CURRICULUM FOR
ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
(IT)

(State Government Approved Short Term Diploma Course)

DURATION	One Year
SCHEME	I
PATTERN	Full Time - Yearly

(To be implemented from the Academic Year 2017 – 2018)

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI
(AUTONOMOUS)
ISO 9001-2013 Certified
49, Kherwadi, Bandra (East), Mumbai – 400 051

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME

COURSE NAME : ADVANCED DIPLOMA IN INDUSTRIAL SAFETY

COURSE CODE : IT

DURATION OF COURSE : ONE YEAR | **DURATION : 32 WEEKS**

YEAR : FIRST | **WITH EFFECT FROM 2017-18**

PATTERN : FULL TIME - YEARLY | **SCHEME : I**

SR. NO.	SUBJECT TITLE	SUB CODE	Abbreviation	TEACHING SCHEME			EXAMINATION SCHEME										TOTAL	SW (23100)
							PAPER HRS.	TH		PR		OR		TW				
				TH	TU	PR		MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN			
1	Industrial Safety Management	23108	ISM	02	01	--	03	100	50	--	--	--	--	--	--	100		
2	Safety In Engineering Industries	23109	SEI	02	--	02	03	100	50	--	--	50#	25	--	--	150		
3	Construction Safety	23110	COS	02	01	--	03	100	50	--	--	--	--	--	--	100		
4	Chemical and Process Safety Management	23111	CPS	02	01	--	03	100	50	--	--	--	--	--	--	100		
5	Environmental Management	23112	EVM	02	01	--	03	100	50	--	--	--	--	--	--	100		100
6	Quality Control in Occupational Safety & Health	23113	QCO	02	01	--	03	100	50	--	--	--	--	--	--	100		
7	Safety, Health and Environmental Legislation	23114	SHE	02	01	--	03	100	50	--	--	--	--	--	--	100		
8	Industrial Hygiene and Occupational Health	23115	IHO	02	--	02	03	100	50	--	--	50#	25	--	--	150		
9	Project	23057	PRO	--	--	04	--	--	--	--	--	50#	25	50@	25	100		
			TOTAL	**16**	**06**	**08**	**--**	**800**	**--**	**--**	**--**	**150**	**--**	**50**	**--**	**1000**		**100**

STUDENT CONTACT HOURS PER WEEK: **30 HRS.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks : **1100**

@ Internal Assessment, # External Assessment, Ø Common to All Conventional Diploma, #* Online Examination, No Theory Examination.

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term work, SW- Sessional Work

- Conduct two class tests each of 25 marks for theory subject having theory exam. Sum of the total test marks of all subject are to be converted out of 100 marks as sessional work.
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : INDUSTRIAL SAFETY MANAGEMENT
SUBJECT CODE : 23108

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	01	--	03	100	--	--	--	100

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**
- **Eight Assignments pertaining to the subject shall be completed in the tutorials.**

RATIONALE

To inculcate the Management Principles and Techniques for Good Practices of Safety, Health and Environment (SHE).

OBJECTIVES

Equipping students with skills and techniques for:

- Accident prevention programme.
- Safety Training & Behavior Based Safety.
- Employee Participation for safety.
- Familiarization of Safety Management principles.
- Management Information system.

LEARNING STRUCTURE

DETAILED CONTENTS

CHAPTER	CONTENTS	MARKS	HOURS
1	**Introduction:** Management Principles, Levels of Management-Lower, Middle and Top, Types of Management – Line and Staff, Authority, Accountability and Responsibility of Management. Span of Management, Delegation and decentralization of authority. **Role of Management in Industrial Safety:** Planning for Safety- Definition, Purpose, Nature, Scope and Procedure. Range of planning, Types of plans, Management By Objectives (MBO), Policy formulation and implementation **Organising for Safety :** Definition, need, nature and principles. Organising for Safety, Health and Environment, Organisation structure, functions and responsibilities. **Directing Safety :** Definition, process, principles and techniques, Leadership – Styles, Role, functions and attributes of a good leader. **Communication:** Purpose, process, types and channels of communication Process. Group-dynamics and Team building. **National Policy on Safety, Health and Environment at Workplace.**	20	14
2	**Safety - Education and Training :** Element of training cycle, Training Need Assessment. Techniques of training, design and development of training programs/module. Training methods and strategies, Types of training. Evaluation and review of training programs. Competence Building Technique (CBT), Role of Multi-Media, Communication, Applications of Computers.	16	10
3	**Employee Participation in Safety :** Purpose, areas of participation, methods. Role of trade union in Safety Health and Environment Protection, Safety Committee - Structure and functions. Tool Box Talks, Safety Kaizen, One Point Lessons, etc. Safety Promotion and Safety Awards (National, State Level and unit level) and Suggestion Schemes, Safety Competitions, Safety Incentives Publicity Schemes, Audio Visual Publicity, other Promotional Methods.	16	10

CHAPTER	CONTENTS	MARKS	HOURS
4	**Behavior Based Safety (BBS) :** Human behavior - Individual differences, causes of behavior changes, behavior as function of self and situation, perception of danger and acceptance of risk, knowledge, and responsibility vis-a-vis safety performance, theories of motivation and their application to safety, role of supervisors and safety departments in motivation. **Conflict & Frustration :** Identification of situations leading to conflict and frustration and techniques of management.	16	10
5	**Management Information System (MIS):** Sources of information on Safety, Health and Environment. Compilation and collation of information, Analysis & use of modern methods of programming, storing and retrieval of information for Safety, Health and Environment. Computer utilization in Safety, Health and Environment (SHE) and SHE software development.	16	10
6	**Accident Prevention :** Principles of Accident Prevention/Program/Plan, Theories of Accident Causation, Need of Accident Prevention, Causes of Accident, Accident Prevention Models - Heinrich Theory, Frank Bird Model, Domino Model. Motivation for Safety, Accident Proneness, Accident Cost-Direct & Indirect. Role of Supervisor in Accident Prevention, Role of Workmen, Role of Management, Role of Trade Union, Role of Factory Medical Officer, Role of Safety Officer.	16	10
	TOTAL	**100**	**64**

INDICATIVE LIST OF TUTORIALS ASSIGNMENTS (Any 8)

Faculty may choose other assignments based on the curriculum

SR. NO.	ASSIGNMENT
1	Training Module For Induction Training
2	Training Module for Accident Prevention
3	Preparation of Model Occupational Health & Safety Policy
4	Annual Training Calendar
5	Preparation of MIS Form
6	BBS Observation Form
7	Tool Box Talk on Eye Protection / Head Protection
8	Any one Safety Kaizen
9	One Point Lesson
10	Accident Prevention Programme

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	Industrial Accident Prevention	By H.W. Heinrich, Dan Petersen, and Nestor Roos	McGraw-Hill Book Company, New York / New Delhi
2	Accident Prevention Manual (Vol. 1 & 2) (*ISBN*: 978-08-7-912135-8)	---	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
3	Accident Prevention Manual for Industrial Operations (ISBN: 978-08-7-912024-5)	---	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
4	Supervisors' Safety Manual (ISBN: 978-08-7-912288-1)	---	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
5	Loss Control Management	By Frank E. Bird, Jr. & Robert G. Loftus (ISBN: 0-8247-8479-0)	Institute Press, Loganville, Georgia (USA)
6	Management Guide to Loss Control	By Frank E. Bird, Jr.	Institute Press, Loganville, Georgia (USA)
7	Techniques of Safety Management	By Dan Petersen (ISBN: *978-18-8-558139-6)*	McGraw-Hill Book Co. Ltd., New York, N.Y. (USA)
8	Industrial Safety and Environment	By A.K. Gupta	Laxmi Publications, New Delhi
9	Industrial Safety: Concepts and Practices	By K.T. Kulkarni	Pune VidyarthiGrihaPrakashan, 1786, Sadashiv Peth, Pune - 411 030
10	A Course in Industrial Safety	By K.U. Mistry	NKM Publishers, Ahmedabad
11	'Method for computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Accidents'	---	IS:3786 – 1983 Indian Standards Institution, New Delhi

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : SAFETY IN ENGINEERING INDUSTRIES
SUBJECT CODE : 23109

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	--	02	03	100	--	50#	--	150

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**
- **Eight Assignments pertaining to the subject shall be completed in the tutorials.**

RATIONALE

Acquire the Knowledge, Skill and Mechanism of functioning of machine, tools and safe use of the same.

OBJECTIVES

The student will be able to:

- Develop SOP for machine operation & machine guards.
- Safe Hand tools Management
- Develop Safe methods of Material handling
- Identify Electrical hazards & suggest control measures
- Study safety aspects in Engineering & other Industries

LEARNING STRUCTURE

DETAILED CONTENTS

CHAPTER	CONTENTS	MARKS	HOURS
1	**Machine Operation and Guarding :** Principles in machine guarding. Ergonomics of machine guarding. Type of guards, their design and selection. Guarding of different types of machinery including special Precautions for wood working, paper, rubber and printing machinery, machine, tools etc. Built-in-safety devices, maintenance and repairs of guards, incidental safety devices and tools. Concept of zero access guarding. **Safety in the use of Machines :** Safety in the use of power presses (all types), shearing, bending, rolling, drawing, turning, boring, milling, shaping, planing, broaching, plating, grinding, CNC machine, robotics, etc. **Safety in the use of Hand Tools and Power Tools :** Main Causes, Prevention and Control of accidents in the use of hand and power tools. Centralized and personal tool issues System. Purchase, storage and supply of tools. Inspection, maintenance and repair of tools. Portable power tools and their selection, inspection, maintenance, repair and safe use. Non-sparking tool. **Hazards at Workplace:** Welding, Gas Cutting, Brazing, Soldering, buffing and polishing hazards and their preventive measures.	20	14
2	**Material Handling and Storage:** **Manual:** Kinetics of manual handling. Maximum loads that could be carried. Lifting and carrying of objects of different shapes, size and weight. Safe use of accessories for manual handling Storage of materials. Safety in stacking and un-stacking, floor loading conditions. Layout condition for safety in storage, ergonomics of manual handling and storage. **Mechanical:** Lifting machinery, lifts and hoists; design, use and care, signaling, inspection and maintenance. Safety in design and construction, operation, inspection and maintenance of industrial trucks, lifting tackles and loose gears, conveyors. Safety features, safe locations, testing, inspection and maintenance of lifting tackles, safe working load for all mechanical material handling equipment. The competent persons in relation to safety legislation - duties and responsibilities.	16	10
3	**Plant Layout Design and Housekeeping :** Plant layout, design and safe distance. Need for planning and follow-up. Safety and good house-keeping. Typical accidents due to poor house-keeping. Disposal of scrap and other trade wastes. Prevention of spillage. Marking of aisles	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	space and other locations. Use of colour as an aid for good housekeeping. Cleaning methods. Benefits of good housekeeping. '5S' system. Inspections and check-lists. Safety Check list for buying new machinery for the plant. Role of preventive maintenance in safety and health. Importance of standards and codes of practice for plant and equipment. **Boiler Operations:** Hazards in boiler operations and safety measures for its operations. **Thermic Fluid Heaters Operations:** Hazards in thermic fluid heaters operations and safety measures for its operations.		
4	**Electrical Hazards At Workplace** Hazards of electrical energy. Safe limits of amperages, voltages. Safe distance from lines. Capacity and protection of conductor. Joints and connections. Means of cutting off power. Overload and short circuit protection. No load protection. Earth fault protection. Earth insulation and continuity tests. Earthing Standards. Protection against voltage fluctuation. Types of protection for electrical equipment in hazardous atmosphere. Hazardous area classification. Criteria for selection, installation, maintenance and use of equipment in hazardous area. **Static Electricity**: Introduction, Electro-Static charge. Electro Static dissipaters. Electro Static hazards and their control. Earthing and bonding. Recommended earthling resistance. **Lightning Arrestors :** Definition. lightning splash. lightning strokes. lightning protection systems. Characterization of health effects of lightening stroke (electrical effects. side flashers. thermal effects. mechanical effects. Function of lightning arrestors.	16	10
5	**Introduction to Safety Aspects in Engineering Industries** : Engineering Industries, Automobile Manufacturing activity like pattern making, melting, moulding, machining, forging, chipping, grinding, Metallurgy: Ferrous and Non Ferrous Industry Foundry, Steel Plant. Hazards associated with Process of melting (furnaces), casting, foundry, forging and hot & cold rolling operations and their control measures **Hazards at workplace :** Mechanical hazards, Noise/Vibration Hazards, Fire Hazards, Physical, Toxic and Chemical Handling Hazards **Safety in Textile Industry:** Processes and Various hazards in textile industries and their control measures. **Safety in Agro-Industry / Sugar Industry** : Processes and Various hazards in agro/sugar industries and their control measures. **Safety in Docks Operations:**	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	Hazards in Handling of cargo – On Board Operations, On Shore and along Shore Operations, Warehouse Operations, Dangerous Goods, Container operations, Lifting appliance, Loose Gears and wire ropes, Responsibility of different agencies for safety and health involved in dock work.		
6	**Destructive Testing, Non Destructive Testing and Heat Treatment :** Break load test, Tensile Stress Load testing, etc. NDT-testing, significance and limitations. Types of NDT – Die Penetration Radiography, Ultrasound, Magnetic Particle Methods, Eddy-Current Method, Thermography and Heat treatment-Safety Aspects. **Safety in IT and Electronic Industry and Service Sector** Various hazards in IT, Electronic, related Service sectors and their control measures. Ergonomic hazards / Musculoskeletal Disorder (MSD), electrical hazards, physical hazards, radiation hazard, fire hazards, Computer Vision Syndrome (CVS), Carpal Tunnel Syndrome (CTS), Repetitive Strain Injury (RSI), Various hazards in Malls, Cinema Halls, Parking Lots and Commercial Sectors, etc. - Preventive and Control measures.	16	10
	TOTAL	**100**	**64**

LIST OF PRACTICAL ASSIGNMENTS / CASE STUDIES (Minimum 8)

SR. NO.	TOPIC
1	Design of a machine guard
2	Development of a plant Layout
3	Preparation of a safety Inspection Check list for Dock Area
4	Prepare Tool Box on Good Housekeeping
5	List out the Hazards at IT / Electronic Industries
6	Preparation of Housekeeping Checklist
7	List out the Hazards at Engineering Industries
8	Preparation of a safety Inspection Check list for Housekeeping
9	Development of a SOP for any one machine
10	List out the Hazards at Textile Industries

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	Safety code for Scaffolds and Ladders, (Part II) – Ladders	--	IS : 3696 , (Part II) - 1966
2	1979 Glossary of terms relating to wire ropes	--	IS 2363

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SR. NO.	TITLE	AUTHOR	PUBLICATION
3	1977 Steel wire ropes for general engineering purposes	--	IS 2266
4	1964 Wire rope slings and sling legs	--	IS 2762
5	1977 Steel wire suspension ropes for lifts, elevators and hoists.	--	IS 2365
6	1967 Code of practice for the selection, installation and maintenance of wire ropes	--	IS 3973
7	Accident Prevention Manual for Industrial Operations	--	National Safety Council444, North Michigan Avenue, Chicago, I 11 – 60611

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : CONSTRUCTION SAFETY
SUBJECT CODE : 23110

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	01	--	03	100	--	--	--	100

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**
- **Eight Assignments pertaining to the subject shall be completed in the tutorials.**

RATIONALE:

The subject paper is based for various industries for which National classification is considered to be based for selection of new industries. Since no. of industries under classification is very large, the scope is limited to only certain industries.

OBJECTIVES:

Equipping students with skills and techniques for:

- Identifying Hazards in Construction activities
- Developing safety measures to control hazards in each activity.
- Safe measures during demolition work.
- Safety measures in handling & using explosives in Construction.

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LEARNING STRUCTURE

DETAILED CONTENTS

The industries have been selected keeping in view of degree of risk frequency and severity of accidents caused in the specific industries and the safety, health & environment measures to be taken.

CHAPTER	CONTENTS	MARKS	HOURS
1	**Safety in Construction Industry :** **Hazards in Construction Sector and their preventive measures** - Basic philosophy, peculiarities and parameters governing the safety in construction - site planning and design layout, safe access, good housekeeping, safety in the use of construction machinery and transport equipment, signs and indication liaison for safety with local authorities, structural soundness. **Safety in the use of construction machinery.** Heavy/Long Items. Earth Moving equipment, Railway wagons, motor trucks, Materials Vehicles etc., Hazardous Materials, Material handling equipment, Seismic structural soundness and Structural stability. **Good Safety Practices / Initiatives in Construction Safety.**	20	14
2	**Types of Construction Activity:** **Working below ground level:** Excavation, drilling and blasting pneumatic, trenching, Excavation equipment, shoring, strutting, tunneling, piling and Safety in using and operating machinery and equipment relating to the above works. Foundations : Plant & Machinery and Structure **Working at height:** Scaffolding, shuttering / form work, ladders, concrete, cofferdams and special operation connected with irrigation work. Safety in use and portion of related machinery and equipment. Safety on working on fragile roof. Precautions on Tower Cranes, Temporary installation and structures.	16	10
3	**General Safety Measures:** **At Ground Level:** Housekeeping, Electrical Hazards, Handling and Storage of construction material at site. Safety precautions in storage handling and staking of material. **Underwater portions:** Well sinking, caissons underwater concreting, cofferdams and special operations connected with irrigation work. Safety in use of machinery and equipment related to underwater portions.	16	10
4	**Special Works:** High rise buildings, bridges and tunnels, roads, railways, asphalting, pneumatic caissons, electrical installations and lifts. Safety in Prevention and Protection	16	10

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CHAPTER	CONTENTS	MARKS	HOURS
	at Work Site including the collapsing of the structure. **Project Management in Constructions Safety:** Introduction, Manpower and material utilization-equipment and tools. **Safety in use and handling of explosives:** Open cost machinery, quarrying.		
5	**Special precautions for works of Engineering construction:** like distilling / fractionating columns, chimney, silos-oil and gas installations, transmission/ communication lines, Cooling towers, cable car installations, air fields.	16	10
6	**Safety in Demolition Operations:** Planning and Permit, sequence of demolition, Safety Precautions to be taken for and during demolition carrying out repairs, additions and alterations.	16	10
	TOTAL	**100**	**64**

INDICATIVE LIST OF TUTORIALS ASSIGNMENTS (Any 8)
Faculty may choose other assignments based on the curriculum

SR. NO.	ASSIGNMENT
1	Checklist for pneumatic hammer working
2	Development of a checklist for elevated platform
3	List out the Hazards for working at height
4	Development of Tool Box Talks for Construction Activity
5	JSA for excavation Activity
6	Prepare Safety Rules for Safe Construction activity
7	Checklist for Shuttering and shoring working
8	List out the Hazards in excavation in the premises of chemical unit
9	Prepare work permit for working at height on fragile roof
10	List out the statutory provisions for construction activity
11	Prepare PPE Matrix for working at Construction site-activity wise

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	The Chain Testers' Handbook	--	Chain Testers Association of Great Britain, 430 Barking Road, London.
2	Rigging Manual	--	Construction Safety Association of Ontario, Ontario, Canada

SR. NO.	TITLE	AUTHOR	PUBLICATION
3	Handbook of Rigging for Construction and Industrial Operations	W.E. Rossnagel	McGraw- Hill Book Co., 1221, Avenue of the Americans, New York, N.Y. 10020
4	Report No. 67 (1945)	N.C. Weston	Great Britain Medical Research Council Industrial Heath Research Board
5	Illumination Engineering Vol. 54, P-317-353, 1959.	H.R Blackwoll	--
6	Ind. J. of Tech. Vol. 2 No. 3, P. 102-106, 1964	V.R & B.K.S	--
7	Forthlight roofs	V.R & B.K.S	Ind. J. of Tech. Vol. 3. No. 3, Pg. 72-74, 1965
8	Rigging Manual	--	Construction Safety Association of Ontario, Ontario, Canada

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : CHEMICAL AND PROCESS SAFETY MANAGEMENT
SUBJECT CODE : 23111

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	01	--	03	100	--	--	--	100

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**
- **Eight Assignments pertaining to the subject shall be completed in the tutorials.**

RATIONALE

Study the nature and functions of chemicals, chemical processes, receiving, storage and handling of chemicals and understand the occupational health, safety and environment systems to be implemented for sustainable development.

OBJECTIVES

The student will be able to:

- Understand Risk Based PSM elements.
- Learn from Major Industrial disasters.
- Learn hazards & safety measures in Unit Process & operations.
- Learn the safe chemical handling & its management techniques.
- Know the Fire Safety aspects
- Learn the hazards in pressure system & control measures

LEARNING STRUCTURE

DETAILED CONTENTS

CHAPTER	CONTENTS	MARKS	HOURS
1	**Process Safety Management (PSM)** Purpose of PSM, its elements and Risk-Based Process Safety Management (RBPSM): Process safety culture, Compliance with standards, Process safety competency, Workforce involvement, Stakeholder outreach, Process knowledge management, Hazard Identification and Risk Assessment (HIRA), Operating procedures, Safe work practices, Asset integrity and reliability, Contractor Management, Training and Performance Assurance, Management Of Change (MOC), Operational readiness, Conduct of operations, Emergency management, Incident investigation, Measurement and metrics, Auditing, Management review and continuous improvement. **Major Industrial Disasters (Case Studies)** Flixborough disaster (1974), Seveso dioxin disaster (1976), Mexico LPG tank farm fire and explosion (1984), Bhopal disaster (1984), Sandoz-Basel disaster (1986), etc. **Enhancing safety in chemical industry** Introduction to Concept : Criteria for siting and layout of chemical plants, Hazardous Area Classification (HAC), Layers Of Protection Analysis (LOPA), Instrumentation for safe and efficient operation of plants, Safety Integrity Level (SIL)	20	14
2	**Unit operations and process hazards** Piping and Instrumentation Diagrams (P&ID), Various unit operations and their associated hazards, Control, precautions and prevention, specific safety measures for certain chemical industries like fertilisers, insecticides/pesticides, chloro-alkali, explosives, paints, petrochemicals, petroleum refineries, pharmaceuticals, etc. Sampling techniques for toxic and flammable chemicals, pharmaceuticals, etc. Precautions in the processes and operations involving explosives, flammables, toxic substances, dusts, gases, vapour cloud formations and combating	16	10
3	**Safe Handling of chemicals** Safety in receiving, storage and handling of chemicals, Nitrogen blanketing of flammable liquid storage tanks, Use of Material Safety Data Sheets (MSDS) and understanding the terminology used in MSDS, Chemical compatibility considerations Transportation of hazardous materials, Safety Precautions for transporting hazardous/ toxic/	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	flammable/explosive/ radioactive substances by all modes, U.N. classification of dangerous goods Transfer of chemicals by pipelines within and outside the installation (aboveground, underground and submarine), Pigging operation of pipelines including intelligent pigging, Cathodic protection of underground pipelines		
4	**Safety in plant operation and maintenance** Safe procedures for plant start-up and shut-down, Pipeline colour coding for identification of contents, Safety precautions for working on pipelines, Safety in preventive and emergency maintenance work, Pressure relief systems and breather valves, Flare system, Mechanism of Mechanical Failure that lead to a Loss of containment. Prevention strategy.	16	10
5	**Fire and explosion :** Industrial fires, Dispersion modelling, Chemistry of fire, Classification of fires, Deflagration and detonation, Unconfined Vapour Cloud Explosion (UVCE), Runaway reaction and control methods, Boiling-Liquid Expanding Vapour Explosion (BLEVE), Common causes of industrial fires, Dust explosion, factors of pentagon, causes of dust explosions and controls **Fire protection:** Design of building, plant, exits, etc. for fire safety, Fire-resistance of building materials, Fire-doors and firewalls, Determination of fire load, Dow Fire and Explosion Index, Salient features of fire, explosion and toxicity index **Fire detection and alarm system:** Various types of fire detection and alarm system, Special safety measures for control of fire and explosion in handling / processing of flammable gases, liquids, vapours, mists, solids, dusts and flying. **Fire-fighting systems:** Different types of portable fire extinguishers, their installation, periodic inspection and operation, Replacement of Halon with safer substitutes. Fire hydrant system, Fire monitors, sprinkler system and deluge system, Carbon-dioxide flooding system, Foam Pourer system	16	10
6	**Pressure vessels:** Pressure vessels (unfired) codes of practices governing their safety, Assessment of reliability of pressure vessels and their testing. Inspection techniques for plants, reaction vessels, Checklist for routine inspection; checklist for specific maintenance. **Pressure System Hazards and Controls :** Principle of pressure system, Pressure, Hazards of steam, Mechanism of Steam explosion, Properties of Liquid Petroleum Gas, Liquefaction of gases for bulk storage	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	under pressure, Pressure system, meaning of relevant fluids, key components and safety features of pressure system, Failure of pressure system, Hazards of overpressure and over temperature in pressure system, **Corrosion causes and protection** Corrosion and erosion, location, causes inspection and prevention, Cathodic protection of underground tanks/pipelines, Sacrificial anode, Protective cladding and lining		
	TOTAL	100	64

INDICATIVE LIST OF TUTORIALS ASSIGNMENTS (Any 8)
Faculty may choose other assignments based on the curriculum

SR. NO.	ASSIGNMENT
1	Sampling of liquefied flammable gas
2	Safe unloading of a flammable liquid tank-lorry
3	Explain the different types of pressure relief systems provided in your plant
4	Explain the fire-fighting systems provided in your plant
5	Statutory requirements for pressure vessels
6	Working of nitrogen blanketing of a storage tank
7	Sprinkler system for a flammable hydrocarbon storage tank
8	Safety features of LPG tank farm
9	Safety and process control system for a continuous distillation column
10	Preparing a reactor for confined space entry for repair work

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	Risk Based Process Safety By Center for Chemical Process Safety (CCPS), American Institute of Chemical Engineers (AIChE) (ISBN: 978-0-470-16569-0)	--	John Wiley & Sons Inc., Somerset, NJ (USA)
2	Accident Prevention Manual (Vol. 1 & 2) (*ISBN*: 978-08-7-912135-8)	--	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
3	Accident Prevention Manual for Industrial Operations (ISBN: 978-08-7-912024-5)	--	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
4	Supervisors' Safety Manual (ISBN: 978-08-7-912288-1)	--	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
5	Prevention of Major Industrial	--	International Labour Office

SR. NO.	TITLE	AUTHOR	PUBLICATION
	Accidents (ISBN: 92-2-107101-4)		(ILO), Geneva (Switzerland)
6	Loss Prevention in the Process Industries (Vol. 1, 2 & 3) (*ISBN:* 0-7506-1547-8)	Frank P. Lees	Butterworth-Heinemann Waltham, Massachusetts (USA)
7	Chemical Process Quantitative Risk Analysis (*ISBN*-13: 978-08-1-690720-5)		Center for Chemical Process Safety, American Institute of Chemical Engineers, New York, N.Y. (USA)
8	Loss Control Management (ISBN: 0824784790)	Frank E. Bird, Jr. & Robert G. Loftus	Institute Press, Loganville, Georgia (USA)
9	Management Guide to Loss Control (ISBN: *978-09-0-912600-1*)	Frank E. Bird, Jr.	Institute Press, Loganville, Georgia (USA)
10	Techniques of Safety Management (ISBN: *978-18-8-558139-6)*	Dan Petersen	McGraw-Hill Book Co. Ltd., New York, N.Y. (USA)
11	Transport of Dangerous Goods – Recommendations of the Committee of Experts of Transportation of Dangerous Goods (*ISBN:* 978-92-1-139136-7)	--	United Nations, New York, N.Y. (USA)
12	Agrochemicals Handbook (ISBN: 978-08-5-186416-7)	Douglas Hartley and Hamish Kidd	Royal Society of Chemistry, University of Nottingham (U.K.)
13	The Merck Index – An Encyclopedia of Chemicals (ISBN: 978-1-84973-670-1)	--	Merck & Company, Rahway, New Jersey, N.Y. (USA)
14	Hazardous Chemical Data Book (ISBN:081-551072-1)	G. Weiss	Noyes Data Corporation, Park Ridge,New Jersey, N.Y. (USA)
15	Threshold Limit Values for Chemical Substances in Work Environment Adopted by ACGIH (Published every year)	--	American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (USA)
16	NIOSH Pocket Guide to Chemical Hazards By National Institute of Occupational Safety & Health (ISBN: 978-15-9-042586-2)	--	U.S. Department of Health and Human Services, Washington, D.C. (USA)
17	Major Hazard Control: A Practical Manual By ILO (ISBN: 978-92-2-106432-9)	--	International Labour Office, Geneva (Switzerland)
18	Industrial Safety and Environment (ISBN: 978-81-3-180454-4)	A.K. Gupta	Laxmi Publications, New Delhi
19	Industrial Safety: Concepts and Practices	K.T. Kulkarni	Pune Vidyarthi Griha Prakashan, 1786, Sadashiv Peth, Pune - 411 030

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : ENVIRONMENTAL MANAGEMENT
SUBJECT CODE : 23112

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	01	--	03	100	--	--	--	100

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**
- **Eight Assignments pertaining to the subject shall be completed in the tutorials.**

RATIONALE

This subject deals with environment management system as well as environmental policy, laws, economics which are very much essential from the point of view of today's environmental problems.

OBJECTIVES

The student will be able to:

- Understand elements of Environment management system.
- Learn methods of Environmental monitoring.
- Study the various techniques of waste management.
- Learn the techniques of Energy Conservation.
- Know the Sustainability Reporting
- Understand global warming issue & its control measures

LEARNING STRUCTURE

DETAILED CONTENTS

CHAPTER	CONTENTS	MARKS	HOURS
1	**Environmental Management Systems** EMS Audit- ISO 14001: 2015, Aspects and impact of Environment Management, Environmental Policy, Environment Management Programmes, Administrative Procedure for Environmental Clearances, Environmental Impact Assessment (EIA), Process and Methodologies, Air Pollution and control measures, Water Pollution and control measures, Soil Pollution and Control measures, Plastic Pollution & control measures, Ecosystem` and the components of ecosystem. **Concept of Common Effluent Treatment Plant (CETP)**: Floating aquatic plant system and its design and operation. Sludge characteristics and disposal methods –design and operation of sludge drying bed. Design and operation of treatment plant. Trouble shooting and trouble free operation.	20	14
2	**Environmental Important Regulations :** Water and Air Acts and Rules, Environment (Protection) Act and Rules, Water Cess Act & Rules, Public Liability Act & Rules, Role of State Pollution Control Board under Water and Air Act. **Environmental Monitoring :** Environment related terms/definitions, Principles & practices for monitoring of air pollution, water pollution, solid waste management. Cleaner technologies. Ambient Air quality, Environmental Noise Pollution, Stack Monitoring, Effluent Monitoring, Effluent Treatment Plant-Key process, Air Pollution Control Devices, Scrubber System, Parameters of Effluent monitored.	16	10
3	**Waste Management :** Statutory Provisions for Bio Medical Wastes, E waste management, Battery waste management, treatment, transportation and disposal. Hazardous Waste Management: Hazardous waste, PCB requirements and transportation of hazardous wastes, Manifest, TREM Card, Solid Waste management, ETP and STP , Management of Hazardous waste by industries. Six R-Concept: Rethink, Refuse, Reduce, Recycle, Reuse & Reprocessing/Co-processing of Waste.	16	10
4	**Global Warming:** Carbon Emission Atmospheric gases, Greenhouse gases, Kyoto protocol, Acid rains, Effects on Human beings, wild life and Natures Mitigation measures of Global warming. Deforestation, Tree Plantation, Bio Diversity, Carbon Credit, Ozone depleting substances and its impact on the Environment , Restrictions for development in Coastal Zone	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	as per CRZ regulations.		
5	**Energy Conservation :** Key elements of energy management system ISO 50001, use of clean technologies, energy conservation measures Water Conservation, Recycling, Harvesting, Power Saving Measures, Paper Saving measures, Raw Material Saving, Depletion of natural resources, Renewable Energy, Life Cycle Assessment(LCA), Product Stewardship, Green Supply Chain, Eco Friendly environment good practices & innovations, etc.	16	10
6	**Sustainability Reporting:** Elements of Sustainability Reports, Purpose & advantages of Sustainability Reporting. Global Reporting Initiative (GRI) G 4 guidelines, Eco system, concept and structure, Monitoring and analysis of industrial effluents, Green Building Concept(GBC).	16	10
	TOTAL	**100**	**64**

INDICATIVE LIST OF TUTORIALS ASSIGNMENTS (Any 8)

Faculty may choose other assignments based on the curriculum

SR. NO.	ASSIGNMENT
1	Preparation of a model EIA
2	Preparation of a model Environmental Policy
3	Checklist for Air monitoring
4	Bio medical waste checklist
5	List out various consent parameters
6	Checklist for a ETP
7	List out various Energy Saving practices
8	List out elements of Sustainability Reporting
9	List out the equipment required for stack monitoring
10	List out various Water Saving practices
11	Assignment of Internal Audit of any unit based on ISO 14001

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	The Environment Protection Act & Rule	--	Bare Act
2	Guide for Environment Clearance	--	Bare Act
3	Environment Impact Assessment	--	Bare Act

SR. NO.	TITLE	AUTHOR	PUBLICATION
4	Standard ISO: 14001	--	ISO
5	Environmental Engineering	Venugopal Rao	Prentice-Hall of India Pvt., New Delhi
6	Environmental Studies	N K Uberoi	Excel Books, New Delhi
7	Environment Management in India	R K Sapru	Ashish Publishing House, New Delhi
8	Environmental Studies	Daniel & Krishnaswamy	John Willey and Sons Inc, New Jersey, USA
9	Environmental Health & Safety Management	Nicholas & Madelyn	Jaico Publishing House, Mumbai
10	Text book of . Environmental Studies	Erach Bharucha	Universities Press (India), Hyderabad
11	Environmental Studies	R. Rajgopalan	Oxford University Press, New Delhi
12	Wastewater Engineering: Treatment, disposal, Reuse	Metcalf & Eddy	Inc.4th ed. TMGHI, New Delhi, 2003.

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : QUALITY CONTROL IN OCCUPATIONAL SAFETY & HEALTH
SUBJECT CODE : 23113

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	01	--	03	100	--	--	--	100

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**
- **Eight Assignments pertaining to the subject shall be completed in the tutorials.**

RATIONALE

It aims to equip the student with skills and techniques for preventing accidents and minimising losses.

OBJECTIVES

The student will be able to:

- Know Safety Inspection, Safety Survey and safety tag system.
- Learn methods of measurement of safety indices as per IS 3786.
- Develop the work permit system.
- Learn the techniques of Hazard Identifications.
- Know the process of safety audit.
- Understand Major accident hazard & its control measures

LEARNING STRUCTURE

DETAILED CONTENTS

CHAPTER	CONTENTS	MARKS	HOURS
1	**Safety Appraisal & Control Techniques:** Plant safety rules and procedure, Safe operating systems, Safety checklist, Safety tag system, Plant Safety Inspection (PSI), Safety sampling, Safety surveys and safety tours, Safety inventory system, Product safety, Total Loss Control (TLC) **Permit to work Systems :** Types of Work Permit – Hot Work, Cold Work, Working at height, Electric Isolation, Confined Space Entry, Excavation, Working on Fragile Roof. Contents of Work Permits, Process for execution and closure of work permit, Lock Out and Tag Out (LOTO) system.	20	14
2	**Accident / incident / near-miss / dangerous occurrence reporting, investigation :** Accident/incident reporting and investigation, purpose and process. Accident Report forms, Accidents reportable under various statutes like Factories Act 1948, the BOCW Act 1996, the ESI Act 1948, etc., Agencies investigating accident. Identifying the key factors and the immediate and basic causes, Accident investigation report, Corrective Action and Preventive Action (CAPA).	16	10
3	**Measurement and evaluation of safety performance** Indian standard IS-3786 and its salient features, Definition of terminology used- Accident, incident, near-miss incident, dangerous occurrence, disabling (lost-time) injury, non-disabling injury, reportable lost-time injury, non-reportable lost-time injury, days of disablement (lost time), partial disablement, temporary partial disablement, permanent partial disablement, total disablement, temporary total disablement, permanent total disablement, man-hours worked/ exposure hours, scheduled charges for disabilities, statistical period, Restricted Work Case (RWC), first-aid case, etc. **Safety performance indicators:** Frequency Rate (FR), weighted frequency rate, Severity Rate (SR), incidence rate, Frequency-Severity Index (FSI), Safe-T-Score, cost factor, cost severity rate, activity rate, Fatal Accident Frequency Rate (FAFR), time charges in the Employee's Compensation Act, 1923, Leading & Lagging indicators. **Classification of industrial accidents and special cases according to IS-3786:** Classification of accidents as per IS-3786:1983, Assessment of special cases: Inguinal hernia, Back injury, Aggravation of pre-existing condition, Aggravation of a minor injury, Cardio-vascular diseases, Miscellaneous, Other disabilities **Accident/incident analysis:** Methods of collating and	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	tabulating data, Record-keeping, Accident/ incident/ occupational illness trend analysis		
4	**Hazard identification, Risk assessment and control** Hazard Identification and Risk Assessment (HIRA), Hierarchy of hazard control, Hazard Analysis (HAZAN), Introduction to concept of Maximum Credible Accident Analysis (MCAA) and Quantitative Risk Assessment (QRA) **Hazard Identification Techniques :** Reactive approach: Incident recall technique (after-the-event approach), Proactive approaches: Critical incident review technique (before-the-event approach), Deductive technique, Inductive technique What-if, Fishbone, Why-Why, Root Cause Analysis (RCA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA), Cause-Consequence Analysis (CCA), Management Oversight and Review Technique (MORT), Failure Mode and Effects Analysis (FMEA), Job Safety Analysis (JSA).	16	10
5	**Major Accident Hazards (MAH) Control System :** Major Accident Control, Definition of major accident hazards, Identification and assessment of MAH installations, Roles of Government, Management, Local Authorities and Public, ILO Code of Practice for major accident control. **Emergency Preparedness and response plans** On-site emergency response plan, Off-site emergency response plan Mutual Accident Response Group (MARG), Major accident control system at local, state, national and international levels	16	10
6	**Occupational Health and Safety Audits** Occupational health and safety audits IS-14489: 1998, Different types of audits: Internal, External audits and Integrated Management System (IMS) IS-18001:2007/ OHSAS 18001:2007/ISO 45001.	16	10
	TOTAL	**100**	**64**

INDICATIVE LIST OF TUTORIALS ASSIGNMENTS (Any 8)
Faculty may choose other assignments based on the curriculum

SR. NO.	ASSIGNMENT
1	HIRA Sheet Format
2	HAZOP Sheet Format
3	JSA Sheet Format
4	FR,SR and Index Examples
5	Safety Audit elements

SR. NO.	ASSIGNMENT
6	FTA (fault tree analysis)
7	Designing Accident Report Form
8	Designing Accident Investigation Form
9	List any Ten Safety Rules followed in your company
10	Prepare model permit for Confined Space Entry Permit
11	Prepare model permit for Hot Work Permit
12	Prepare model permit for Work at height

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	Industrial Accident Prevention	H.W. Heinrich, Dan Petersen, and Nestor Roos	McGraw-Hill Book Company, New York / New Delhi
2	Accident Prevention Manual (Vol. 1 & 2) (*ISBN*: 978-08-7-912135-8)	--	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
3	Accident Prevention Manual for Industrial Operations (ISBN: 978-08-7-912024-5)	--	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
4	Supervisors' Safety Manual (ISBN: 978-08-7-912288-1)	--	National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
5	Prevention of Major Industrial Accidents (ISBN: 92-2-107101-4)	--	International Labour Office (ILO), Geneva (Switzerland)
6	Loss Prevention in the Process Industries (Vol. 1, 2 & 3) (*ISBN:* 0-7506-1547-8)	Frank P. Lees	Butterworth-Heinemann Waltham, Massachusetts (USA)
7	Chemical Process Quantitative Risk Analysis (*ISBN*-13: 978-08-1-690720-5)		Center for Chemical Process Safety, American Institute of Chemical Engineers, New York, N.Y. (USA)
8	Loss Control Management (ISBN: 0-8247-8479-0)	Frank E. Bird, Jr. & Robert G. Loftus	Institute Press, Loganville, Georgia (USA)
9	Management Guide to Loss Control	Frank E. Bird, Jr.	Institute Press, Loganville, Georgia (USA)
10	Techniques of Safety Management (ISBN: *978-18-8-558139-6)*	Dan Petersen	McGraw-Hill Book Co. Ltd., New York, N.Y. (USA)
11	Industrial Safety and Environment	A.K. Gupta	Laxmi Publications, New Delhi
12	Industrial Safety: Concepts and Practices	K.T. Kulkarni	Pune Vidyarthi Griha Prakashan, 1786, Sadashiv Peth, Pune - 411 030
13	A Course in Industrial Safety	K.U. Mistry	NKM Publishers, Ahmedabad

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : SAFETY, HEALTH AND ENVIRONMENTAL LEGISLATION
SUBJECT CODE : 23114

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	01	--	03	100	--	--	--	100

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**
- **Eight Assignments pertaining to the subject shall be completed in the tutorials.**

RATIONALE

To acquaint the student with National and International Acts, Rules, Conventions pertaining to Safety, Health and Environment.

OBJECTIVES

The student will be able to:

- Know various safety statutory requirements under Factories Act and its rules.
- Learn safety provisions under BOCW Act & Rules.
- Know safety statutory requirements under various SHE Legislations.
- Know the important measures in Social Security Legislations.
- Know the safety related ILO conventions & recommendations.

LEARNING STRUCTURE

DETAILED CONTENTS

CHAPTER	CONTENTS	MARKS	HOURS
1	**The Factories Act, 1948 and Rules :** Provisions relating to Safety, Health and welfare, under the Act and Factories Rules made there-under, Amendments Process to the Act and Rules, The Maharashtra Factories Safety Audit Rule 2014, Important Case Laws under the Factories Act, 1948,	20	14
2	The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, and Central Rules, 1998 and State Rules The Building and other Construction Worker's Welfare Cess Act, 1996 and State Rules, 1998, Maharashtra Fire Prevention and Life Saving Act, 2007 and Rules.	16	10
3	**Environment Protection Legislations :** Water (Prevention & Control of Pollution) Act 1974 and Rules. Air (Prevention and Control of Pollution) Act 1981 and1982 and Rules. **Environment (Protection) Act, 1986 and Rules.** Manufacture Storage and Import of Hazardous Chemical Rules, 1989, Noise Pollution Act, 1998, Bio-Medical Waste, E-Waste Rule, Batteries Rule, Hazardous Waste Management (Trans boundary) Rules, Chemical Accidents (Emergency Preparedness, Planning and Response) Rules 1996	16	10
4	**Safety, Health and Environment (SHE) related Important Legislation:** Sections pertaining to SHE in Indian Boilers Act, 1923 with allied Regulations, 1961, Indian Electricity Act, 2003 and Rules, latest CEA guidelines, Indian Explosives Act, 1984 and Rules. Petroleum Act and Rules, Gas Cylinders Rules. Calcium Carbide Rules, The Insecticides Act and Rules. Radiation Protection Rules, Hazardous Materials Transportation Rules, Static and Mobile (Unfired) Pressure Vessel Rules, 1981 as amended in 2000. The Dock Workers (Safety, Health & Welfare) Act 1996 and Rules and Regulations.	16	10
5	**Social Security Legislations** Employees Compensation Act and Rules, ESIC Act and Rules, Contract Labour (Abolition and Conditions of Service) Act and Rules, Public Liability Insurance Act, 1991 and Rules, Responsible Care (RC), Motor Vehicles Act, 1988 and Rules The Central Motor Vehicles Rules, 1989, The Maharashtra Motor Vehicles Rules, 1989, Transport of Hazardous Goods by Road Rules, Fire Prevention and life Safety	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	Measures Act 2006 and rules.		
6	**ILO Convention and Recommendation concerning Occupational Health & Safety** Relevant Conventions and Recommendation of ILO in the furtherance of Safety, Health and Environment (SHE). SHE a human right issue. Trade Policy affecting OHS.	16	10
	TOTAL	**100**	**64**

INDICATIVE LIST OF TUTORIALS ASSIGNMENTS (Any 8)

Faculty may choose other assignments based on the curriculum

SR. NO.	ASSIGNMENT
1	List out the Health Provisions under Factories Act / Rule
2	Identify the Duties of Occupier under Factories Act / Rule
3	List out the Key Statutory Provisions under BOCW Act / Rule
4	List out the rules under Environment (Protection) Act, 1986
5	Case Law on Social Security Act
6	Case Law on Dock Safety Act, 1986
7	Case Law on Factories Act
8	List out the Provisions under Factories Act /Rule for Hazardous Process
9	Duties Of Safety Officer
10	List out the Key Elements in PCB Consent to Operate

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	The Factories Act, 1948 & Factories Rules	--	Bare Act
2	Environment (Protection) Act, 1986 and Rules	--	Bare Act
3	The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, and Central Rules, 1998 and State Rules	--	Bare Act
4	Employees Compensation Act, 1923 and Rules	--	Bare Act
5	Indian Electricity Act, 2003 and Rules CEA guidelines, Indian Explosives Act, 1984 and Rules.	--	Bare Act
6	The Petroleum Act & Rules	--	Bare Act
7	The Dock Workers (Safety, Health & Welfare) Act 1996 and Rules and Regulations.	--	Bare Act
8	Indian Boilers Act, 1923 with allied Regulations. 1961.	--	Bare Act
9	The Maharashtra Fire Prevention and life Safety Measures Act 2006 and Rules	--	Bare Act

COURSE NAME : ADVANCE DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH
SUBJECT CODE : 23115

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	--	02	03	100	--	50#	--	150

NOTE

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW)**

RATIONALE

Acquire knowledge of interaction of Man and Machine to maintain Hygiene and Health while working to prevent exposure to dangers.

OBJECTIVES

The student will be able to

- Learn the heat stress and understand the importance of adequate ventilation.
- Select proper Personal Protection Equipments for industrial activities.
- Study the heat stress indices & ventilation techniques.
- Know the hazards & control measures for Noise & vibration.
- Study occupational health hazards and its control measures.
- Know the first aid measures for various injuries.
- Understand the ergonomical hazards and its solutions

LEARNING STRUCTURE

DETAILED CONTENTS

CHAPTER	CONTENTS	MARKS	HOURS
1	**Ventilation and Heat Stress :** Purpose of ventilation. Physiology of heat regulation. Thermal environment and its measurement. Indices of heat stress. Thermal limits for comfort, efficiency and freedom from health risk. Natural ventilation. Mechanical ventilation. Air conditioning. Control of heat exposures at source, dilution and local ventilation. Recommended values for air changes required for various areas as per Factories Act, 1948 and National Standards. **Industrial Lighting & Illumination :** Purpose of lighting. Benefits of good illumination. Phenomenon of lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended optimum standards of illumination. Stroboscopic Effect, Design of lighting installation. Maintenance. IS Standards relating to lighting and color. **Noise and Vibration :** Noise and ill-effect of noise on human health- Auditory & non-auditory, Measurement and evaluation of noise. Control of Noise Hazards- Noise absorption techniques, silencers. Permissible level of exposure to noise in Industry. Ill effects of vibration, White Fingers (Reynolds's phenomenon), and control measures of vibration.	20	14
2	**Industrial Hygiene :** Definition of Industrial Hygiene, Industrial Hygiene: Control Methods, Substitution, Changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures. Introduction to chemical hazards, dangerous properties of chemical, dust, gases, fumes, mist, vapours, smoke and aerosols. Route of entry to human system, recognition, evaluation and control of basic hazards, concepts of dose response relationship, bio-chemical action of toxic substances. Personal Sampler. High Volume Sampler. Midget Impinger Tubes. Rota meter. Calibration of Rotameter. Concept of threshold, limit values TLV-TWA/ PEL /OEL, STEL, IDLH, LC_{50}, LD_{50} and air sampling strategies, personal exposure monitoring.	16	10
3	**Personal Protective Equipment :**	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	Need for personal protection equipment, selection, applicable standards, supply, use, care & maintenance respiratory and non-respiratory personal protective equipment. Non-respiratory personal protective devices: Head protection, Ear protection. Face and Eye protection. Hand protection, Foot protection, body protection. Respiratory personal protective devices : Classification of hazards: Classification of respiratory personal protective devices. Selection of respiratory personal protective devices. Instructions and training in the use, maintenance and care of self-containing breathing apparatus. Training in the use of breathing apparatus (opens circuits and close unit). Testing Procedures and Standards.		
4	**Occupational Health :** Definition: As per WHO, Common Occupational Diseases, Occupations involving risk of contracting these disease - mode of causation of the diseases and its effects - diagnostic methods. Biological monitoring - Method of prevention Compensation for occupational diseases. Evaluation of injuries Occupational Health Management Services at the work place. List of notifiable diseases Third Schedule of Factories Act, 1948. Occupational Health Surveillance-Pre employment, Periodical, Post employment Medical examination, Role of Factory Medical Officer / Certifying Surgeon. Occupational exposure & Risk based health surveillance **Occupational Health Hazards & Occupational Diseases :** Adverse health effects of noise, vibration, cold, heat stress, improper illumination, thermal radiation, ionizing and non-lionizing radiations. Permissible threshold exposure limits - short term and long term effects of exposures - Preventive and control measures. Common Occupational Diseases as per the Third Schedule of the Factories Act, 1948 Preventive and control measures.	16	10
5	**First Aid :** Define First Aid, Purpose, Principles of First aid, First Aider-Role & Responsibilities and Qualities. Fundamentals of First-Aid- for thermal burns & chemical burns, Fractures, Fainting, Shock, insects and animal bites, Suffocation, Toxic Ingestion - Bleeding Wounds and Bandaging, Artificial Respiratory, Cardiopulmonary Resuscitation (CPR), Techniques. Victim transportation, Rescue Techniques. First Aid Box and its contents.	16	10
6	**Introduction to Ergonomics:** Definition, Aims and Scope, Man-machine (Job),	16	10

CHAPTER	CONTENTS	MARKS	HOURS
	Environment System, Constituents of Ergonomics, Application of Ergonomics in industry for Safety, Health and Environment. Ergonomics of Automation/Assembly, Visual Fatigue and Ergonomics of Rehabilitation while assigning alternate jobs. Working postures Its effect on cardio-vascular and musculoskeletal system and implications on health, Anthropometry and fundamental of bio-mechanics: Basic and applied aspects: Anthropometric measurements and their usefulness in industry, Permissible limits of load for manual lifting and carrying. Concept of workstation and its design. Improving safety and productivity through work station design. **Physiology at Work:** Assessment of Workload based on Human Physiological reactions. Assessment of Work Capacity Fatigue and Rest Allowances. Physiological Test for Assessment of Occupational Health. Work and Physical Fitness Aerobic work capacity (physical work capacity), methods of its determination (use of bicycle, ergometer, treadmill, step-stool ergometer). Factors affecting aerobic capacity and work performance.		
	TOTAL	**100**	**64**

LIST OF PRACTICAL (Minimum 10 experiments)

SR. NO.	EXPERIMENTS
1	Demonstration. Calibration of Sampling Equipment
2	Sampling and Estimation of Gases in Work Environment by Colorimetric Method Oxides of Nitrogen, Sulfur Dioxide, Ammonia & Chorine
3	Sampling and Estimation of Solvent / toxic vapours in work environment. Benzene-Sampling by Activities Charcoal and Analysis by Gas Liquid Chromatography, CO, H_2S, CS_2 Sampling by Aspiratory Bottle Analysis by Colorimetric Method.
4	Personal Protective Equipment (PPE)
5	**Noise Level Measurement.** (a) Measurement of Sound pressure level in dBA and dB linear. (b) Frequency analysis of noise.
6	**Measurement of Ventilation:** Measurement of thermal Dry Bulb Temperature Wet Bulb Temperature Determination of relative humidity and effective corrective effective. 1) Aspirator Hygrometer. 2) Kata-Thermometer

SR. NO.	EXPERIMENTS
	3) Globe-Thermometer
7	Lung Function Test Ear Testing on Audiometer
8	Explanation of charts on Industrial noise, notifiable diseases, physical health hazards, chemical health hazards, industrial dermatoses prevention and control
9	Transportation of Victim Rescue of Victim, Bandaging, CPR
10	To find out the physical fitness of person by step test
11	Demonstration of Medical equipment such as Vision tester, Blood Analyser and Electrocardiograph (ECG)
12	Measurement of illumination level at working place with the help of digital Lux meter

EQUIPMENTS FOR PRACTICAL

SR. NO.	NAME OF EQUIPMENT
1	Rotameter
2	Impinger Tube
3	Personal Sampler
4	Multi Gas Detector
5	Gas Detector Tube with pump
6	Lux meter
7	Noise Decibel meter / Sound Level Meter
8	Kata Thermometer
9	Dry Bulb & Wet Bulb Thermometer
10	Psychrometer
11	Audiometer
12	First Aid Box
13	Stretcher
14	Other Equipment

SUGGESTED LEARNING RESOURCES

SR. NO.	TITLE	AUTHOR	PUBLICATION
1	"Health & Safety At Work" Booklets	--	Department of Employment and Productivity, U.K
2	Model Code of Safety Regulation for Industrial Establishments	--	ILO
3	Encyclopedia of Occupational Health and Safety	--	ILO
4	Accident Prevention Manual for Industrial Operations	--	National Safety Council, 444, North Michigan Avenue, Chicago, I 11 – 60611.

SR. NO.	TITLE	AUTHOR	PUBLICATION
5	The Chain Testers' Handbook	--	the Chain Jesters Association of Great Britain430 Barking Road, London E 13 BHG
6	Lung function assessment and application in Medicine	Cotes J.E	3rd Edn. Blackwell Scientific Publications 1969 P.g. 385 to 387
7	Spirometric Standards for normal males and females.	Morris J.P.	Am. Rev. Resp. Dis. 1971, 03, 57
8	Predictor equation for Lung function in Indians	Kamath S.R. et all	Jr. Ass. Phys. Ind. Vol. 25, Aug. 1977
9	Proper Training, Techniques Vital to pulmonary testing Pg. 23-27.	Horvath P.E	
10	Biological effects and health implications of microwave radiation.	S.F.Cleary (Ed.),	US HEW Report BRH (DBE2-70), Rockville, 1971
11	Uncortainties in the evaluation of the biological effects of microwave	S.F.Cleary	Hlth. Phys. 25,
12	Biological effects and health hazards of microwave radiation.	P.Czerski et. all (Eds.),	Polish Medical Publ. Warsaw 1974
13	Biological and Medical problems raised by the use of radar ultrasound waves.	R.P. Delahaye	Radioprotection, Dunod, 12, 199-216, 1977
14	Factories Act & State Factories Rule	--	--
15	National Standards. IS:3103-1975-Code of practice for Industrial Ventilation, National Building Code Part VIII, Building Services.	--	--

COURSE NAME : ADVANCED DIPLOMA IN INDUSTRIAL SAFETY
COURSE CODE : IT
YEAR : FIRST
SUBJECT TITLE : PROJECT
SUBJECT CODE : 23057

TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME			EXAM SCHEME & MAXIMUM MARKS					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	50#	50@	100

RATIONALE

The main aim of the preparation of project on industrial safety is to judge the knowledge gained by the students during their tenure of the industrial safety programme, the transfer of learning that has taken place as well as their exposure to industrial environment and its safety; so that many faceted development of the students can be achieved under various skills of domains such as Personal, social, professional & lifelong learning. The students will be benefited lot by this exercise of preparation of project on their safety experiences which will certainly add values in their attitudes such as value for health, work commitment, hardworking, honesty, problem solving, punctuality, loyalty and independent study. The Student should also make a brief presentation about the project and the salient observations and findings.

The Project report should essentially consists of the following

1. TITLE OF THE PROJECT WORK
2. ACKNOWLEDGEMENT
3. PREFACE
4. CERTIFICATE FROM THE ORGANISATION
5. CERTIFICATE FROM THE STUDENT THAT PROJECT HAS BEEN DONE BY HIM
6. EXECUTIVE SUMMARY
7. INDEX / CONTENTS
8. AIM, OBJECTIVE AND METHODOLOGY
9. INTRODUCTION
10. ABOUT THE ORGANISATION / COMPANY
11. SAFETY, HEALTH AND ENVIRONMENTAL ACTIVITIES IN THE COMPANY
12. OBSERVATIONS AND FINDINGS
13. SUMMARY OF RECOMMENDATIONS
14. REFERENCES / BIBLIOGRAPHY
15. MY KEY LEARNING IN INDUSTRIAL SAFETY AFTER PROJECT

LEARNING STRUCTURE

Application	To develop the students from all faces of various domains of skills such as Personal, social, professional & life long learning and make them a perfect human being with awareness of all social responsibilities
Procedures	Methods of preparation of day- to- day record of actual work done in industrial safety. Collection of various related information about the same. Procedures for preparation of project and its submission.
Principles	Principles of record keeping, data collection, scrutiny and selection for presentation of project.
Concepts	Data of actual work done, subject data, diagrams and results.
Facts	Actual safety experiences, work done, subjects, records, presentation aids.

IMPLEMENTATION STRATEGY

The project report is to be assessed by external and internal examiners equally for

a) **Project assessment – 50 marks** (To be reported under title term work – **TW**)

b) **Oral based on Project work – 50 marks** (To be reported under title Oral– **OR**)

MPORTANT NOTE

- There should not be any sort of typographical, diagrammatic, chemical titles, chemical formulas / structures and any other mistake/s in the final bound copy of the project report submitted by the candidate.
- Refer General Guidelines given below.

GUIDELINES FOR PREPARING THE PROJECT REPORT

Project work is a basic requirement for the award of Advance Diploma in Industrial Safety. Project shall be prepared based on any one of the subjects of the Programme. The project work should be comprehensive and cover all aspects of the management of occupational health and Industrial Safety.

1. TITLE OF THE PROJECT WORK

Select an appropriate title, e.g., "Safety in a Petrochemical Plant" or "Safety in a Chlor-Alkali Plant", "Safety in an Engineering Company", etc. The upper half of the first page of the project report should have the title of the project report in bold block letters and the lower half some important information like the year, the name of the author (report writer) and the name of the institute.

2. CONTENTS

On the second page of the project report should be the table of contents. This table can be prepared after finishing the project report, i.e., when the typing work of the entire project report has been completed, the pages have been numbered and all annexures appended at the end.

3. ACKNOWLEDGEMENT

It should appear on the third page and the report writer should acknowledge the guidance provided by the project guide. Here the author may also acknowledge other persons who might have rendered help or supplied the required data or information for completion of the project. It should be brief and crisp. Generally, one page should suffice for acknowledgement.

4. PREFACE, OBJECTIVE AND METHODOLOGY

Preface should describe the choice of selected project work and its objective. The preface should be limited to one or two pages. It will be prudent to mention the objective and the methodology used for the project work, e.g., collecting data from various records available in

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the company, interviewing certain key employees, questionnaires, etc. Thereafter, briefly mention the scope of project work. The objective could be, for example, :

(1) To study the safety organisation and safety procedures of the company
(2) To study the underlying causes of accidents and near-miss incidents
(3) To examine and evaluate the safety performance of the company
(4) To give suggestions/recommendations for improving the safety performance of the company, preventing occupational diseases and conserving the environment.

5. INTRODUCTION

Brief description of the Organization, the main raw materials used, its processes and the main features of manufacturing and other key operations, including the potential hazards shall be the contents. It is recommended to limit the description to about 5 to 10 pages.

6. SAFETY, HEALTH AND ENVIRONMENTAL ACTIVITIES IN THE COMPANY

This is the most important part of the project report and forms the main body of the project report. It needs very comprehensive coverage of all aspects of safety in the plant, industrial hygiene, environmental conservation, safety in storage and transportation, etc. It will usually require about 60 to 100 pages. Write-up should include the details mainly in some of the following areas:

- Occupational health, safety and environment policy of the company and its implementation
- Safety organisation
- Role of management in promoting safety and striving for continual improvement
- Accident and near-miss incidents reporting system
- Accident and near-miss incident investigation system
- Accident/incident analysis (using data of previous five years at least)
- Case-studies (discuss at least five cases of different types of accidents/near-misses)
- Selection and training of employees
- Safety induction and safety training of employees and contractor personnel
- Health and hygiene (including pre-employment and periodic medical examinations)
- Environmental conservation
- Safety in transportation and training of drivers
- Trade union and its role in promoting safety
- Plant layout
- Facilities and services
- Storage and handling of chemicals
- Built-in safety measures
- Instrumentation for safety of plant and personnel
- Fire prevention and fire-fighting measures
- Housekeeping
- Personal protective equipment (PPE)
- Pollution control measures

- Various safety procedures (e.g., work permit system, working at height, etc.)
- Job safety analysis (JSA)
- Preventive maintenance
- Safe operating procedures (SOPs) and operating manuals
- Safety manual, material safety data sheets (MSDS), Tremcards, etc.
- Health, safety and environment audits.

Relevant information and data presented in the form of tables and graphs (e.g., graphs for injury frequency rates, severity rates, frequency-severity indices, incident rates, fire statistics, etc.), accident/incident analysis, work permit form, accident/near-miss incident report form, medical attention form, block diagrams, plant layout, relevant photographs, MSDS, etc., which are required to supplement your project report, should be included at the end as annexures with appropriate references in the main text of the project report. If an annexure is of more than one page, it should be provided with page numbering. Page numbering should be done individually for each annexure.

7. RECOMMENDATIONS

Based on the project work and study of safety management system, student should identify areas needing improvement and recommend measures for improvement. The recommendations should be specific, relevant and practically implementable.

8. PROJECT REPORT FORMAT

Paper Size	-	A4
Printing	-	Only on one side of the sheet
Line Spacing of Paragraph	-	1 ½
Font Face	-	Times New Roman
Font Size	-	12 for Normal text, 14 for Sub-headings and 16 for Headings
No of Project Report copies	-	Two
Binding	-	Hard bound copies with Black cover (Golden Embossing)

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