### SCHEME OF EXAMINATION - CBCS PATTERN

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<th>Part</th>
<th>Course Title</th>
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## Semester – IV

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## 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

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<th>SUBJECT</th>
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<td>Elective I</td>
<td>Safety Management of Plants during commissioning &amp; Maintenance</td>
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<td>Principles of Risk Management</td>
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<td>Elective II</td>
<td>Nuclear Radiation Hazards</td>
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<td>Fire Polices &amp; Indian Legislative act in Industrial safety</td>
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<td>Elective III</td>
<td>Lay out &amp; Design of Fire Detection System</td>
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<td>Plan Lay out and Design of hydrants</td>
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<td>Elective IV</td>
<td>Design &amp; Lay out of automatic Extinguishing system</td>
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<td>study on sprinklers</td>
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@  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 Voice 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 an 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

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

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
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

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
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
- 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
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

UNIT V

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

UNIT V

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- Turning to the right- Right about turn- From the right number- As you were- Proving of Parade.

UNIT III

UNIT IV

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

UNIT II

UNIT III

UNIT IV

UNIT V

Reference :

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

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

UNIT II

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

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 coordination, 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

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

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

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

UNIT III

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:

**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:**
2. Basic Grammar – Wren & Martin
3. Better Business Communication - Denish Murphy
4. Written Executive Communication – Shurter
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

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

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 – Windmill – Solar energy - Nuclear and hydel energy

UNIT II

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

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 kinds 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**


**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:**

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.

UNIT III

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 I (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

UNIT II

UNIT III

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

**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

**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

**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 valancy- 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
Unclear 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, antina 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

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 – Electromagnetic 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

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 above 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**

**UNIT III**

**UNIT IV**

**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

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

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