

**MAHARASHTRA STATE BOARD OF SKILL DEVELOPMENT EXAMINATION, MUMBAI**

1	Name of Course	<b>Diploma In Fire &amp; Industrial Safety Engineering</b>																																																																																							
2	Course Code	<b>( 411403 )</b>																																																																																							
3	Max. No. of Students Per Batch	25 Students																																																																																							
4	Duration	2 year		2 year																																																																																					
5	Type	Part Time		Part time																																																																																					
6	No. Of Days / Week	5 days		Classroom/ Online / Blended learning																																																																																					
7	No. Of Hours /Days	3 hours		14 hrs –Sat - Sun																																																																																					
8	Space Required	Theory = 250 sq feet Practical = as per requirement (annexure 1)																																																																																							
9	Minimum Entry Qualification	12 <sup>th</sup> Pass with Science (Physics, Chemistry).  12 <sup>th</sup> pass (non-science) with 3 years of experience in factory shop-floor, safety, construction site, factory, office premises and similar other).  10 <sup>th</sup> Pass (non-science) with 5 years of experience in factory shop-floor, safety, construction site, factory, office premises and similar other).																																																																																							
10	Objective Of Course	To create high awareness for safety across all sectors across Industries To encourage people for all fields to embrace safe way of working as a way of Life Providing skilled manpower in Safety to the Industry Reducing the number of accidents in the Industry and adding \$ Bn to GDP (50% reduction in accidents and add to almost 3-5% to the GDP) Re-skilling existing man-power in the Industry for adopting safe working practices.																																																																																							
11	Employment Opportunity	Employment opportunity: - Safety Steward, Safety Officer, Fire Officer																																																																																							
12	Teacher's Qualification	Degree in Any branch of Engineering Or B.Sc with Diploma in Industrial Safety. and minimum 5 Years' Experience as a Fire & Safety Officer in reputed industries.																																																																																							
13	Training System	<b>Training System Per Week (average)</b>																																																																																							
		Theory	Practical	Total																																																																																					
		10 hrs	10 hrs	20 hrs																																																																																					
14	Exam. System	<table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Paper Code</th> <th>Name of Subject</th> <th>TH/PR</th> <th>Hours</th> <th>Max. Marks</th> <th>Min. Marks</th> </tr> </thead> <tbody> <tr> <td align="center" colspan="7"><b>First Year</b></td> </tr> <tr> <td align="center">1</td> <td align="center"><b>41140311</b></td> <td>Fire Service Organization &amp; Engineering Science</td> <td align="center">TH /PR</td> <td align="center">3hrs.</td> <td align="center">100</td> <td align="center">50</td> </tr> <tr> <td align="center">2</td> <td align="center"><b>41140312</b></td> <td>Special Hazard</td> <td align="center">TH /PR</td> <td align="center">3hrs.</td> <td align="center">100</td> <td align="center">50</td> </tr> <tr> <td align="center">3</td> <td align="center"><b>41140313</b></td> <td>Fire Detection and Fire Fighting Systems. Fire Prevention, Rescue And Paramedics</td> <td align="center">TH /PR</td> <td align="center">3hrs.</td> <td align="center">100</td> <td align="center">50</td> </tr> <tr> <td align="center">4</td> <td align="center"><b>41140321</b></td> <td>Practical – Fire Safety – I/ Case study based – submission</td> <td align="center">Grade</td> <td></td> <td align="center">A</td> <td align="center">D</td> </tr> <tr> <td align="center">5</td> <td align="center"><b>41140322</b></td> <td>Continuous Learning –Monthly assessment – Online</td> <td align="center">online</td> <td></td> <td align="center">A</td> <td align="center">D</td> </tr> <tr> <td></td> <td></td> <td align="center"><b>Total</b></td> <td></td> <td></td> <td align="center"><b>300</b></td> <td align="center"><b>150</b></td> </tr> <tr> <td align="center" colspan="7"><b>Second Year</b></td> </tr> <tr> <td align="center">1</td> <td align="center"><b>41140314</b></td> <td>Introduction to Industrial Safety</td> <td align="center">TH /PR</td> <td align="center">3hrs.</td> <td align="center">150</td> <td align="center">75</td> </tr> <tr> <td align="center">2</td> <td align="center"><b>41140315</b></td> <td>Introduction to Construction Safety &amp; Chemical Safety</td> <td align="center">TH /PR</td> <td align="center">3hrs.</td> <td align="center">100</td> <td align="center">40</td> </tr> <tr> <td align="center">3</td> <td align="center"><b>41140316</b></td> <td>Introduction to Safety Management</td> <td align="center">TH /PR</td> <td align="center">3hrs.</td> <td align="center">100</td> <td align="center">40</td> </tr> </tbody> </table>				Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks	<b>First Year</b>							1	<b>41140311</b>	Fire Service Organization & Engineering Science	TH /PR	3hrs.	100	50	2	<b>41140312</b>	Special Hazard	TH /PR	3hrs.	100	50	3	<b>41140313</b>	Fire Detection and Fire Fighting Systems. Fire Prevention, Rescue And Paramedics	TH /PR	3hrs.	100	50	4	<b>41140321</b>	Practical – Fire Safety – I/ Case study based – submission	Grade		A	D	5	<b>41140322</b>	Continuous Learning –Monthly assessment – Online	online		A	D			<b>Total</b>			<b>300</b>	<b>150</b>	<b>Second Year</b>							1	<b>41140314</b>	Introduction to Industrial Safety	TH /PR	3hrs.	150	75	2	<b>41140315</b>	Introduction to Construction Safety & Chemical Safety	TH /PR	3hrs.	100	40	3	<b>41140316</b>	Introduction to Safety Management	TH /PR	3hrs.	100	40
Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks																																																																																			
<b>First Year</b>																																																																																									
1	<b>41140311</b>	Fire Service Organization & Engineering Science	TH /PR	3hrs.	100	50																																																																																			
2	<b>41140312</b>	Special Hazard	TH /PR	3hrs.	100	50																																																																																			
3	<b>41140313</b>	Fire Detection and Fire Fighting Systems. Fire Prevention, Rescue And Paramedics	TH /PR	3hrs.	100	50																																																																																			
4	<b>41140321</b>	Practical – Fire Safety – I/ Case study based – submission	Grade		A	D																																																																																			
5	<b>41140322</b>	Continuous Learning –Monthly assessment – Online	online		A	D																																																																																			
		<b>Total</b>			<b>300</b>	<b>150</b>																																																																																			
<b>Second Year</b>																																																																																									
1	<b>41140314</b>	Introduction to Industrial Safety	TH /PR	3hrs.	150	75																																																																																			
2	<b>41140315</b>	Introduction to Construction Safety & Chemical Safety	TH /PR	3hrs.	100	40																																																																																			
3	<b>41140316</b>	Introduction to Safety Management	TH /PR	3hrs.	100	40																																																																																			

			& Safety Legislations	<sup>TH</sup> /PR	3hrs.	100	40
4	41140323	Practical – Industrial safety – I/ Case study based	grade	3hrs	A	D	
5	41140324	Continuous Learning –Monthly assessment - Online	grade		A	D	
		<b>Total</b>			<b>300</b>	<b>150</b>	

## 1<sup>st</sup> Year

### Subject 1- Fire Service Organization & Engineering Science

Chapter	Name of the Topic
1	Fire Service Organization: Fire service organization, State and Municipal, its functions, requirement thereof, Wings of Fire service organization, Chain of commands.
2	Fire Service Administration and Management: Duties, responsibilities and fundamentals of fire station management, Public relation, Operational records, orders and instructions, Station administration, Maintenance of documents. Rank, uniform, rank marking and Helmet marking.
3	Leadership and Discipline: Types of Leadership, Functions of leadership and aspects of welfare and discipline in connection thereof, Qualities of a good leader, Discipline, Motivation and decision making in respect of fire service, Standard Operating Procedures.
4	Training: Need of training as a first responder, Classification of training, Training methodology, Methods of instructions, Fire reports and Statistics.
5	Special skills required for investigating a fire: Introduction, Importance and reasons for thorough investigation, Process of investigation, Source of ignition, Role of scientific forensic laboratory in the investigation of fires, Preparation of investigation report, Arson-its meaning and detection, motives, Role of fire officer in investigation of arson fires.
6	Watch Room procedure, Fire calls handling procedure, Equipments in watch room, mobilizing board.
7	Control Room Procedure: Control Room, Communication system in Fire Service, Duties and responsibilities of ground incharge, Mobile van.
8	Fire laws: Basic knowledge of acts, regulations, rules and orders which are related to fire service administration and operation, Petroleum act, calcium carbide act, Explosives act, Temporary structures act, Cinema photography act, General Insurance Co's.
9	Combustible Matter: Combustible Solids, Physical and Chemical properties of Combustible Solids, Wood, Grass, Fibers, Cloth, Paper, Rubber And Plastics, Magnesium, Zirconium, Sodium And Potassium, Zinc, Aluminum Etc. Flammable/ Combustible Liquids: Physical and Chemical properties of Flammable/ Combustible Liquids, Explosivity and flammability range, Auto ignition temperature, Spontaneous combustion, Combustible Liquids Oils And Condensate, Paints, Thinners, Lacquers, Fuels, Solvents, Chemicals, Petrochemicals, Alcohols, Hydrocarbons, Residue from stored Hydrocarbons, Classification of petroleum liquids as per NFPA Combustible Gases: Physical and Chemical properties of Combustible Gases, toxic or infectious, corrosive etc.
10	Combustion: Combustion and it's types, oxygen content in air by weight and volume, combustion of solid, liquid and gases, Exothermic and Endothermic reactions, Jet and flash, flames and its types, premixed, diffusion, turbulent, stationary and propagating flames, Burning velocity, Flash point, Fire point, Transmission of heat by conduction, convection and radiation.
	Fire: Definition of Fire, Fire Triangle, Tetrahedron of Fire, Classification of Fires. Types of extinguishing media or Agent, Principles of Fire extinguishing methods. Cooling, Starvation,

11	Smothering (Blanketing), Retarding chain reaction.
12	Fire extinguishing media or agents, Extinguishing property of water, Characteristics of ideal liquid extinguishing agent, various forms of water like solid stream, fog, spray.
13	Foam: Types of foam concentrate, Protein, AFFF, fluoro protein, Alcohol type, Low, medium and high expansion foam, Physical and chemical properties of foam.
14	Dry Chemical Powder: Various types of dry chemical powders and their uses.
15	Carbon dioxide, Halons, FM 200 and similar extinguishing agents
16	Hydraulics: Flow of water through pipes, Calculation of velocity and flow Friction Loss , Velocity and Pressure , Water Hammer, Discharge through Fire Nozzle , Nozzle Velocity ,Jet Reaction and Back Pressure
17	Electricity: Definitions of current, voltage, resistance, insulation, conductor, electrical circuits, Power, Electrical Fire hazards such as short circuit, static electricity, lightning, A.C. D.C., Heating effect of electricity.
	<b>Practical</b>
1	Physical Drill
2	Squad Drill, Fire Drill
3	Portable Fire Extinguishers & Extinguishing methods
4	Small Gears and Hand Tools
5	Ladders & Special Appliances
6	Pump and Primers
7	Assessment
8	Workbook
9	Industrial Visit
10	Visit Report Writing

## Subject 2- Special Hazards

Chapter	Name of the Topic
1	Explosives: Definition, General classification of explosives, Fire fighting classification for fighting explosives and ammunitions fires, general principals to be observed in the storage of explosives.
2	Dust Fires: Dust and gas explosion, Nature and behavior of dust, Causes of dust explosion and fires, Explosions suppression system, Preventive measures, Precautions while fire fighting,
3	Fuels: Study of various types of fuels, Solid, Liquid and Gaseous fuels, Bio-mass, Fossil Fuels, Advantageous and Dis advantageous of various types of fuels

4	LPG and LPG bottling plant: Properties of LPG, Nature and behavior in fire, Fire prevention and protection in bottling plant, Safety in bottling plant, Storage of LPG, Hazards of LPG.
5	Petrochemical Plants and Refinery Fires: Fire safety of vehicle at first entrance at petrochemical plant and refinery, Fire preventive and protective measures in and around plant, Jet fires, Pool fires BLEVE, VCE
6	Radioactivity: Nature of Radioactivity, Radioactive materials, Decay, half life period, Alpha, Beta, gamma radiations, Biological effect of Radiations, Fire fighting procedure and safety precautions to be taken in case of radiation hazards like preparation of zones, Shielding, evacuation, etc. fires in radioactive material, Special teams.
7	Fire Risks at Airports: Various categories of Airports, Basic fire hazards, jettison, nature of air crash, Access and escape / egress problems, Safety belts, Ejection seat, Rescue and fire fighting technique, Categorisation of casualties and process of rescue at involving aircrafts, Hazards at air ports, Protection of hangers, draining out of fuel in aircraft, Rescue and fire fighting equipments kept at airports, on site and off site emergencies.
8	Forest and Rural Fires: Fire fighting difficulties, Causes of fires, Equipment and appliances useful in forest and rural fires.
	<b>Practical</b>
1	Hose and Hose fittings, Hydrant
2	Foam and Foam equipment
3	Fire engine and Water relay
4	Ropes and Knots
5	Assessment
6	Workbook
7	Industrial Visit
8	Visit Report Writing

### Subject 3 - Fire Prevention, Rescue And Paramedics

Chapter	Name of the Topic
1	Fire Prevention and Protection: Organization for fire prevention, inspection enforcement of codes, public education and community relation, Fire loading, Access for fire fighting, Causes of fire and their preventive methods General fire prevention measures, and house keeping, Standing fire orders, fire practice and mutual aid scheme, Fire Prevention and Protection for flammable Gas and Liquid plants, classification of flammable liquids..
2	Fire protection, fire prevention and its importance, means of escape in case of fire, fire separation and compartmentation, fire notices, provision and siting of first aid fire fighting equipments, ventilation systems including fire and smoke venting.

3	Chemical Leak: Prevention and protective measures to be taken in case of Gas/ Liquid leak from Chlorine tonner, LPG tanker, Ammonia container
4	Storage of Hazardous Material: Storage of hazardous materials: Warehouse and its requirements, Ventilation, entrance and exits, Types of storages and various methods of stacking of goods, Fire fighting arrangements and action in case of fire as per rules, Factors involved in fire risk, standard basis, Fuel storage and gas cylinders.
5	Salvage: Damage due to fire, smoke and water, Equipment for salvage work, salvage covers, Forced entrance, salvage works, Packing and Storing, Salvage before entering fire ground, After entering fire ground, Salvage following fire ground, saving property
6	Rescue: Lift rescue, Rescue by Hydraulic Platform, Rescue by Chutes, rescue from sewers, road, railway and highway accidents, rescue from collapsed building, rescue of animals, rescue from debris, rescue from wells, rivers. Rescue from train and aircraft accidents.
7	Paramedics And First Aid: Study of paramedics and approach to casualty, structure and function of human body, Respiration, Circulatory system and Asphyxia, Dressings and Bandages, Wounds, bleeding and shock, Injuries of bones(fractures), Injuries to muscles and joints, Nervous system and unconsciousness, Burns and Scalds, Poisoning,
8	Miscellaneous conditions, Approach to casualty, Psychological aspects and first aid , Labeling of casualties, Handling and transportation of injured persons, Ambulances and Types.
	<b>Practical</b>
1	Fire Alarm & detection System, Fixed Fire protection system
2	Rescue and Escape
3	Ambulance drill
4	Breathing apparatus drill
5	Pick up Drill
6	First Aid
7	Assessment
8	Workbook
9	Industrial Visit
10	Visit Report Writing

## Subject 4 - Fire Detection and Fire Fighting Systems

Chapter	Name of the Topic
1	Detection System: Need of detection system in fire service, Automatic fire detectors, General Principle of working of common detectors, Various types of detectors viz. heat detectors, Smoke detector, photo-electric relay, ionization chamber, their operational principle, Infra-red heat detectors, General test for heat detector.
2	DPITC of Detection System: Various components of a smoke detection system, Study of Code of Practice for Selection, Installation and maintenance of Automatic Fire Detection and Alarm System I.S. 2189 / 1988, Deluge system, Drenchers, sprinkler system IS 9972-2002
3	Pumps: Definition, Working Principles of Pumps, Types of Pumps, Positive Displacement Pump, Force Pump, Lifts Pump, Rotary Pump, Submersible pumps etc., Centrifugal pump, Multistage pumps, Characteristics of centrifugal pump.
4	Primers - Reciprocating primer, Exhaust ejector primer, Water ring primer and Rotary primer, Uses, Advantages and disadvantages of various primers.
5	Fire Hydrant System: Hydrants, IS 908-1975 Fire hydrant stand post type, IS 909-1992 sluice valve type, IS 5714-1981 Hydrant stand pipe, Screw down type as per IS, I.S. 13039-1991 External Hydrant system provision and Maintenance
6	DPITC of Fire Hydrant System: Various components of a fire hydrant system
7	Water Supply: Water supply from designing point of view, Types of Water supplies, IS 9668-1990 provision and Maintenance of water supply for fire fighting.
8	First Aid Fire Fighting System [ Hose Reel ]: Details of F.A. Fire Fighting System and its use, Rising Mains : Down Comer, Wet Riser, Dry Riser
9	Study of National Building Code of India with specific reference to part –IV: Classification of buildings as per NBC.
10	Plan Reading : Importance of plan with methods of readings, Requirements of standards, Preparation of standard symbols, Designation of floors, Symbols and abbreviation of fixed fire fighting equipment structural symbol and small-scale drawings, Miscellaneous symbols for small-scale drawings, Fire protection symbols for small scale, Drawings and layout plans.
11	Basic construction features in buildings viz. walls, floors, Plinth, roofs. Construction of building by wood versus construction by using RCC
12	Hazards Associated In High Rise Buildings: Domestic and fire fighting water storage, Lift and fireman's lift, Compartmentation and refuge area.
13	Means of Escape: Evacuation drill in HRB and precautions, IS 9457-1980 safety colours and signs, IS 12349-1988 Fire protection safety signs, IS 12407-1988 Graphic symbols for fire protection plans, IS 13716-1993, Precautions relating to personal safety in various occupancies, Constructional features of exits and type of exit, their location and travel distance, Roof exits, probable means of escape and their maintenance
	<b>Practical</b>
1	Communication, Watch room and Control room procedure

2	Machine Guard & Installation
3	Hands on Lock– out & Tag– out Techniques How to use the Tags
4	Material Safety Data Sheet (MSDS)
5	Assessment
6	Workbook
7	Industrial Visit
8	Visit Report Writing

## 2<sup>nd</sup> Year

### Subject- 1 – Introduction to Industrial Safety (100hr)

Sr. No.	Name of the Topic
1	<b>INTRODUCTION OF INDUSTRIAL SAFETY-</b> Introduction of Industrial Safety- Importance of Safety, Terminology, Where Do Accidents Happen?, How Do Accidents Occur? Why Do Accidents Occur? 5 E's engineering, types of Hazards, Machine accidents: Non-Machine accidents:
2	<b>DIFFERENT TYPES OF PHYSICAL HAZARDS-</b> Industrial Noise and its Measurement Sources of Noise Noise Control Measures Legal Provisions involving High Noise Levels Permissible Exposure in case of continuous noise Permissible Exposure level of impulsive Industrial Lightening & Ventilation Legal Requirements Methods of Achieving Good Illumination Heat and Ventilation Purpose of Ventilation Advantage of Ventilation Classification of Ventilation Control of Heat Exposure Forcible Entry Controlling Fires with Ventilation Salvaging with Use of Water
3	<b>HAZARD &amp; RISK ANALYSIS</b> Industrial Noise and its Measurement  Sources of Noise Noise Control Measures Legal Provisions involving High Noise Levels Permissible Exposure in case of continuous noise Permissible Exposure level of impulsive Industrial Lightening & Ventilation Legal Requirements Methods of Achieving Good Illumination Heat and Ventilation Purpose of Ventilation Advantage of Ventilation Classification of Ventilation

	Control of Heat Exposure Forcible Entry Controlling Fires with Ventilation Salvaging with Use of Water Overhaul
4	<b>Practical's</b> HIRA Exercise with case studies  HIRA of actual sites – building, Mall, factory, site  Hazard identification and reporting
5	<b>Assessment</b>
6	<b>Workbook</b>
7	<b>Industrial Visit</b>
8	<b>Visit Report Writing</b>

## Subject–2 -Introduction to Construction Safety (120 Hrs)

Sr. No.	Name of the Topic
1	<b>CONSTRUCTION SAFETY ACTIVITIES HAZARDS &amp; CONTROL-</b> Safety & Health Provisions under BOCW (Re&Cs) Act, 1996 and Central Rules, 1998 – Highlights Safety & Health in Construction Sites - Check List Fire and Emergencies Safety Tips for Excavation Work Working on Fragile Roofs Use of Chemicals in Construction Work Precautions Fire at Project Sites Safety Work Cycle at Construction Sites
2	<b>HEALTH HAZARDS ENCOUNTERED IN SMALL CONSTRUCTION ACTIVITIES-</b> Safety in Scaffolding Alteration and Dismantling Maintenance and Storage Use of Elevators/Lifts Safety FAQs Codes & Standards Segregation of Electric Supply Over Speed Governor Safety (Ultimate Safety of an Elevator) Car Levelling Device Safety Tips Hazards of Cement in Construction Work and Control Measures Health Prevention and Health Surveillance Indian Standards on Construction of Earthquake Resistant Structures BIS Standards Ladder Safety Demolition Protective Clothing and Equipment

3	<p><b>CONFINED SPACE ENTRY</b> Introduction, hazards, precautions , safe entry into confined space, team, responsibilities, sample entry permit</p>
4	<p><b>MOBILE EQUIPMENT SAFETY-</b> Safe Operation of Vehicles, Equipment &amp; Machinery Workplace Transport Pedestrian Routes Vehicle Routes Minimizing Reversing Operations Instructions and Guidelines for Drivers Wood Working Machinery Circular Saw Hand Held Power Circular Saws Chain Saws Abrasive Wheels Machinery Safe Ways of Using Mechanical Equipment Concrete Mixers and Batching Plants Dumpers and Dump Trucks Generators Operation and Inspection of Cranes and Hoists Guard Moving Parts Outrigger Supporting Surface Mechanical and Manual Handling Use and Inspection of Rigging Manual Handling Common Causes of Back Injuries Good Handling Techniques for Lifting</p>
5	<p><b>MATERIAL HANDLING</b> Mechanical Handling Lifting Equipment/Gear Safety in Material Handling Mechanical Equipment Unsafe Work Habits Mechanized (Kinetic) Material Handling Crane Safety Precautions Chain Pulley Block Safety Precautions Forklift Truck Safety Precautions Factors of Safety Slings and Slinging Practices Safe Working of Cranes Primary Basics of Rigging Use and Inspection of Rigging Manual Handling Common Causes of Back Injuries Good Handling Techniques for Lifting</p>
6	<p><b>WORKING AT HEIGHT-</b> Working at heights / elevated works Fall Protection Options Personal Fall Arrest Systems Guardrail systems Do's and don'ts at the working place at height</p>
7	<p><b>LADDERS</b> Ladder terminology, types of ladders, uses, maintenance of ladder, load ratings <b>SCAFFOLD</b></p>

	Introduction, terminology, hazards, types of scaffold, couplers types, types of ties, types of bracing, erection and dismantling method. Tag system, uses, dos and don'ts
8	<b>PERSONAL PROTECTIVE EQUIPMENTS:-</b> General Requirements of PPE, Training, PPE Selection and types of PPE , Need for Personal Protective Equipment, ,non-respiratory personal protective devices ,respiratory personal protective devices, Safety Inventory System
9	<b>Practical</b> HIRA Exercise with case studies HIRA of actual sites – building, Mall, factory, site Hazard identification and reporting Accident reporting and analysis
10	Assessment
11	Workbook
12	Industrial Visit
13	Visit Report Writing

### Subject – 3. Introduction to Chemical Safety

Sr. No.	Name of the Topic
1	<b>CLASSIFICATION &amp; PROPERTIES OF CHEMICALS AND ITS HAZARDS:-</b> Requirements , Process Hazard Analysis , Hazard Communication ,Material Safety Data Sheets ,Labelling and Marking Systems , Employees Training , The Written Plan , Permits and Planning ,Safe Work Procedures ,Chemical Classifications.
2	<b>CHEMICAL HAZARDS &amp; TOXIC SUBSTANCES:-</b> What are Chemical Hazards and Toxic Substances? , How does OSHA Regulate Workers' Exposure to Chemicals, Allowable Airborne Concentrations ,OSHA Permissible Exposure Limits (PELs) ,Common Terms for Chemical Hazards or Toxic Substances
3	<b>SAFE HANDLING OF CHEMICAL:-</b> Ground Rules to Ensure Safe Handling of Chemicals , Storing, Labelling, Handling and Personal Hygiene: Things to Remember
4	<b>SAFE UNLOADING of CHEMICALS:-</b> Scope and Definitions ,Classification Criteria , Storage Location , Storage of Different Kind of Gases, Safety Data Sheet , Discharging Bulk Liquid Chemicals and Dry Powder Chemicals Procedure , Pre-Delivery , Training , Emergency Procedures , Attachments and Reference Forms , Toxicity Measurement , Factors Influencing the Effects of Toxic Materials
5	<b>SAFETY PROPERTIES OF HAZARDOUS FLAMMABLES:-</b> Hazardous Area Classification and Control of Ignition Sources ,General Principles ,Selection of Equipment , Ignition Sources - Identification and Control , Lightening Protection , Vehicles , Factors for Assessor of a Safety Case to Consider , Status of Guidance , Reference Documents , Electrical/Non-Electrical

	Equipment , Electrostatic Ignition Risks
6	<b>CHARACTERISTICS OF OIL &amp; LIQUID &amp; GAS AND ITS CLASSIFICATIONS</b> Classifying Produced Liquids , Parameters for Liquid Classification ,Determining Well Status Fluid Type , Verifying Produced Liquids for Volume Gas Well Liquid Status Wells , Safety in Oil Refinery , Safety and Fire Hazards in Oil Refinery , General Characteristics , Liquefied Petroleum Gas (LPG)
7	<b>PPE's</b> General Requirements of PPE, Training, PPE Selection and types of PPE , Need for Personal Protective Equipment, , RESPIRATORY PERSONAL PROTECTIVE DEVICES ,RESPIRATORY PERSONAL PROTECTIVE DEVICES, Safety Inventory System
8	<b>Practical</b> HIRA Exercise with case studies HIRA of actual sites – building, Mall, factory, site Hazard identification and reporting Accident reporting and analysis
9	Assessment
10	Workbook
11	Industrial Visit
12	Visit Report Writing

### Subject- 4 – Safety Management

Sr. No.	Name of the Topic
1	<b>ACCIDENT AND ITS COST-</b> Accident causes , Accident classification ,The Agency Part ,Nature of injury ,Accident Investigation Report , Lost-Time Injury Frequency Rate , Lost-Time Injury Severity Rate ,  reportable accident severity rate , Vehicle accident rate
2	<b>WORK PERMIT SYSTEM--</b> Different Types of Work Permit. Safe Work Permit System, Types of Permit to Work (PTW) Supporting Documents (SDs), Permit Issue, Permit Review , Permit Duration and Cancellation, PTW (Permit to Work) Administration Process Chart,BASIC ELEMENTS OF THE 'PERMIT-TO-WORK' SYSTEM, Application of the Work-Permit System
3	<b>JOB SAFETY ANALYSIS-</b> What is JSA, scope of JSA, steps of JSA, Advantages of JSA, JSA chart.
4	<b>SAFETY INSPECTION</b> PLANT SAFETY INSPECTION, Types of Inspection:, Who is In-charge for Safety Inspection?, Plant Safety Inspection Procedures, Follow up Against Safety Inspection. Safety Audit

	Types of Audit Scope Objectives of Safety Audit Features of Safety Audit Benefits of Safety Audit Methodology
5	<b>Safety Survey-</b> Safety Survey Objective Toxicity Measurement Immediately Dangerous to Life and Health (IDLH) Dangerous Occurrences
6	<b>Practical</b> Preparation of Audit Check-list Audit plan Case Studies of JSA Introduction to ISO 19011 and 45001 Conduct sample audit at site/factory/building Audit report writing
7	Assessment
8	Workbook
9	Industrial Visit
10	Visit Report Writing

## Subject 5. Introduction to Safety Legislations

Sr. No.	Name of the Topic
1	Factory Act Duties and Responsibility of Factory Inspector Main Provisions made in Factory Act Safety Provisions to be Adopted in a Factory Provisions Relating to Hazardous Process
2	Working Hours for Adults Factory Act: Provisions on Health of Workers' Cleanliness Provisions Relating To Safety
3	<b>Practical</b> Case studies and application of Act
4	Assessment
5	Workbook

## **Assessment methodology**

1. Continuous assessment using workbooks
2. MCQ based assessment at topic level
3. Descriptive test
4. Project work based on Site visit/implant/internship/site project/process
5. Test paper is based on 50% theory and 50% practical case-studies

## **Equipment Exposure at site or during visit to factory/site**

- Safety Gear – Hearing /Head/Foot/Hand and Arm/ Eyes and Face Protection ( 5 nos)
- Safety Signs (Different Charts) (10 nos)
- Fire Fighting Equipment (Delivery Hose with Couplings )2 nos
- Short Branch 1 no
- Deffuger Branch 1 no
- Landon Pattern Hand Control Branch 1 no
- First Aid Equipment's 1 set
- Fire Extinguisher of Water/ CO2/ DCP/Foam/ AFFF - 1 set
- Safety Helmet 5 nos
- Safety shoes 5 nos
- Safety Gloves 5 nos
- Safety Goggles 10 Nos
- Ear Plugs 10 nos
- Safety Belts 3 nos
- Detector – Fire , Smoke, Heat . installed - one number
- 20 Minutes Fire Proof Fire Fighting Jackets 1 no
- Fire Alarm (Manual & Automatic ) 1 nos
- Aluminum Fire Suit 1 no
- Fire Resistant Material 1 no
- Flammable with Flame Proof, spark Proof equipment and tools 1 no
- Breathing Apparatus 1 no
- Housekeeping Equipment 1 no
- Aspirator Hygrometer 1 no
- Kata-Thermometer 1 no
- Globe-Thermometer 1 no
- Sound Level Meter 1 no
- Road safety signals and symbols. 1 no
- Glass Impenger tubes. 1 no
- Aspirator Bottle. 1 no
- Fire Extinguisher. 1 no
- First AID Box 1 no
- Anthropometer 1 No
- Skin Fold Calliper

## **List Of Books**

- National Fire Service College, Nagpur- Fire fighting Drill Manual
- National Fire Service College, Nagpur- Practical Fire Safety And Ground Command Tips
- A.S. Khan- Fire Fighters Drill Manual

- Industrial Safety Management written by L.D. Deshmukh
- Safety Book Prepared by the Institute
- MFS Manual
- Nbc code
- Varies BIS standard
- Development Control regulation
- Industrial Act
- Books and notes prepared by Institute of Security of Fire Technology & Institute of Fire Technology.
- Special Edition – Trainer Notes ( by Mr Subhash Rane (Ex-MFS)
- Industrial Safety - A Practical guide – A K Kulkarni

**VIDEO CASSETTES/ CDS**

- i) Regulatory Compliance OSHA set of 13 Videos. VC15, Academia Books International Pvt.
- ii) LP Gases Emergencies, Planning and Response. VC21, Academia Books International Pvt.
- iii) Petroleum Fire, VC22, NFPA
- iv) Industrial Fire Hazards VC23, NFPA