss -Accident Sequence : Heinrich Triangle & Domino Theory - Causes of accidents Classification of accidents - Reasons for accident prevention - Methods of accident prevention

UNIT II

Responsibility of management towards Safety - Unsafe acts and unsafe working conditions - Cost of accidents - Role of management, Supervisors and workers in safety - Motivation for safety

UNIT III

Need for integration of Safety Health and Environment (S, H & E) - Safety and government role - Safety act and provisions for worker's welfare - General Instructions for Safety - Approaches to prevent accidents - Factory act 1948 and amendment 1987

UNIT IV

Introduction to Safety and Safety Management - Principles of Safety Management - Planning: Types of plans, steps in planning, and process of planning. - Nature of objectives, setting objectives. - HSE Policy - Project HSE Plan - Statutory requirements, Rules and Regulations - Supervision

UNIT V

Safe work place - Objectives of Safety and Security measures - Site Security, Fencing and gates, Security personnel their role in safety, lighting - Objectives of Safety Management - Record keeping

REFERENCE BOOKS:

1. Construction Safety Hand Book – Muraleedharan Pillai
2. Industrial Safety Management – NK Tarasdar, KJ Tarasdar
3. Industrial Safety, Health and Environment Management Systems – RKJain

Core -2- Fire Science

Objective: Fire Science includes the study of the processes to prevent any kind of accident fires and in case they do break out, to control them. It also teaches the students the necessary elements of first aid, that they may be required to administer in case of an emergency. Fires in industries, residential buildings or public places need to be tended to immediately in order to prevent any harm to individuals, property and resources. Therefore, fire fighters need to be knowledge about the fire-fighting equipment operation and maintenance, principles of the fire science and combustible substances, methods of controlling different types of fires, hazardous material handling and control and fire rescue procedures.

UNIT I

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

UNIT II

Terms and Definitions: Molecule, Atom, valancy, Oxidation, Elements, Compound, exothermic reaction, Endothermic reaction, Calorie, Specific heat, Matter, Temperature, Mixture.

UNIT III

Basic Chemistry of fire

Chemical reaction - Heat formation - Heat of combustion - Mechanism of combustion
Flash Point fire Point - Spontaneous Ignition Temperature

UNIT IV

Fire Chemistry

Atomic structure - Elements, compounds - Pure substance and mixture - Physical and chemical changes - Condition for the changes - Energy changes

UNIT V

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 - Flammables and combustible chemicals - Spontaneous combustion

Reference:

Principles of Physical Chemistry – Dr. BR Puri, Dr. LR Shama, Mr.Patania
Thermodynamics – Dr. JC Kuriakose, Dr. J Raja Ram
Engineering chemistry – Jain & Jain

Core-3- Fire Technology Part -I

Objective : This module will enable the students to learn 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 practical related equipments and systems.

UNIT I

Fire - Fire triangle Components of fire - Fire Tetrahedron - Chain reaction - State of matter - Spread of Fire - Extinction of Fire - Quenching of free radicals - Back drought - Delayed Back drought

UNIT II

Classification of Fire - Class A Fire - Class B Fire - Class C Fire - Class D Fire Class E Fire - Class K Fire - Electrical Fire - Extinguishing media for various class of Fire

UNIT III

Properties of solid, liquids and gas. - Prevention of Fire - Causes of initiation of Fires

UNIT IV

Foam

Definition - Qualities of good foam - Types of foam - Chemical foam, mechanical foam, Venturi effect

UNIT V

Hose and Hose Fitting

Definition - Types of hoses - Delivery hose, types of delivery hose, lined hose, unlined hose - Characteristics of hose - Advantages and disadvantages of lined and unlined hose - Care and maintenance of hoses. - Storage and use of hoses - Couplings, Adapters, Breaching piece, Nozzles, inductors, electro magnetic relay, Hose reels
Hose drill

REFERENCE BOOKS:

1. Industrial Safety Management – N.K Tarasdar, K.J Tarasdar
2. Industrial Safety, Health and Environment Management Systems – R.K Jain

Core- 4- Industrial Safety

Objective: Workers in industries like fire safety and construction are always exposed to various risks and hazards which may even turn out to be fatal. Minor accidents could also lead to extreme consequences. However, proper planning of activities and appropriate implementation of safety regulations can help in avoiding them. Therefore, the workers in these industries should not just be careful but also be attentive about possible dangers. The protective gear should be worn properly and safety inspections should also be carried out regularly.

UNIT I

Industrial Hazards

Physical hazards - Chemical hazards - Mechanical hazards - Biological hazards - Ergonomic hazards- Noise hazards - Chemical safety – Toxicity - IDLH (Immediate Danger to Life and Health) - Chemicals - Storage, Handling and Transportation - Preventive measures for chemical spillage - Transport Emergency Card (TREM Card)

UNIT II

Electrical Safety

What is electricity - Safety in use of electricity - Dangers from electricity - Importance of safety equipment in design and use of switches, switch fuses, circuit breakers and isolating lines - Over load and short circuit protection - Earth fault protection - Earthing of electrically driven equipments – ELCB – Precautions - Static electricity Electrical shock treatment - Points to be checked at the electrical system

UNIT III

Workshop Safety

Hand tools and Power tools - Safety while using Grinding stone - Welding and gas cutting safety - Dangerous points - Lubrication Safety

Petroleum Refineries

Refinery Process - Classification of Petroleum Products - Storage Tanks

UNIT IV

Hazard Evaluation Techniques - HAZOP Study - Job safety analysis - Fault tree analysis - Event tree analysis - Failure modes and effects analysis - Relative ranking techniques

Monitoring of Safety Performance

Statistics of accidents - Frequency rate and severity rate - Frequency severity incidence - Safe – T – score

UNIT V

House Keeping – Definition - Need for house keeping - Importance in view of safety - Methods

Safety Inspections

Safety Audit - Safety Survey - Plant safety inspection - Safety tour - Safety samplings

REFERENCE BOOKS:

1. Industrial Safety Management – NK Tarasdar, KJ Tarasdar
2. Industrial Safety, Health and Environment Management Systems – RK Jain

Allied-1- Organization & Administration Management

Objective: In any organization company or establishment smooth functioning can be ensured only through proper organization administration and management. Organizing is an activity comparable to setting up a machine. It is important for all the parts of the machine, big and small, to be put together with accuracy and precision for the machine to function smoothly. However, once the machine is ready, proper administration is required to ensure that all the parts function smoothly. Therefore, organization and administration are inseparable. While the former defines the pre-execution stage, the latter is the execution stage. The responsibility of the management, on the other hand, is to determine a common goal; to ensure that employees and all those associated with the organization are aware of the goals and vision of the organization: to see it to that all policy matters are handled carefully; to educate and train the staff and ensure that the objectives/goals are met. Like many other things, the three elements of an establishment, organization, administration and management are together responsible for the safety of those associated with it, mainly the employees.

UNIT I

Introduction – Objectives - Basic Safety Programming - Safety Department

UNIT II

Management Responsibility for Safety - Safeguarding Public - General Safety Rules
Responsibilities of Government - Responsibilities of Social Organizations -
Responsibilities of Public Authorities

UNIT III

Principles of Management Functions of Manager – Planning – Organising – Staffing –
Leading – Controlling – Leadership – different leadership styles - the importance of
vision- the motive to lead- and organizational climate

UNIT IV

Effective leadership - Include influence- follower motivation and effective followership -
role of ethics and values in guiding organizational behaviour - methods used to effectively
manage groups and teams.

UNIT V

Safety Activities of ILO - Maintenance and Safety - Factories Act – 1948
Inspection and certifying

References

1. Industrial Safety Management – LM Deshmukh
2. ILO Convention – 155 & Recommendation – 164
3. Indian Factories Act 1948

Core-5- Fire Technology Part –II

Objective : This module will enable the students to learn 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 practical related equipments and systems.

UNIT I

Pumps – Definition - Types of pumps, Centrifugal force - Working principle of each type of pump - Reasons for failure of pump - Care and maintenance

UNIT II

Primers -Definition -Necessity of primers in fire fighting - Type of primers, Working principle of each type of primer - Effect of atmospheric pressure on water when primer is used -Care and maintenance

UNIT III

Fire Fighting Special Clothing

Basic Fire protective clothing - Advantages of wool over cotton, Full fire fighting rig, Type of suits.- Donning procedure, Washing, re-proofing, Care and maintenance - Fire Proximity Suit - Fire Entry Suit - Thermal Imaging

UNIT IV

Fire Fighting Vehicles and Appliances

Domestic Fire Tenders - Crash Fire Tenders – Water Tenders

UNIT V

Aircraft Crash Rescue and Fire Fighting

Definitions - Layout of a standard airfield - Airfield Markings - Runway Lighting - Rescue Operations

REFERENCE BOOKS:

Fire Service first Responder Daniel Limmer – Micheal Grill
Fire Equipment – David L Bever

Core 6- Emergency Planning & First Aid

Objective : Emergency planning refers to the process of planning the desired course of action to be taken in the case of mishaps or accidents that may occur. It is better to be prepared for such occurrences instead of being overwhelmed when they take place. However, it also includes responding to a disaster in a composed and sorted manner. Both precaution and response are equally important in emergency planning. When such disasters occur, individuals who have a basic knowledge of administering first aid are of great help. Therefore, emergency planning and first aid go hand in hand.

UNIT I

On-site Emergency Planning

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

Off-site Emergency Planning

Off-site Emergency Plan - Mutual Aid Scheme - Emergency Evacuation - Security and Media management

UNIT II

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 III

First Aid

Introduction - Principles of First Aid - Training in First Aid - General rules of First Aid – Shocks - Electrical Shock - Artificial Respiration - Fainting – Poisoning - Open Wounds - Control of bleeding and Scalds - Heart Attack

UNIT IV

Basic CPR Skills Chest compressions – Rescue breaths – primary assessment : unresponsive person – **Basic Life Support Care** : unresponsive & breathing – unresponsive & not breathing – automated external defibrillators – basic AED operation – using an AED – trouble shooting – choking

UNIT V

Burns & sudden illness Burns – chemical burns – electrical burns – Caring for sudden illness – warning for sudden illness – altered mental status – stroke – diabetic emergencies – seizure – breathing difficulty- shortness of breath – Asthma – severe allergic reactions – pain – severe pressure – discomfort in the chest – severe abdominal pain – Poisoning – ingested poisoning – inhaled poisoning – Heat exhaustion – Heat stroke – hypothermia – frost bite

References:

1. Heart saver 1st Aid CPR AED Student Book - Laedral
2. St. John Ambulance Reference Guide on First Aid

Core 7- Controlling Environmental Pollution

Objective: This module Controlling Environmental Pollution aims at creating awareness about environmental pollution and the dangers that it poses to the health of all life. The natural environment, includes all living and non-living things that occur naturally on Earth or some region thereof. It is an environment that engulfs the way in which all living species interact with one another. Our natural environment is extremely beautiful and a little care and precaution can go a long way in ensuring its safety and purity. An attempt at keeping the environment pure and pollution-free will ensure the safety and well-being of all living things.

UNIT I

Introduction - Survival of the environment - Conflict between North and South - Endangered Earth - Environmental Control Regulations -Control through education Impact Assessment –

UNIT II

Prevention and control of pollution - Central Pollution Control Board

UNIT III

Approaches to environmental Regulation - Concept of Industrial Ecology - Environmental Management System - Compliance to Legislations - Environmental Standards - ISO 14000 - International Environmental guiding Principles

UNIT IV

Environment Management - Integrated approach in managing Safety & Environment - Development process towards sustainability - Management and waste disposal system - Hazardous Waste Management

UNIT V

Environmental standards ISO 14000 – ISO 14000 standards and benefits of Environmental Management system – International environmental guiding principles – International Chamber of commerce chapter for sustainable development – environment management

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain
2. Industrial Safety & Environment - Anupama Prashar
3. Environmental Management – NK Uberoi

Core 8- Practical-Squadron & Hose Drill

UNIT I

PERFORM THE SQUAD DRILL AND TO VERIFY IT'S APPLICATIONS IN FIRE SERVICES: Identification of Squad Drill- Working of Squad Drill and Importance of Squad Drill. What is Squad- Procedure for Formation of Squad- File- Rank- Sizing- Fall in- Fall Out Various types of Cautions given to the Squad.

UNIT II

IDENTIFY AND PERFORM THE MOVEMENTS OF A SQUAD : Attention- Stand at ease- Stand easy- Mark time- Double mark time- Right dress- Left dress- Dress up- Open order march- Close order march- Forward march- Backward march- Steps to the right- Steps to the left- Directions of a Squad- Turning to the left- Turing to the right- Right about turn- From the right number- As you were- Proving of Parade.

UNIT III

IDENTIFY THE MARCHING OF A SQUAD: Quick march- Double march- Slow march Right turn- Left turn- Halt- Forward- Break up- Change direction- Change formation Reformation of Squad- Saluting- Reporting- Getting on Parade- Inspection Parade- Guard of honor.

UNIT IV

PERFORM FIRE FIGHTING HOSE DRILL: Hose Drill Actions: Lifting hose- Lowering hose- Carrying hose- Laying hose- Connect hose- Disconnect hose- Under running- Remove the kink- Rolling. Identification of different types of hose fittings and their uses.

UNIT V

PERFORM HYDRANT DRILLS: 3 -man Hydrant Drill: Drill procedure with application of Hose and Hydrant Fittings: Add one length of hose- Remove one length of hose- Replace the burst Hose- Divide one line into two line using Dividing Breeching- Collect two line into one line using Collecting Breeching- Hydrant Gears and its operation.

Allied 2- Security Management of Industrial Plants

Objective: This module Management of security risks applies the principles of risk management to the management of security threats. It consists of identifying threats (or risk causes)- assessing the effectiveness of existing controls to face those threats- determining the risks' consequence(s)- prioritizing the risks by rating the likelihood and impact- classifying the type of risk and selecting an appropriate risk option or risk response.

UNIT I

Introduction to security management Introduction – Loss prevention – External threats – Internal Threats - Need of Security Arrangements in Industrial Plants – Risk options – risk avoidance – risk reduction – risk spreading – risk transfer – risk acceptance - Security Program - Fencing and Walls - External Landscape – Lighting

UNIT II

Security Policy implementations Alarm System – burglar alarms – alarm clocks – distributed control systems – first out alarm – civil defence siren – Alarm management – warning systems - Visitor Entry Pass - Employee entry Pass – Communication - Safe Keys and Locks

UNIT III

Security personnel management Security Guard Force - Check List for Plant Security - Security Staff Parade Drills – Discipline - Record Keeping – arson control – radio operation – bouncer – door man – body guards

UNIT IV

Physical Security Protection from espionage- theft & terrorist attack – Deterrence methods – Physical barriers – natural surveillance – security lighting – Intrusion detection and electronic surveillance – sensors – video surveillance – Access control – Mechanical & electronic access control systems – Identification systems and access policies

UNIT V

Security Procedures Jurisdiction – Organisation and structure – Internal affairs – Police agencies – coordination with external law enforcement agencies – dealing with public – press reporters – fraud management – mock drills

Reference :

1. Effective Security Management- Sixth Edition - Charles Sennewald
2. https://en.wikipedia.org/wiki/Security_management#Physical_security

Core 9- Chemical and Environmental Hazards

Objective : This module will enable the students to know about the chemical and environmental hazard. How to prevent / control these hazards and also gives a good theoretical knowledge about safeguarding the industry.

UNIT I

Definitions:- Toxicity – Flammability – Spontaneous – Ignitibility- Chemical reaction
- Flammable liquids- Solid and gas – Oxidizing ability - Characteristics of chemical substance (Physical Chemical Hazards)

UNIT II

Introduction - Multiple effects of Chemicals - Industrial Toxicology - Toxic Chemicals and its harmful effects on Humans - Harmful effects of Chemicals - Factors influencing the effects of Toxic Materials - Units of concentration

UNIT III

Chemical Hazards Exposures - Safety Analysis - Control Measures - Management of Workplace Exposure - Plant Operations - Dust Explosions

UNIT IV

Introduction to Environmental Hazards - Terms and Definitions – Pollution - Environment Pollutants - Energy, Man and Environment - Law of Conservation of Energy – Thermodynamics

UNIT V

Environmental management system (EMS) – Environmental space ISO 14000- Effect of air pollution on our cultural assets – Effects to human health due to pollution – Environmental Impact assessment – Environmental engineering.

References:

1. Industrial Safety, Health and Environment Management Systems – R K Jain
2. Thermodynamics – Dr. J C Kuriakose, Dr. J Raja Ram

Core 10- Industrial Safety Analysis

Objective: Industrial safety is essential for all industrial plants in which there are potential hazards. These industries include oil and gas plants, nuclear plants and construction. Various guidelines have been laid down in order to protect humans, equipment and the environment against such hazards. Though these guidelines do not alter the process itself, they provide a degree of protection to possibly hazardous situations. The analysis of such guidelines and possibly hazardous situations is essential in order to be able to avert them.

UNIT I

Introduction - Homogeneity in system analysis - Locating and defining injury sources
- Sources of Data - Identify causes of Injury - Information for identification -
Subsidiary facts - Injury Investigation

UNIT II

Evolution of Methodical Analysis - Binary Number System - Computer Logic - Safety
Analysis Technique - Fault Tree Calculations - Fault Tree Limitations

UNIT III

Hazard analysis – Vulnerability analysis Vs Risk analysis – Fault tree analysis – Fault
tree diagram

UNIT IV

Fault tree analysis of circuit for warning light failure – Various fault tree symbol –
Analysis process down ward unwanted event

UNIT V

Failure Modes and Effect Analysis - Other systems analysis Techniques - Risk
Tolerability – Risk priority number – Disadvantage of FMEA

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Core 11 - Industrial Noise and Its Control

Objective: Industrial noise is a hazard for human health and sustained exposure to it can lead to permanent hearing damage. Industries like construction, mining and ship-building have been known to cause noise-induced hearing loss (NIHL). Therefore, noise control is of utmost concern to such industries and is a point of concern under occupational hazards. The impact of such noise on the ears can have a range of effects and certain precautions have to be taken to counter them.

UNIT I

Definition – Sound – Noise – Short noise – Thermal noise – flicker noise – Acoustic attention – Audio metery – Resonance absorption coefficient – Decibel frequency

UNIT II

Introduction - Effect of noise on the auditory system - Electrical noise and interferences - Audible Noise – Acoustics - Fundamentals of sound - Measurement of audible noise

UNIT III

Attenuation of Sound Pressure Levels - Acceptable levels of noise - Criteria for Hearing Loss - Control of noise - Noise Abatement – Vibration - Galloping

UNIT IV

Corona vibrations - Vibration Dampers - Audiometric Testing - Hearing Protectors - Record Keeping

UNIT V

ILO convention / Recommendation with respect to noise preventive & protective measures – Supervision of health of workers – training information and research – Request of OSHA's hearing conservation.

References:

Industrial Safety, Health and Environment Management Systems – RK Jain

Allied 3- Industrial Psychology, Ergonomics And Accidents

Objective: Industrial psychology is a field of study that relates to the study of the behaviour and performance of individuals in the setting of an organization. It is also called organizational psychology since it is primarily applicable in the case of business organizations. This field of study is quite complex as social and professional relationships in the workplace are quite difficult to understand or work on. Industrial psychology is a relatively new discipline that has evolved rapidly and revolutionized the workplace within the last century. Ergonomics is a related concept that aims to make the workplace better-suited to the needs of workers.

UNIT I

Introduction - Industrial Psychology - Scope of Industrial Psychology - Concepts of Industrial Psychology - Principles of Industrial Psychology - Applications of Industrial Psychology

UNIT II

Industrial Accidents - Human Carelessness - Accident Proneness - Physical Factors

UNIT III

Vision - Reaction Time - Relationship between Perception and muscular responses and injuries - Relationship between Intelligence and Injury Experience – Hearing - Emotional Instability – Fatigue – Illumination - Noise

UNIT IV

Vision - Atmospheric conditions - Job stress and its effect - Coping with stress -Bio Mechanics and Ergonomics - Industrial Ergonomics and Measurements

UNIT V

Physiology – Psychology - Working Environment

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain
2. Industrial Psychology: A Brief Study – KC Dubey
3. Industrial And Organizational Psychology- Vol.2 – HL Kaila

Skill Based Subject 1 - Construction Industrial Safety - I

Objective :The construction industry entails a lot of hazards. When accidents occur in this industry, the costs are high and the damage extreme. This is in terms of people profits and productivity. It is one of the most hazardous land –based industries in the world. Construction workers always at the risk of being injured by heavy machinery that could turn fatal. However, these mishaps can be avoided by appropriate planning and co-ordination, both before starting the job and while working on it. This also help in minimizing costs. When any project is planned and started, the safety of people and recourses at the construction site should be taken into consideration. All phases of the job and man power involved in it must be efficiently and effectively utilized without causing any harm to them. The governments of various countries and other organizations have laid down certain guidelines with regard to the practices that should be implemented in the industry.

UNIT I

Safe Work Place

Safe means of access - Fall Protection - Safety while working on Roofs - PFASS (Personal Fall Arrest Safety System)

UNIT II

Scaffolding

Parts of Scaffold - Ladder Access - Working on Scaffold - Basic requirements of Scaffolding - Erection of Scaffolding - Scaffolding Safety - Scaffold Inspection

UNIT III

Ladders

Types of Ladders - Selection of Ladder - Positioning ladders - Safety Precautions

Permit To Work System (PTW)

Definition - Hot Work Permit - Cold Work Permit - Responsibilities relating with PTW - Circumstances when Permit is required - Confined Space entry

UNIT IV

Personal Protective Equipment (PPE)

Need and importance of PPE - Employer's responsibilities - Employees responsibilities - Types of PPE - Head Protection - Eye and Face Protection - Ear Protection - Hand Protection - Leg Protection - Skin Protection -Respiratory protection

UNIT V

HSE Training

Importance of Safety Education - Safety Training - Objectives of HSE training and education - Induction Training - In-house Training - Specialised Training - Tool Box Meeting (TBM)

References:

1. Construction Safety Hand Book – Muraleedharan Pillai

Core 12- Safety Training For Employees and Human Resource Development

Objective :Human resource forms a vital part of every organization and various safety standards and regulations have been set by the Government for their welfare. These regulations relate to the employee as well as the employer. Human resource development also aims to improve the skills of the employees in such a manner that they can efficiently work towards the goals of the organization.

UNIT I

Definitions - Methods of Training to Industrial Employees - Discussion Groups
Continued Training - Training Facilities - Benefits of Training to Employees -
Specialized Training for Safety - Positive Instructions

UNIT II

Human Resource Development (HRD) - HRD Concept - Nature of HRD - Objectives
of HRD - Benefits of HRD - Concept of HRD - HRD Matrix - HRD Process -
Challenges and Tasks - Emerging Horizons - HR Managers

UNIT III

Voluntary agencies for safety activity – Objectives of national safety council – British
safety council – World health organization - Aim of Voluntary agencies

UNIT IV

Planning in safety engineering – Application- Remote control – Placement Feeding –
Ejecting- Preventive maintenance

UNIT V

Application of ergonomic practice – Working position – Work process – Work lay out
and displace – lifting of loads – Safe guarding of machines – Safety by construction –
Safety by position – safety by guarding

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Core Practical – Knots & Lines and Fire Extinguishers, Hose Drill

UNIT I

PERFORM HYDRANT DRILLS: 4 -man Hydrant Drill: Drill procedure with application of Hose and Hydrant Fittings: Add one length of hose- Remove one length of hose- Replace the burst Hose- Divide one line into two line using Dividing Breeching- Collect two line into one line using Collecting Breeching- Hydrant Gears and its operation

UNIT II

FIRE TENDER DRILL 6 -MAN WATER TENDER DRILL: Mounting procedure Dismounting procedure- Individual working procedure like -working with ladder- Application of different types of signals applied during pump operation- working with B.A. set- Soft suction Hard suction.

UNIT III

STUDY THE USE OF ROPES AND LINES IN FIRE SERVICE : Types and construction- material used in construction of ropes and lines. Different types of lines used in fire service for different purposes like rescue- lifting- lowering. Care and maintenance of ropes and lines.

UNIT IV

STUDY DIFFERENT TYPE OF KNOTS: Rescue knots: Bow line- Running bow line- Bow line on the bight- Chair knot. Self rescue knots: Slippery hitch- draw hitch. Other knots: Loop- Half hitch- Thumb knot- figure of eight- Clove hitch- Rolling hitch- Round turn two half hitch- fisherman's hitch- waterman's hitch- Cat's paw- Sheep shank- Single sheet bend- Double sheet bend- Reef knot- carric bend- midshipman hitch. Construction and application of guide lines.

UNIT V

IDENTIFICATION-SELECTION- OPERATION AND MAINTENANCE OF FIRE EXTINGUISHERS: Identification of different types of Fire Extinguishers {Water Expelling type- Foam type- DCP type- CO2 type} With respect to constructional feature- capacity operation and use. in fires- It's effective application in extinguishment- Recharging procedure- Care and Maintenance- Performance test- Hydraulic test Inspection procedure -Weekly- monthly- quarterly- half yearly- yearly.

Core 13- Social Security In Industries

Objective : Social security in industries is of utmost concern to employees and employers. The proper maintenance of the equipment in these industries is also essential. In order to ensure the safety of employees and equipment, organizations are insured. In case of any mishap, the insurance agencies reimburse the concerned organization, with which they can continue their operations. Besides this, organizations also offer certain benefits to their employees like compensation and maternity benefits. All these are included in the overarching realm of social security in industries.

UNIT I

Definitions - Scope of Social Security - Social Security in India – Administration Working of ESI - Benefits of Workers

UNIT II

Group Life Insurance - Workman's Compensation Act - Maternity Benefit Act - Employees Provident Fund Act - Right to Payment for Maternity- Medical benefits

UNIT III

Insurance Policies - Taking Policy - Transit Insurance - Employees State Insurance - Inspection/ Safety Audit - After Fire incident - After Theft - After Accident

UNIT IV

Various legislative act for social security of works in India- Indian factories act – Industrial dispute act

UNIT V

Lost time injury (Disabling injury) - growth of trade unions in India – Settlements of disputes and redress in industry – Involvement of various Non – Governmental organizations towards the security of the employees

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Allied 4- Communication & Soft Skills

Objective : To enhance the communicative skill of students and enable them to use English in a confident and natural way.

UNIT I

Essentials of Grammar: -Parts of Speech – Punctuation - Vocabulary Building - Phonetics

UNIT II

Office Management:

Types of Correspondence - Receipt and Dispatch of Mail - Filing Systems - Classification of Mail.- Role & Function of Correspondence – MIS - Managing Computer

UNIT III

Letter & Resume Writing:

Types of Letters-Formal / Informal- Importance and Function - Drafting the Applications - Elements of Structure - Preparing the Resume - Do's & Don'ts of Resume - Helpful Hints

UNIT IV

Presentation Skills:

Importance of Presentation Skills - Capturing Data - Voice & Picture Integration - Guidelines to make Presentation Interesting - Body Language - Voice Modulation - Audience Awareness - Presentation Plan - Visual Aid - Forms of Layout - Styles of Presentation.

UNIT V

Interview Preparation:

Types of Interview - Preparing for the Interviews - Attending the Interview - Interview Process - Employers Expectations - General Etiquette - Dressing Sense - Postures & Gestures - Group Discussion & Presentation: Definition – Process – Guidelines - Helpful Expressions - Evaluation

REFERENCE BOOKS:

1. Business Communication – K.K.Sinha.
2. Basic Grammar – Wren & Martin
3. Better Business Communication - Denish Murphy
4. Written Executive Communication – Shurter

Skill Based Subject 2- Safety In Power Plant

Objective :Power plants are industrial facilities that generate electrical power for commercial purposes. There are a number of heavy-duty machines and equipment located in the plant and the workers handling them have to be careful, in order to avoid any possible mishaps. Utmost care must be taken in order to ensure safety in such industrial units. It is divided into three units. The first unit deals with the basic concepts of safety in power plants. Safety of diesel and electrical power plants have been explained in the following unit while the last unit discusses the usage and safety related to high voltage cables.

UNIT I

Introduction – Types of power plants – Main power plant and auxiliary power plants – Rotary and reciprocal power plants – Electrical dynamo motors – Hydel generators – Nuclear turbines – Wind milling propellers – Solar panels

UNIT II

Responsibilities of Employees - General Safety Requirement/guidelines – Boilers - Structure and Buildings - Control of Fluid systems safety - Safety guidelines for high speed rotary equipment - Gas Turbine - Fuel Pipe Line

UNIT III

Safety of Diesel Stations - Electrical quality associated with Human Injury- Safety Precautions for electrical workers - Safety Rules for Line Men – Authorization - Care and storage of live line tools

UNIT IV

HT and EHT Cables - Precautions in respect of Storage Batteries - Electrical Maintenance- Earth

UNIT V

Periodic maintenance of power plants overhauling of plants – Safety factors in the plant – Cooling , Lubrication, clearances of moving parts – Erection of plants – Wire fencing and earthing of high tension transformers – Cautionary boards and warning signals- protection against rain fire and theft

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Core 14 - Radiation Hazards

Objective : Radiation is a process by which energetic particles or waves move through a medium or space. It is harmful for humans (destroys living cells) as well as the environment. Radiation has also been considered to be one of the direct causes for causing cancer. Most of these radiations are seen to be harmful in plants where nuclear energy is processed. However, radiation is also caused by numerous factors. In some rare cases, it is used for a specific purpose (like destroying cancerous cells) though in most cases, it is extremely harmful. It provides an overview of the basic concepts related to radiation hazards. Natural gas, thermal neutrons and types of radiation have been explained. And also deals with the methods and devices of controlling radiation hazards.

UNIT I

Definitions - Nuclear Energy - Nuclear Fission - Nuclear Cycle – Enrichment
Fabrication - Nuclear Fission Chain Reaction - Nuclear Cycle Re processing -
Nuclear Power Plant

UNIT II

Natural Gas - Thermal Neutrons - Enrichment Process - Chain Reaction - Ionizing and
non ionizing radiation - Particulate and electromagnetic radiation - Radiation Dose -
Alpha Radiation - Gamma Radiation - Cosmic Radiation

UNIT III

Ionizing Radiation Controls - Devices for measuring Radiation - Controlling
Radiation Hazards - Controlling Radiation Exposure - Non ionizing Radiation -
Disposal of Radioactive wastes

UNIT IV

Personal protection against radiation – Use of protective equipments against radiation

UNIT V

Preventing pilferage of radio active elements – Safe custody of radio active elements –
leakage of core, cooler of Nuclear reactors – Prevention of Biological Hazard

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Core 15- Occupational Health & Preventive Measures

Objective : According to ILO / WHO 1950, 'Occupational Health is the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs'. Working conditions and the nature of job have a tendency to have drastic consequences on the health of an employee. The theory of 'Occupational Health' has developed from work-related disorders. Occupational health in a broad sense denotes any injury, harm or disease influencing a worker or employee during his working tenure. More over, besides dealing with work-related ailments, it even includes all those aspects that influence the community health within it. The insufficient supervision of employees is the prime reason for an increase in the existence of work related and other non communicable life style ailments at one's place of work.

UNIT I

Definitions – Anthropometry – Fatigue – Physical, Pathological and Psychological fatigue – Noise – Audiometry

UNIT II

Introduction - Occupational Health Risks - Ways to reduce occupational Risks - Excerpts from ILO Convention - Measures for Occupational Health and Safety - Compensation and Rehabilitation

UNIT III

Working Women - Working Children - Insurance Schemes - Tips to improve Occupational Health - Community Health - Health services

UNIT IV

Preventive medicines - Illness and Healing - Degenerative Illness - Common Diseases - Care of ENT - Diseases: Causes and cures

UNIT V

Occupational health measures against fatigue – health effect of noise- prevention of occupational health problems - occupational health practices – Protective clothing and equipment

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Core 16 - Disaster Management

Objective : Disaster Management, as you will learn in this module, is all about dealing with risk and avoiding them. It is a discipline that teaches you to prepare for a disaster even before it takes place. It involves activities that help support and rebuild society following some natural or man-made disaster. Disaster management requires active participation from the government as well as non-government bodies. Disaster Management personnel are trained to manage emergency situations and respond to the needs of the people and areas affected quickly and effectively. They are responsible for evacuating a town in danger, managing the distribution of food to people in crisis, or overseeing the provision of medical care to injured people. Their assistance is required in large and small emergencies, including hurricanes, terrorist attacks and chemical spills.

UNIT I

Introduction - Disaster Management Plan - Disaster Zoning for natural calamities - Important consideration in Disaster Management – Structure – Constitution - Needs and resources to tackle disaster

UNIT II

Pre-Disaster preparedness - Disaster Management Plan - Fire : Disaster

UNIT III

Post disaster response and recovery - Control of emergencies - Organization consideration - Concept of communication

UNIT IV

Organization during a disaster – On site and off site planning – Unnatural disasters in industry – prevention of industrial disaster

UNIT V

Natural disaster / calamities – National and International disasters – soil liquefaction – Volcano – Tornado- Earth quake – Floods – Tropical cyclone – storm

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Core 17 - Energy Conservation and Sustainable Development

Objective : Energy is central to sustainable development and poverty reduction efforts. It affects all aspects of development— social, economic and environmental— including livelihoods, access to water, agricultural productivity, health, population levels, education and gender related issues. None of the Millennium Development Goals (MDGs) of the United Nations Development Programme (UNDP) can be met without major improvement in the quality and quantity of energy services. Through an integrated development approach, UNDP works to help create enabling policy frameworks, develop local capacity and provide knowledge-based advisory services for expanding access to energy services.

UNIT I

Definitions – Encashment area – elevation – Kinetic and potential energy – Wind mill – Solar energy - Nuclear and hydel energy

UNIT II

Energy Conservation Act - Bureau of Energy Efficiency - Energy Management- Energy Conservation - Energy Audits - Indian Renewable Energy Development Agency (IREDA) - Sustainable energy development

UNIT III

Introduction to sustainable development - Issue of achieving sustainable development - Optimal resource utilization - Sustainable cities - Sustainable Transportation system

UNIT IV

Sustainable mining Technology - Energy conservation - Sustainable Future - Efficient energy management - Bio-Methanation - Bio filtration - Sustainable development - Protection of atmosphere

UNIT V

Advantages and Disadvantages of hydel projects – solar energy renewable source – Nuclear energy – Energy from Bio gas products – Encouragement of conventional energy – recycling of products organic and inorganic – Power generation from waste and effluents

References:

1. Industrial Safety, Health and Environment Management Systems – RK Jain

Skill Based Subject 3 - Construction Industrial Safety-II

Objective : The construction industry contributes remarkably to the economy of the nation, and provides great employment opportunities. Although it happens to be among the most rapidly developing sectors in India, it witnesses the maximum number of accidents and injuries as compared to any other industrial activity. Besides the loss of lives and fatal human injuries, the accidents prove to be extremely expensive as far as damage to property and delays in completion of projects are concerned. The primary safety perils on sites are falling from heights motor vehicle crashes excavation accidents, electrocution and being hit by falling objects.

UNIT I

Safe Use of Hand Tools and Portable Power Tools

Hand Tools - Ten Commandments for personnel using hand tools - Portable Electric Power Tools - Pneumatic Tools - Lone Working

UNIT II

Safe Operation of Vehicles, Equipment and Machinery

Workplace Transport – Hazards - Pedestrian routes - Vehicular routes - Reversing operations (Safety guidelines) - Instructions for drivers - Hand held Power circular Saws - Chain Saws - Abrasive Wheels

UNIT III

Safe Material Handling Operations

Safe Handling of materials - Major injuries - Lifting appliances - Safe operations of Cranes - Pilings, Rigs, Side Booms - General Safety Requirements for Lifting operations

UNIT IV

Accident Reporting, Investigation and Analysis

Definitions - Lost Time Injury (LTI)- Multiple LTI - Lost Time Injury Frequency Rate (LTIFR) - Lost time Injury Severity Rate (LTISR) - Reporting near misses -Reporting Accidents

UNIT V

Major activities of Construction Project

Definitions - Excavation Hazards & precautions - Methods of Excavation - Welding and Cutting Operations - Types of Welding - Hazards and precautions for welding - Confined Space entry precautions - Painting operations - Hazards and precautions - Sand Blasting - Hazards and precautions - Demolition - Hazards and precautions

References:

1. Construction Safety Hand Book – Muraleedharan Pillai

Skill Based Subject 4 – Personal Protective Equipments

Objective : Personal Protective Equipment deals with all the personal protection equipment of a worker who is involved in hazard industrial activities. It ensures safety of workers engaged in all kind of industrial work including construction maintenance exposure to chemicals, Nuclear radiation etc. Students will be able to understand the use of proper PPEs against any kind of industrial hazard.

UNIT I

Personal Protective Equipment Standards Introduction – requirements of PPE – Head protection – Eye & face protection – body protection – hand protection – foot protection – Respiratory Protective Equipment – fit testing – Fall protection – working over or near water - Skin Protection

UNIT II

Breathing Apparatus – Introduction - Smoke Mask - SCBA, BASCCA, ELSA - Donning procedures, Operating procedure - Face seal checks, routine checks – BA Controller, Duties of BA Controller - Life line, Personnel line, guide line.

UNIT III

Various types of head protection units- Eye and face protection equipments - Body hand foot protection equipments in details- hygienic condition of PPEs – Metrical used for manufacture of PPEs – Use of standard /ISI/BIS registered products

UNIT IV

Types of breathing apparatus – Atmospheric, self contained, closed circuit and open circuit – Technical details of breathing apparatus – description of SCBA – Care and maintenance of breathing apparatus – Advantages and disadvantages of SCBA – Oxygen cylinders and regulators, non return valves and indicators

UNIT V

Preservation of PPEs – Disinfection methods of PPEs – Quality and endurance of various breathing apparatus – Checking of the quality of medicinal oxygen – Special protective equipment:- Snow, glacier, radiation, Nuclear leak, chemical hazards, -G effect (Suit) and de-compression (Suit)

References:

1. Safety Professional's reference & study guide – W David Yates

Core 18 – Practical – Ladder and BA set & Small Gear

UNIT I

IDENTIFY THE USE OF FIRE SERVICE LADDERS: Types of ladders- their construction- uses- identification of parts- care and maintenance of ladders.

Carry Out Four Men Drill Formation Of Crew: individual working procedure on get to work command- ladder pitching- climbing- rescue operation- fire fighting- ventilation procedure- ladder carrying- drill report.

UNIT II

CARRY OUT STANDARD TESTS OF LADDER: String test- round test- standard line test- acceptance test- deflection test.

Study Breathing Apparatus Set: Study- working- identification of different parts of BA- Donning Procedure- Pre-Entry Test- BACO- Tally- Searching operation procedure with Guide Line and Personnel Line- Entrapped Procedure- Use of Y manifold.

UNIT III

STUDY OF SMALL GEARS USED IN FIRE SERVICE: Grouping of Small Gears with examples – Fireman Axe- Ceiling Hook- Drag Hook- Fire Beater- Door Breaker- Steel shod lever- Pad Lock Remover- Persuader- Spreader- Cutter- Bending Bar- Quick Release Knife- Shears- Bolt cutter- Search light- Focusing light. Study of hydraulically operated small gears and their use in Rescue Operation Care and Maintenance of small gears

UNIT IV

MOCK DRILL FIRE FIGHTING

Using first aid fire fighting extinguishers and MTU.

UNIT V

RESCUE DRILL

Causality evacuation from wrecked building

Evacuating fainted causality from higher raise building by tenable ladder or rope or by winch motoring

Evacuation of causality from land slide or avalanche.

Ppe's Demonstration

Application of PPE's by demonstration.

Elective 1 (a) – Safety Management of Plants during Commissioning & Maintenance

Objective: Students will understand the safety management functions and processes of any plants during the commissioning as well as maintenance period.

UNIT I

Introduction – Principles of Safety Management – terms & definitions – Safety Policy – Safety organization in plants – Safety Audit - walk through – Intermediate

UNIT II

Organising for plant safety Management response – training & supervision – Economic aspects – Fixed expenditure – Recurring expenditure – economic benefits – Annual reports – Motivation to Managers & supervisors – motivation to employees – Operation and maintenance procedures

UNIT III

Safety during plant commissioning Observance of safety during pre-commissioning and during commissioning of plant – Commissioning procedure – Emergency procedures – Human factors – Site emergency plan – Safety rules for commissioning – Safety clearance notice – precautions during plant engineering – observation- trial and handing over – safeguards for operators safety

UNIT IV

Safety Management in Operations & Maintenance Safety aspects in operations and maintenance of electrical plant equipment – types of maintenance and safety process – Electrical maintenance – preventive maintenance – Interface between preventive maintenance & safety – Inspection- testing and repairing program - Safety precautions during maintenance

UNIT V

Trouble shooting Failures of circuit breakers – failure of main conducting circuit-insulation system – Electrical failure modes of solid insulators – Control room facilities and fault investigation – trouble shooting of substation equipment – functional requirement of earthing systems

References: 1. Testing- Commissioning- Operation and Maintenance of Electrical Equipments – S. Rao

Elective 1 (b) – Principles of Risk Management

Objective: Students will be able to identify- evaluate and mitigate risk in every aspect of management and operations. This course offers a holistic approach- bringing together all elements of risk management.

UNIT I

Introduction Ten elements of risk area – business structures – self employed – partnership – private limited companies -10 Ps of risk management –

UNIT II

Identifying risk factors Risk Assessment – Identifying hazards – Risk factors – physical properties – security risk – product or service – competitive risk – purchasing – people elements – people –procedures – protection- processes – performance – planning – policy

UNIT III

Evaluating the hazards & Risks Likely results from exposures – rating the extent of potential harm – evaluating the likelihood that harm will occur

UNIT IV

Controlling the Risks Control Measures – Physical controls – Behavioural controls – organizational or procedural controls – systems of control – employment controls – legislative controls – security controls – competitive controls – financial controls – deciding priorities for action

UNIT V

Case studies Health services – Call centres – Food production and processing – Engineering and manufacturing – Management strategies to manage risks – planning – stakeholders and spreading the risks - Policies

Reference : Risk Management – 10 Principles – Jacqueline Jeynes

Elective 2 (a) – Nuclear & Radiation Hazards

Objective : Students will be able to understand various aspects of nuclear and radiation- they will be aware of controlling nuclear and radiations accidents.

UNIT I

General definition in nuclear science – Atomic structure- Atomic valency- Nucleus - Protons neutrons - Nuclear fuel, nuclear coolant, moderator, nuclear fission, nuclear fusion.

UNIT II

General definition radio active elements like X ray Gamma rays, beta rays and alpha rays, UV rays and Rhongten tube of X ray

UNIT III

Various power generating nuclear sources – Nuclear power plant – Parts of nuclear power plants- Various types of installation of power plant. Safety in construction of nuclear reactors.

UNIT IV

Nuclear fuels – Types of fuels used- Types of coolant used- Types of moderator used- Various nuclear hazards.

UNIT V

Nuclear and radiation accidents – Nuclear accidents by various faults like:- Reactor core damage- Leakage in shielded container – Preventive methods for radiation leakage – Leakage through coolant and water- Various hazards from radar, antenna including receivers and transmitter.

Reference :

1. Modern Physics for Engineers by B L Theraja

Elective 2 (b) – Fire Policies and Indian legislative Act in Industrial Safety

Objective : The students will be able to understand various aspects of fire policies enacted by the Indian Parliament through legislative act.

UNIT I

History of fire – National fire protection association – International fire marshals associate tariff advisory committee- National college of fire institute

UNIT II

OSHO and its functions – Investigation on fire accidents – Objective and scope of fire investigation – Fire loss control plan

UNIT III

Role of Government in industrial safety – Safety laws – Enforcement of laws – Role of management in industrial safety

UNIT IV

History of factory legislation in India - Accident investigation and accident report - Role of ILO and its role in safety health and welfare of workers

UNIT V

Various acts pertaining fire policies – Indian factories act :- Duties and responsibilities and main provision in the act- Indian electricity act- Work men compensation act- employees insurance act – Indian explosive act – Petroleum act- Gas cylinder rule – Water pollution act – Air pollution act – Environmental protection act – Contract labour act – Industrial dispute act

Reference :

1. Indian Legislative act in industrial safety by Indian labour constitution Micheal Grill

Elective 3 (a) – Lay out and Design of Fire Detection System

Objective : Students will be able to understand various design of fire detection system and lay out of detection circuit as per the requirement. Also helps them to identify the fault and rectify the snags

UNIT I

Electrical and electronic definitions – AC and DC- Parallel and series circuit – Faradays law Ohms law- Inductance capacitance – Amplifier – Oscillation-EMF- EM Relay – Transistor fundamentals- Diodes- Transistor- Rectifier – Feed back amplifiers – Conductors – Filters

UNIT II

Fire Alarm- Principles of fire detectors – Types of detectors – Requirement of detectors – Parts of fire alarm units- Types of detectors- Intruder alarm

UNIT III

Automatic fire detection – Principles of fire detection – Types of systems classification of detectors – Open circuit and closed circuit detection system – Line theory circuit diagram of open and closed circuits.

UNIT IV

Design of automatic fire detection system – Lay out design of single zone fire system – Lay out multi zone and multi stored fire detection system- routing of cable for installation – Installation of detectors, manual call button and siren or audio sound.

UNIT V

Fault analysis – fault analysis of main control panel – Circuits – Detectors – Electro magnetic relays – Failure of circuit and resetting of control panel

Reference :

1. Fire Service first Responder Daniel Limmer – Micheal Grill
Fire Equipment – David L Bever

Elective 3 (b) – Plan Lay out and Design of Hydrant

Objective : Students will be able to understand the description, use and maintenance of variety drants and lay out design in high rise building.

UNIT I

Basic definition fluid mechanics specification of water- Density of water - Viscosity of water- Pascals law – Atm pre - measurement of fluids pressure- Manometer Bernoulli's equation - Venture principle

UNIT II

Fire in a high rise building- Define- Hydrant- Various types of hydrant:-Wet rise, dry riser classification of lay out- Ground hydrant & Pillar or post hydrant- Ball types hydrant- screw down types hydrant slice valve type hydrant.

UNIT III

Components of hydrants metal pipe – Valve assembly – Black cap cast iron box- cast iron spindle – Frost valve- Hose ramp-Adapter –Hydrant gear- Flow gauge- Methods of water relay – Open Circuit- closed circuit – Collection pumping

UNIT IV

Fire hydrant and mention system:- Fire water pump of fire water network- Jockey pump- Duty Pump- Standard by pump- Typical system of pumping with one electric and one diesel fuel pump (Diagram)

UNIT V

Lay out of hydrant in high rise building- Isometric view of hydrant installation period maintenance of hydrants- Prevention of corrosion of adaptor coupling etc.

REFERENCE BOOKS:

Fire Service first Responder Daniel Limmer – Micheal Grill
Fire Equipment – David L Bever

Elective 4 (a) – Design lay out of Automatic Extinguishing system

Objective : To teach the student about the automatic extinguishing system and their importance

UNIT I

Introduction : Automatic fire detection system – Automatic extinguishing system in Aircraft- Ships and important vital fire prone installation

UNIT II

Definitions: AC/ DC - Circuit- Open & Close circuits – Parallel & Series connection- Induction- Resistance- Capacitor – Transistor – Diodes-Amplifiers – Conductors – filters – EMF- Em relays.

UNIT III

Automatic detector- Principle of fire detector- Types of detector – Open & Closed circuit of detector- Parts of fire detector system – Line theory circuit – Diagram - Intruder alarm – Circuit diagram of extinguishing of aircraft and ship.

UNIT IV

Automatic extinguish system – Main automatic extinguish system – Sprinklers and radially drilled pipe lines with stringers – Different extinguishant bottles - Freon – Halon- Ammonia - Bottle valve cartridges.- Bottle pressure – Gauge – Different types of cartridges valve.

UNIT V

Design lay out of extinguishing pipe line – Spacing of detectors – Spacing of Perforated principles – Installation of fire bottles – Circuitry check of detectors – Flow check pipe lines – Care and maintenance of pipe line.

REFERENCE BOOKS:

Fire Service first Responder Daniel Limmer – Micheal Grill
Fire Equipment – David L Bever

Elective 4 (b) – Study on Sprinklers

Objective : Students will be able to understand the detected function of sprinklers which is an automatic extinguishing system.

UNIT I

Function of the sprinkler – Types of sprinklers – Wet system – Dry system – Alternate wet and dry system- Methods of operation – Manual – Automatic- Automatic quick operating.

UNIT II

Parts of sprinklers:- Head – Body – Yoke- Deflection – Valve diaphragm or valve seating – Fusible or link glass tube- Type of fusible control:- Soldered strut or link – Glass bulb – Advantages of glass bulb – Colour coding of glass bulb for operative temperature – Steam sprinkler – Disadvantages

UNIT III

Spacing of Sprinkler:- Arrangement sprinklers zone wise- Principal control valves in sprinkler – Un installation – Types of gauges

UNIT IV

Definition – Drenchers – Types of drencher – Explanation – Roof drencher – Hall or curtain drencher – Window drencher.

UNIT V

Types of installation – Pump operated type – Self contained pressurised type – Pre-Mixed type – Advantages of deluge system- Maintenance of small gears – Testing of sprinklers (Pressure – Temperature etc.)

REFERENCE BOOKS:

Fire Service first Responder Daniel Limmer – Micheal Grill
Fire Equipment – David L Bever