

**CURRICULUM
FOR
ONE YEAR POST DIPLOMA COURSE
IN**

**INDUSTRIAL SAFETY
EFFECTIVE FROM SESSION**

ANNUAL SYSTEM

UNDER DEVELOPMENT

**PREPARED BY
CURRICULUM DEVELOPMENT CELL**

**INSTITUTE OF RESEARCH,
DEVELOPMENT & TRAINING, U. P.,
KANPUR**

**STUDY AND CREDITS/EVALUATION SCHEME FOR THE PROPOSED
ONE-YEAR POST DIPLOMA COURSE IN INDUSTRIAL SAFETY**

Curriculum				SUBJECT	SCHEME OF EXAMINATION									
Periods Per Week					THEORY					PRACTICAL				
Lecture	Tutorial	Lab	Total		EXAMINATION		Sess. Marks	Total Marks	EXAMINATION		Sessional Marks	Total Marks	Grand Total	
					Dur (Hr.)	Marks			Dur	Marks				
2	1	-	3	1.1	Safety Management	2.5	100	-	-	-	-	-	-	100
2	-	-	2	1.2	Safety Engineering-I	2.5	100	-	-	-	-	-	-	100
2	1	2	5	1.3	Safety Engineering-II	2.5	100	-	-	3	25	25	50	150
2	1	-	3	1.4	App. Analysis Insp. and Control Procedures	2.5	100	-	-	-	-	-	-	100
2	-	-	2	1.5	Safety & Law	2.5	100	-	-	-	-	-	-	100
2	1	2	5	1.6	Industrial Hygiene & Occupational Health	2.5	100	-	-	3	25	25	50	150
2	-	-	2	1.7	Safety in Chemical Industry	2.5	100	-	-	-	-	-	-	100
2	-	-	2	1.8	Elective-Any one	2.5	100	-	-	-	-	-	-	100
				1.8.1	Safety in Engineering Industry									
				1.8.2	Safety in Textile Industry									
				1.8.3	Dock Safety									
				1.8.4	Safety in Construction Industry									
2	-	-	2	1.9	Environmental Education & Disaster Management (*)	2.5	50	-	-	-	-	-	-	-
-	2	4	6	1.10	Project									
-	-	2	2	1.11	Term Work									
-	-	4	4	1.12	Student Centered Activities									
										Viva	100	100	200	200
										Viva	50	50	100	100
										-	-	-	-	-
18	6	14	38	TOTAL		-	800	-	-	-	200	200	400	1200

NOTE:

- Each session will be of 32 weeks
- Effective teaching will be at least 25 weeks
- Remaining periods will be utilized for revision etc.
- Each period will be of 1-hour duration.
- (*) It is compulsory to appear and to pass in examination but marks will not be included for division and percentage of obtained marks.

Minimum Passing Marks in Theory 33%
 Minimum Passing Marks in Practical & Viva 40%
 Minimum Passing Marks in sessionals 50%
 First Division 66% & above
 First Division with Honors 80% and above

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MAIN FEATURES OF THE CURRICULUM

- | | |
|----------------------------|--|
| 1. Title of the course | Post Diploma in "Industrial Safety" |
| 2. Duration | One Year |
| 3. Type of course | Full Time |
| 4. Admission qualification | (a) Recognized degree in any branch of Engineering or Technology and relevant experience for a period of not less than two years.

OR

(b) Recognized Diploma in any branch of Engg. or Technology and relevant experience for a period of not less than 5 Years.

OR

(c) Recognized degree in science with Physics or Chemistry and relevant experience for a period of not less than 5 Years. |
| 5. Mode of admission | Industry sponsored/permitted candidates by merit based upon qualifications, experience and aptitude. |

NOTE :-

The relevant experience should be in any one of the following

- (i) Experience in manufacturing, Maintenance or Safety department of an industry.

OR
- (ii) Experience in building or other construction works or department of port or dock or construction industry.

OR
- (iii) Experience in research, training or education in the field of safety.

- (iv) Experience in a government department in administration of any Safety legislation.

NEED ANALYSIS AND CURRICULUM PROFILE

Revision of a curriculum for many reasons is vital at times either to update it or to restructure it to more suitable form. In view of the rapid industrial growth, introduction of new technologies, the amendment of factories Act and increased responsibilities placed on the employers, the necessity to upgrade the standard of safety officers working in the industries became inevitable. So the revision work of the syllabus for Post Diploma Course in "Industrial Safety" running at regional labour institute Kanpur had been undertaken by this institute. For this curricula of other regional Labour Institutes and particularly that of Central Labour Institute Bombay were examined thoroughly and discussed before finalising the structure of this curriculum. The following feature of the new syllabus deserve mention :

The first six compulsory papers are so restructured as to cover all basic considerations related to industrial safety Viz. Health and Hygiene, Safety Engineering, Safety Management, Safety Legislation and appraisal, Inspection and control procedures for all safety measures taken in the industry. The seventh compulsory paper "Safety in Chemical Industry" has been taken as a special example. Safety in other major industries (eg. Engg. Industry, Textile Industry etc) which deserve equal consideration has been put in the list of elective papers. It is because the trainees are sponsored candidates from various industries they are interested to gain more in their own fields and may not be equally interested in other fields. The introduction of group of elective papers gives them opportunity to learn more in their own field and relieves them of the burden of studies they are reluctant to. The list of elective papers includes two new papers Viz. " Dock Safety " and "Safety in construction industry" which could not be given consideration in previous syllabus perhaps to keep its size manageable because in that there was no provision for elective papers; all papers were compulsory. Their inclusion is just to widen the scope of the curriculum and accordingly the experiences in building or other construction works or department of port or dock or construction industry too have been taken as relevant experiences for admission.

The laboratory work proposed under "Safety Engg.-II" and "Industrial Hygiene and Occupational Health" aims to give an extra impetus to incumbents perception. The project work and the term work based on factory visit and library research aims to develop incumbents capability of observation, analysis, investigation and reporting.

LIST OF EXPERTS

Experts who contributed in developing this curriculum at IRDT Kanpur.

- | | | |
|------------------------|--------------------------|---------------------------------------|
| 1. Sri D. Govindarajan | Manager
fire & safety | ICI India ltd.
fertilizers, Kanpur |
| 2. Sri P.K. saxena | Dy. Director
(safety) | R.L.I. Kanpur |
| 3. Sri S.K. Srivastava | Dy Director
(IH) | R.L.I. Kanpur |
| 4. Sri B. Lal | Asstt. Professor | IRDT Kanpur |
| 5. Sri R.C. Trivedi | Asstt. Professor | IRDT Kanpur |

The curriculum as developed, was reviewed by the following committee (constituted as per Govt. Letter No. 1471/92-Pra. Shi.-3-1992 Lucknow Dated-8/12 May 1992).

- | | | |
|------------------------|--------------------------|---|
| 1. Shri P.N. Sharma | Director in
charge | Reasional Labour
Institute,
Sarvodaya Nagar,
Kanpur |
| 2. Shri D.Govandarajan | Manager
Fire & Safety | I. C. I. India Ltd.
Fertilizers, Kanpur |
| 3. Shri P. L. N. Das | Dy. Director | Directorate of Tech.
Education, U.P.,
Kanpur |
| 4. Shri P. C. Dikshit | Director | Institute of Research
Development & Training
U.P., Kanpur |
| 5. Smt. Sushma Gaur | Asstt. Professor | Board of Technical
Education, U.P.,
Lucknow |

The members of the committee recommended its being adopted after a few ammendments which have been incorporated in the curriculum.

LIST OF EXPERTS

On dated 30-05-2000, the following experts contribution and suggestions in revision/review of the curriculum is a matter of obligation to I. R. D. T., U.P., Kanpur.

1. Shri Laxmi Narayan Director Incharge
R.L.I., Kanpur
2. Shri P. K. Saxena Dy. Director
R.L.I., Kanpur
3. Shri S. B. Mathur Dy. Director
R.L.I., Kanpur
4. Shri Karunesh Srivastava Department of Safety
R.L.I., Kanpur
5. Shri K. M. Gupts Assistant Professor
I. R. D. T., Kanpur

On dated 1-12-2003 the following experts contribution and suggestions in revision/review of curriculum is a matter of obligation to I. R. D. T., U.P., Kanpur. Experts proposed to continue the curriculum for this session.

1. Shri M. S. Tyagi Director Incharge
R.L.I., Kanpur
2. Shri P. B. Pal Deputy Director
R.L.I., Kanpur
3. Shri S. S. Gautam Deputy Director
R.L.I., Kanpur
4. Shri P. K. Saxena Deputy Director
R.L.I., Kanpur
5. Shri K. M. Gupta Assistant Professor
I.R. D. T., Kanpur

On dated 29-01-2008 the following experts contribution and suggestions in revision of curriculum is a matter of obligation to I. R. D. T., U.P., Kanpur.

- 1 Shri S. B. Mathur Director, R.L.I., Kanpur
2. Dr. Brij Mohan Dy. Director, R.L.I., Kanpur
3. Shri S. K. Dwivedi Dy. Director, R.L.I., Kanpur
- 4 Shri N. K. Rustogi Dy. Director, R.L.I., Kanpur
5. Shri J. Ansari Dy. Manager, Moser Bayer Photo
Voltaic Limited, Noida
6. Shri A. K. Chakraborty Asstt. Director, R.L.I., Kanpur
7. Smt. Nisha Bahuguna Dy. Secretary, B.T.E., Lucknow
8. Shri M. P. Singh Bhadauria Asstt. Professor, I.R.D.T., Kanpur

1.1 SAFETY MANAGEMENT

Rationale:

Safety professionals in factory are required to assist the top management in creation and implementation of safety systems for enhancing the safety of the factory. This requires knowledge of general management techniques and their application to SHE systems.

Sr.No.	Units	Coverage		Time
		L	T	P
1.1	Introduction	8	4	-
1.2	Principles of accident Prevention	6	3	-
1.3	Planning for Safety	3	2	-
1.4	Organising for safety	3	2	-
1.5	Directing for Safety	3	2	-
1.6	Safety Education & Training	3	2	-
1.7	Employee Participation in Safety	6	3	-
1.8	Human behaviour & safety	6	3	-
1.9	Financial aspects of Safety	4	2	-
1.10	Safety Management Information System	4	2	-
1.11	Introduction to national & international SHE Management Systems	4	-	
		50	25	

INTRODUCTION

Management:

Concept, definition, nature and importance, Role and functions of a manager, Elements and functions of Management.

Management Principles:

Authority, responsibility & power of Management, Span of Control. Delegation and decentralisation of authority. General principles of Management.

Industrial Safety:

History of Safety Movement in India and abroad. "The Accident Problem". Nature & size need for safety, legal, humanitarian, economic and social considerations.

Safety Management:

Role of management in Industrial Safety. Safety Management - Principles & Practices.

1.2. **PRINCIPLES OF ACCIDENT PREVENTION**

Definitions:

Accident, injury, hazard, Risk, Danger, unsafe acts, unsafe conditions, dangerous occurrences etc.

Accident Prevention:

H.W.Henrich, Frank bird & Multiple Causation theories of accident occurrences. Principles of accident prevention, Models of accident prevention.

1.3 **PLANNING FOR SAFETY**

Planning:

Definition, purpose, nature, scope and procedure. Range of planning. Variety/forms of plans.

Strategic planning and process of implementation. Management by objectives and its role in safety. Policy formulation and effective planning for safety.

1.4 ORGANISING FOR SAFETY

Organising:

Definition, need, nature and principles.

Organisation for Safety:

Organisation structure and safety department

Safety Officer:

Role, responsibility, authority. Power and qualifications/attributes.

SAFETY COMMITTEE:

Structure & functions. Line & Staff functions in safety department.

1.5 DIRECTING FOR SAFETY

Direction:

Definition, Process, Principles & Techniques.

Leadership

Role, functions & attributes of a leader. Leadership styles and safety management.

Communication:

Fundamentals, importance, process, types & channels.

Five essential rules for communication.

Two-way communication.

Barriers and break-downs in communication. Communication with management, employees & union.

Communication and group-dynamics.

Managerial Communication:

A tool for management of frustrations, conflicts and attitudes towards safety & health.

1.6 SAFETY EDUCATION AND TRAINING

Training for Safety:

Assessment of needs. Design & development of training programme. Training methods and strategies. Training of manager ,supervisors & workers. evaluation of training programmes.

Training Programme:

In-Plant training programmes. Out-of-plant training programmes. Seminars, Conferences & Workshop , Programmes for new workers. Job instructions Vs Safety instructions.

1.7 EMPLOYEE PARTICIPATION IN SAFETY

Employee Participation:

Purpose, nature, scope and methods. Safety committee and union participation.

Trade Unions:

History of trade unions in India. Role of trade unions in safety and health. Collective bargaining and safety.

Safety Promotion & Publicity:

Safety suggestion schemes. Safety competitions, Safety incentive Schemes. Audio Visual Publicity, other promotional methods.

1.8 HUMAN BEHAVIOUR AND SAFETY

Human factors contributing to accidents.

Human Behavior:

Individual differences. Behaviour as function of self and situation. Perception of danger and acceptance of risks. Knowledge and responsibility vis-a-vis safety performance. A.Maslow's, Herzberg's, Douglas Mcgregore's and Adam's equity theories of motivation and their application to safety. Role of management , Supervisors and safety department in motivation.

1.9 FINANCIAL ASPECTS OF SAFETY

Cost of Accident:

Financial costs-direct and indirect social costs of accidents. Compilation procedure for financial costs. Cost data, quality and its limitations-Budgeting.

1.10 SAFETY MANAGEMENT INFORMATION SYSTEM

1.10.1 Sources of information on Safety , Health, and Environment. Compilation, Processing retrieval and analysis of information.

1.10.2 Status and future scope of computer utilization in Safety. Health and Environment (SHE) Services in Industries.

1.11 Introduction to national & international SHE Management Systems

1.11.1 Total Quality Management and its application to SHE, occupational Health & safety appraisal system 18001 and 15001

1.2 SAFETY ENGINEERING-I

Rationale:

Various types of machines are in use in factories and advent of newer machines is continued. A qualified safety professional is expected to provide basic guidance in safe use of machines. This paper covers various other mechanical and other hazards which are encountered at the work places.

Sr.No.	Units	Coverage		Time
		L	T	P
2.1	Safe guarding of Machines	8	-	-
2.2	Manual handling & storage of materials	8	-	-
2.3	Mechanical handling of materials	8	-	-
2.4	Working at heights	8	-	-
2.5	Hand tools and portable tools	10	-	-
2.6	Safety at work place	8	-	-
		50		

2.1 SAFEGUARDING OF MACHINES

Statutory provisions related to safeguarding of machinery and working on/near unguarded machinery. Principles of machine guarding. Ergonomics of machine guarding. Type of guards. Guarding of different types of machinery : wood working, paper, rubber and printing machinery, Selection, maintenance and repair of guards. Incidental safety devices and methods.

2.2 MANUAL HANDLING AND STORAGE OF MATERIALS

Basic principle of correct lifting and handling of materials. Avoidance of excessive muscular efforts. Maximum loads that may be carried. Lifting and carrying of objects of different shapes, size and weight. Safe use of accessories for manual handling. Storage of materials. Ergonomics of manual handling and storage.

2.3 MECHANICAL HANDLING OF MATERIALS

Lifting machinery: Safety aspects in design and construction, testing, use and care, signalling, inspection and maintenance Safety in design and construction, operation, Inspection and maintenance of power trucks and tractors, Lifts and hoists, lifting tackles, and loose gears, conveyors. Safety features, safe working load, destructive and non-destructive testing, inspection and maintenance of lifting tackles. The competent persons, duties and responsibilities under the various legislations.

2.4 WORKING AT HEIGHTS

High incidence of serious accidents in working at heights. Types of operations. Safety features associated with design. Construction and use of stairways, runs, ramps, gangways, floors, ladders of different types, scaffolds of different types including Boatswain's chair and safety belts. Working on roofs, other safety requirements while working at heights. Prevention of fall of persons at floor level. Potential tripping and slipping hazards.

2.5 HAND TOOLS AND PORTABLE TOOLS

Main causes of tool accidents. Control of tool accidents .Centralised tool control. Purchase, storage and supply of tools. Inspection, maintenance and repair of tools, detectable causes of tool failures. Tempering, safe ending and dressing of certain tools. Handles of tools, safe use of various types of hand tools used for metal cutting, wood cutting, miscellaneous cutting work, material handling; and other hand tools such as torsion tools, shock tools, non-sparking tools. Portable power tools and their selection, inspection, maintenance, repair and safe use.

2.6 SAFETY AT WORK PLACE:-

Work place design: Concept of workplace and its design. Improving safety and productivity through work place design control measures. Technical and engineering control measures. Control measures against human error. Preventive maintenance. Role of Preventive maintenance in safety and health. Standards and code of practices for plant and equipment. Standardisation and its benefits, Purchasing policy.

1.3 SAFETY ENGINEERING-II

Rationale:-

Physical hazards, their assessment and control is very impotent for providing good working conditions. Some of such hazards are covered in this paper.

Sr.No.	Units	Coverage		Time
		L	T	P
3.1	Plant design and House keeping	10	5	-
3.2	Industrial Lighting	8	4	-
3.3	Ventilation & heat control	8	4	-
3.4	Electrical Hazards	8	4	-
3.5	Noise and Vibration	8	4	-
3.6	Fire & Explosion	8	4	-
		50	25	50

3.1 PLANT DESIGN AND HOUSEKEEPING

Plant layout and design: Safety and good housekeeping. Need for planning and follow-up. Typical accidents due to poor housekeeping. Disposal of scrap and other trade wastes. Prevention of spillage. Marking of gangways and other locations. Use of colour as an aid for good housekeeping. Clean-up campaigns. Cleaning methods, employee assignment. Inspections and check-list. Result of good housekeeping.

3.2 INDUSTRIAL LIGHTING

Purpose of lighting. Advantages of good illumination. Lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended minimum standards of illumination. Design of lighting installation, Lighting and colour.

3.3 VENTILATION AND HEAT CONTROL

Purpose of ventilation. Classification of Ventilation as General Ventilation (Natural and Mechanical modes), Local Exhaust Ventilation, Special methods for Thermal Stress control such as Air conditioning , Radiant Heat Control.

3.4 ELECTRICAL HAZARDS

Dangers from electricity. Safe limits of amperages, Voltages Safe distance from lines. Capacity and protection of conductors, Joints and connections, Means of cutting of power overload and short circuit protection. Earth fault protection. Earth insulation and continuity tests. Protection against over-voltage. Hazards arising out of 'borrowed' neutrals. Other precautions. Portable electrical apparatus. flame proof electrical apparatus. flame proof electrical equipments, Precautions in their selection, installation, maintenance and use. Control of hazards due to static electricity.

3.5 NOISE AND VIBRATION

Engineering Control of noise, Vibration damping, Noise isolation, Noise absorption. Silencers. Case studies on impact of noise from compressors and generators.

Vibration:

Effects, measurement and control.

3.6 FIRE & EXPLOSION

Statutory provisions regarding fire safety. Factors contributing towards fire. Chemistry of fire. Classification of fires. Common causes of industrial fires. Determination of fire load. Fire resistance of building materials. Design of building plant, exits, etc. for fire safety. Prevention of fire. Portable extinguishers. Water systems, carbon-di-oxide systems. Foam extinguisher system. Dry chemical extinguishing system. Industrial fire detection and alarms. Sprinkle systems. Special precautionary measures in handling/processing flammable liquids, gases, vapours, mists and dusts. BLEVE(Boiling Liquid Expanding Vapour Explosion). Fighting fires involving pesticides. Emergency action plan. EAC or Hazchem Code.

SAFETY ENGINEERING-II
LABORATORY WORK UNDER PAPER-3

1. Measurement of illumination level by Photo Meter.
2. Measurement of number of air changes in a room by Velometer
3. Measurement of Sound Levels.
4. Determination of concentration of inflammable vapours.
5. Measurement of Static Charge/Electricity with the help of Static Charge Meter.
6. Determination of Fire Load in a given work place.
7. Measurement of Vibrations of Machines and equipment.
8. Measurement of Insulation Resistance.
9. Continuity test for Electrical Circuits.
10. Earthing continuity test.

1.4 APPRAISAL, ANALYSIS, INSPECTION AND CONTROL PROCEDURES

Rationale:-

Measurement, assessment and reporting systems are the backbone of successful safety management. This papers covers application of general management system to industrial safety.

Sr.No.	Units	Coverage		Time
		L	T	P
4.1	Plant and equipment safety appraisal and control techniques.	12	4	-
4.2	Hazards identification Techniques	14	8	-
4.3	Accident investigation & Reporting and analysis.	12	8	-
4.4	Measurement and control of performance	12	5	-
		50	25	

4.1 PLANT AND EQUIPMENT SAFETY APPRAISAL & CONTROL TECHNIQUES

Objectives, Plant safety observation, Plant Safety Inspections. Safety Sampling. Safety Surveys. Job Safety Analysis. Safety Inventory System. Product Safety. Permit to work systems. Safety tag systems. Loss Control: Damage control & system safety.

4.2 HAZARD IDENTIFIATION TECHNIQUES

Hazard identification techniques with examples such as FMEA, CMA, Fault Tree Analysis, Preliminary Hazard Analysis (PHA), Hazard and operability (HAZOP) study, Safety Audit, Quantitative risk analysis-Out line of methodology. Consequences analysis (Calculation of release rates of liquids under ambient pressure and liquids under pressure. Calculation of dispersion of released gases and vapours and plating of equal concentration contours), Dow (Index) Fire and Explosion Index System of Risk Analysis.

4.3 ACCIDENT INVESTIGATION REPORTING AND ANALYSIS

Purpose. Identifying the key factors and the causes. Writing reports and report forms. Corrective action. Standard classification of factors associated with accident. Method of collecting and tabulating data. Keeping the records.

4.4 MEASUREMENT AND CONTROL OF PREFORMANCE

Lost time accident. Disabling injury. Accidents reportable under the factories Act and E.S.I. Act. Frequency rate. Severity rate. Frequency Severity Index (FSI) ,Safe-T-Score, Incidence rate per 1000 workers and man days lost. Temporary disablement and permanent disablement. Partial and total disablement. Time charges scheduled in Workmen's Compensation Act and the Indian Standard.

1.5 SAFETY AND LAW

Rationale: -

The law of the land gives minimum level of safety, which all the occupiers of industrial units must achieve. A safety professional must have a thorough knowledge of the applicable safety statutes. Some of such provisions are covered in this paper.

Sr.No.	Units	Coverage		Time
		L	T	P
5.1	Introduction To ILO	3	-	-
5.2	History of safety legislation in India	3		
5.3	Factories Act 1948 and the factories Rules	14	-	-
5.4	Employees welfare and legislation	10	-	-
5.5	Provisions Relating to Safety, Health & Environment issues in other Important Legislations	20		
	Total	50	-	-

5.1 INTRODUCTION TO ILO

ILO convention and recommendations in providing safety, health and welfare to workers.

5.2 HISTORY OF SAFETY LEGISLATION IN INDIA

5.3 FACTORIES ACT 1948 AND THE FACTORIES RULES

Provisions made under the Factories Act And the Rules framed there under.

5.4 EMPLOYEES WELFARE AND LEGISLATION

Workman compensation Act and rules. ESI Act and rules. Public Liability Act & Rules framed there under

5.5 PROVISIONS RELATING TO SAFETY , HEALTH & ENVIRONMENT IN OTHER IMPORTANT LEGISLATIONS

Indian Boilers Act and Regulations. Indian Electricity Act and Rules. Indian Explosives Act and Rules. Petroleum Act and Rules. Petroleum Act and Rules, MSIHC Rules, CIMAH Rules, Gas Cylinders Rules. Radiation Protection Act and Regulations. Static and mobile pressure vessels rules. The Dock workers (Safety, Health & welfare) Act & Regulations. Building and other construction workers Act and Rules, Provisions regarding transportation of dangerous Cargo under Central Motor Vehicle Act and Rules, The insecticides Act and Rules. Environmental Protection Act 1986, Air(Prevention and control of pollution)Act, Water (Prevention and control of pollution) Act and Rules.

1.6 INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH

Rationale:-

Good workplace hygiene & health is a prerequisite of the optimal efficiency in an industrial worker. Providing hygienic working conditions and minimizing occupational hazards is very essential. A safety officer in the industry should be knowledgeable about such situation to take preventive measures effectively.

Sr.No.	Units	Coverage		Time
		L	T	P
6.1	Industrial Hygiene	14	7	-
6.2	Work Physiology	12	6	-
6.3	Occupational health	12	6	-
6.4	Personal Protective Equipments	12	6	-
		50	25	50

6.1 INDUSTRIAL HYGIENE

6.1.1 CHEMICAL HAZARDS:

- 6.1.1.1 Acute and chronic health effects of substances liable to be absorbed through skin absorption, ingestion and inhalation in the form of Dusts, Fumes, Mists, Gases and Vapours.
- 6.1.1.2 Assessment of airborne contaminants in the work environment-including various methods of air sampling like dynamic or active sampling, passive sampling or dosimetry for area and personal sampling, relevant analytical methods Biological sampling and analysis.
- 6.1.1.3 Exposure limits for airborne contaminants-Threshold Limit Values as recommended by American conference of Government Industrial Hygienists and Permissible Limits of Exposure as laid down in (Indian) Factories Act 1948.
- 6.1.1.4 Control of airborne contaminants by substitution, isolation, mechanization, Wet methods, Industrial Ventilation – dilution and local exhaust systems, House keeping, Personal Hygiene and Maintenance.

6.1.2 PHYSICAL HAZARDS:

- 6.1.2.1 Effects of occupational exposure, Methods of assessment, Permissible standards and prevention and control measures of physical Hazards-
Thermal stress-Physiology of Heat regulation, Heat disorders, Measurement of Thermal stress using different heat stress indices, Permissible limits of heat stress.
Noise and its effects on man, measurement and evaluation of noise, Permissible limits for noise, Hearing conservation programme.
Vibration and its effect on man.
Improper illumination.
Ionizing and non Ionizing radiations like X-rays, radioactive radiations, Infrared, ultraviolet, laser, radio frequency, microwave etc.

6.2 WORK PHYSIOLOGY

Classification of workload. Work capacity and man-job alignment. Fatigue and rest allowances. Ergonomics, fitting the task to man. Application of ergonomics in safety and Health management. Fitness criteria for work. Diet and exercise for work Stress control and rehabilitation.

6.3 OCCUPATIONAL HEALTH

Common occupational diseases. Occupations involving risks of contracting these diseases. Mode of causation of the diseases and its effects. Diagnostic methods, Physiological tests in occupational health assessment. Methods of prevention.

Compensation for occupational diseases. Evaluation of injuries. Industrial medical services in an industrial establishment and its functions.

Occupational diseases of the lungs. Occupational dermatitis. Occupational cancer. Pre-employment and periodic medical examination of workers. Medical surveillance for control of occupational diseases. Health records, fundamentals of first-aid. Burns, fractures, suffocation, toxic ingestion, bleeding wounds. Artificial respiratory techniques bandaging.

6.4 PERSONAL PROTECTIVE EQUIPMENTS

- (a) Non-respiratory personal protective devices: Head protection. Ear protection. Face and eye protection. Hand protection. Feet protection. Body protection. Supply, use care and maintenance of personal protective equipments. Training in the use of Non-respiratory Personal protective equipments, Requirements under the Factories Act and Rules.
- (b) Respiratory personal protective devices: Classification of hazards. Classification of respiratory personal protective devices. Selection of respirators. Instructions and hints in the use of breathing apparatus. Supply, use, care and maintenance of breathing apparatus. Training in the use of respiratory personal protective devices.

INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH LABORATORY WORK UNDER PAPER-6

1. Calibration of Rotameter by Soap Bubble Meter.
2. Calibration of Rotameter by Wet Test Meter.
3. Detection of Carbon Monoxide, NO_x, Hydrogen Sulphide, Ammonia, Aromatic Hydrocarbons, SO₂ by Gas Detectors and other direct reading instruments.
4. Measurement of Concentration of Dust using Personal Sampler by Gravimetric Method.
5. Sampling and analysis of Ammonia.
6. Estimation of Hydrogen Sulphide in Air.
7. Estimation of Chlorine in Work Environment.
8. Estimation of Mercury concentration in working atmosphere.
9. Sampling and analysis of SO₂ using Colorimetric method.
10. Assessment of Heat Stress in Work Environment.
11. Plotting of an Audiogram by Audiometer.
12. Carrying out Lung Function Test by Spirometer.

1.7 SAFETY IN CHEMICAL INDUSTRY

Rationale:-

Though general principles of Safety and Health in industries are applicable to the chemical industries also, special features like large variations in the hazardous properties of chemicals, chemical operations and potential of chemicals to result enormous damage to life and property both inside and outside the works, etc., render it necessary to include additional Safety considerations for chemical industries. Accordingly, the special features for ensuring safety in chemical industries are being included in this paper.

Sr.No.	Units	Coverage		Time
		L	T	P
7.1	Safety in transportation, storage and handling of hazardous chemicals.	10	-	-
7.2	Chemical process hazards and their control.	10	-	-
7.3	Safety aspects of maintenance in chemical plants.	10	-	-
7.4	Major Accident hazard control.	10	-	-
7.5	Safety and health in selected chemical industries.	10	-	-
		50	-	-

7.1 SAFETY IN TRANSPORTATION, STORAGE AND HANDLING OF HAZARDOUS CHEMICALS:-

- 7.1.1 Hazardous properties of chemicals and appreciation of information provided in Material safety data sheets.
- 7.1.2 Classification of dangerous materials with pictorial symbols, common hazard and common precautions for each class.
- 7.1.3 Safety in transportation of dangerous materials by road, rail, ships and pipelines.
- 7.1.4 Safety in bulk storage of hazardous substances.
- 7.1.5 Safety in shelf storage of hazardous substances.
- 7.1.6 Safety in handling of chemicals in the plant by pipelines.

7.2 CHEMICAL PROCESS HAZARDS AND THEIR CONTROL:-

- 7.2.1 Hazards of chemical reactions, and possibilities of reactions going out of control.
- 7.2.2 Common hazards of important chemical reactions and their control.
- 7.2.3 Common hazards of important unit operations and their control.
- 7.2.4 Safety considerations in process control instrumentation.
- 7.2.5 Safe start up, shut down and emergency shut down procedures.
- 7.2.6 Safety in sampling and gauging.
- 7.2.7 Safety aspects of plant modifications.

7.3 SAFETY ASPECTS OF MAINTENANCE IN CHEMICAL PLANTS :-

- 7.3.1 Proper identification of plants and equipments.
- 7.3.2 Maintenance of component failure history
- 7.3.3 Corrosion prevention for safety.
- 7.3.4 Preventive maintenance of vulnerable equipments.
- 7.3.5 Safe entry into confined spaces.
- 7.3.6 Permit to work system for safety in chemical plants.
- 7.3.7 NDT in chemical Plants

7.4 MAJOR ACCIDENT HAZARD CONTROL:

- 7.4.1 Major Accident Hazards and roles of management, local bodies, and public.
- 7.4.2 Safety while site selection and lay out planning.
- 7.4.3 Fire and explosion in chemical plants.
- 7.4.4 Outline of quantitative risk analysis (or hazard analysis or HAZAN or hazard assessment).

- 7.4.5 Preparation of safety reports.
- 7.4.6 On site emergency planning and off site emergency planning.
- 7.4.7 Hazard and operability (HAZOP) studies.
- 7.4.8 Fire and Explosion (DOW) index and toxicity index.
- 7.4.9 Case studies of following Major accidents-Bhopal, Mexico, Flixborough, Seveso and Fayzin disasters.

7.5 SAFETY AND HEALTH IN SELECTED CHEMICAL INDUSTRIES:-

- 7.5.1 Chlorine-caustic soda-hydrochloric acid manufacturing plants (Mercury cell and Membrane cell process).
- 7.5.2 Ammonia-Urea manufacture.
- 7.5.3 Manufacture of Sulphuric acid by double conversion double absorption (DCDA) process.
- 7.5.4 LPG Storage and bottling plants.

1.8 ELECTIVES

1.8.1 SAFETY IN ENGINEERING INDUSTRIES

Rationale:-

Engineering industry is a major industry employing large number of workers who are engaged in hard and assiduous jobs. If not properly taken care this industry may cause serious injuries and other ill effects to the health of the workers. Hazardous situations which are peculiar to this industry are covered in this paper.

Sr.No.	Units	Coverage		Time
		L	T	P
1.1	Introduction	3	-	-
1.2	Hot Working of metals	10	-	-
1.3	Cold working	10	-	-
1.4	Other operations	8	-	-
1.5	Heat treatment	8	-	-
1.6	Safety Statutes	3	-	-
1.7	Health & Welfare	8	-	-
	Total	50	-	-

1.1 INTRODUCTION:

Introduction to various hot and cold processes in engineering Industry including manufacture of various grades of steel.

1.2 HOT WORKING OF METALS

- 1.2.1 Flow sheet for foundry operations including use of different types of furnaces in each of the operation. Health hazards and safe methods of preparation in the above.
- 1.2.2 Forging Operation: Different forging operation hazards inclusive of heat radiation. Preventive maintenance of forging machines, safe work practice of forge.
- 1.2.3 Operations in hot and cold rolling mills. Safe work practices in the above.

1.3 COLD WORKING

Safety in the use of

1. Power presses (all types)
2. Shearing
3. Bending
4. Rolling
5. Drawing
6. Turning
7. Boring
8. Milling
9. Planning
10. Grinding

Inclusive of the need for selection and care of tools. Preventive maintenance and periodic checks for safe operation. Associated hazards and their prevention.

1.4 OTHER OPERATIONS

Safety precaution in the

1. Welding
2. Cutting
3. Soldering operations.

Selection, care and maintenance of associated equipment, instruments, safety in finishing operations like:-

1. Cleaning
2. Polishing
3. Buffing and related hazards.

Maintenance of these machines and selection of equipment with reference to safety.

1.5 HEAT TREATMENT

Various heat treatment methods. Safety in handling, storage, Responsibility of treatment medium. Disposal effluents thereof. Health precautions, Elimination and prevention of long time exposure to hazardous fumes.

1.6 SAFETY STATUTES

Relevant provision of factories Act and Rules

1.7 HEALTH AND WELFARE

Occupational hazards, Occupational diseases. Personal protective equipment. Health and welfare measures. First-aid facilities and other appropriate measures. Hospitals. Clinics. Special precautions for specific work environments,

1.8.2- SAFETY IN TEXTILE INDUSTRY

Rationale:-

Textile industry is one of the major industries of this country. Its safety problems are much different than those of others industries. Hazards and their control measures, which are specific to this industry, are covered in this paper.

Sr.No.	Units	Coverage		Time
		L	T	P
1.1	Section 1	16	-	-
1.2	Section 2	12	-	-
1.3	Health & Welfare	12	-	-
1.4	Safety Statutes	10	-	-
		50		

1.1 SECTION 1:

Introduction to process flow charts of:

- I) Short staple spinning
- II) Long staple spinning
- III) Viscose Rayon and synthetic fibre manufacture
- IV) Spun and filament yarn to cloth manufacture

Accident Hazards, Guarding of machinery and safety precautions in opening, Carding, Combing, drawing flyers frames and ring frames, double rotor spinning, winding, wrapping

1.2 SECTION 2:

Sizing process and loom shed, safety precautions in chemical processes, bleaching, dyeing, printing and finishing and accident hazards, Chemical hazards in wet processing, Effluents in textile processes.

1.3 HEALTH & WELFARE :

Health hazards in textile industry, Dust and fly, Noise generated and control measures, occupational hazards, Occupational diseases, Personal Protective equipments, Health & welfare measures, First -Aids facilities and other appropriate measures, Hospitals, Clinics, Special precautions for specific work environments

1.4 SAFETY STATUTES:

Relevant provision of Act and Rules and other statutes applicable to textile industry.

1.8.3-DOCK SAFETY

Rationale:-

A very large workforce of this country is engaged in loading and unloading operations carried out in various docks of the country. Hazards involved are varied in nature as a variety of materials ranging from heavy cargo to hazardous chemicals. Such situations, which are specially dealt with, by the applicable legislations, are also covered in this paper.

Sr.No.	Units	Coverage		Time
		L	T	P
1.1	History of Safety legislation	02	-	-
1.2	Dock safety statutes	06	-	-
1.3	Working on board ships	06	-	-
1.4	Lifting appliances	06	-	-
1.5	Loose gears	06	-	-
1.6	Handling Cargo	06	-	-
1.7	Transport equipments	06	-	-
1.8	Containerisation	06	-	-
1.9	Health & Welfare	06	-	-
		50		

1.1 HISTORY OF SAFETY LEGISLATION:

ILO convention and recommendation in providing safety, Health and Welfare to Dock workers.

1.2 DOCK SAFETY STATUTES:

The Dock workers (Safety, Health and Welfare) Act and Rules framed there under.

1.3 WORKING ON BOARD SHIPS :

Types and classification of ships, Working on board ships, Safe means in handling of hatch beams. Method of marking of hatch beam and hatch cover, rigging of derricks, Use and care of derricks, Chipping and painting of ships.

1.4 LIFTING APPLIANCES:

Different types of cranes, safety in the use of cranes, Testing, examination and certification of lifting machines and equipments, Appointment, duties and responsibilities of competent persons.

1.5 LOOSE GEARS:

Use and care of fibre ropes, wire ropes, chain ropes, Different slings and loose gears, Examination and Certification of loose gears.

1.6 HANDLING CARGO

Handling different types of cargo, Stacking and un stacking, Development of general cargo handling methods, Handling dangerous goods, Trend of accidents in ports and different agencies responsible for it.

1.7 TRANSPORT EQUIPMENTS

Safety of transport equipments and their operation, Dock railways, Conveyors, Transport of workers by water, Importance of Road safety in Dock

1.8 CONTAINERISATION

Containerisation and container handling equipments, Examination and inspection of containers, Carriage of dangerous goods in containers, Maintenance and certification of container for safety operations, Safety at freight container terminals.

1.9 HEALTH AND WELFARE

Occupational hazards, Occupational diseases, Personal protective equipments, and Health and welfare measures, first –aid facilities and other appropriate measures, Hospital, Clinics, Special precautions for specific environments

1.8.4-SAFETY IN CONSTRUCTION INDUSTRY

Rationale:-

Steep rise in construction activities has brought in several new hazards to which the construction workers are exposed. With the advent of Building and other construction workers statutes in the country, this subject has gained importance for those who wish to get more information in this field.

Sr.No.	Units	Coverage		Time
		L	T	P
1.1	Meaning of safety in construction	02	-	-
1.2	Safety in construction operations	16	-	-
1.3	Safety in demolition operations	06	-	-
1.4	Safety with regard to storage & handling of material of construction	06	-	-
1.5	Safety planning and accident prevention	06	-	-
1.6	Health and welfare	06	-	-
1.7	Statutory obligations	08	-	-
		50		

1.1 MEANING OF SAFETY IN CONSTRUCTION :

Basic philosophy, Peculiarities and parameters governing the safety in construction, Health and structural soundness, Accident and hazards- their causes and effects.

1.2 SAFETY IN CONSTRUCTION OPERATIONS :

(a) Underground works:

Excavation, drilling and blasting, trenching, strutting, tunneling, piling and safety in using and operating machinery and equipment relating to the above components.

(b) Above Ground works:

Scaffolding, centring, frame work, ladders concreting wall and floor openings, staircases and railings, structural steel work including welding, cutting, erection, etc. and safety in use and operation of related machinery and equipment.

(C) Under water operations:

River draining, well sinking, caissons, under water concreting, cofferdams and special operations connected with irrigation works, safety in use and operation of related machinery and equipment.

(d) Movement of materials and personnel's:

Heavy/long items, Railway wagons, motor trucks, vehicles, Hazardous materials etc.

(e) Special works:

High rise buildings, bridges, roads, railways, asphaltting, pneumatic caissons, electrical installations and lifts.

(f) Fire prevention and protection

1.3 SAFETY IN DEMOLITION OPERATIONS:

Planning and permit, precautions prior to demolition, protection of the public, precautions during demolition, Sequence of demolition operations from safety point.

1.4 SAFETY WITH REGARD TO STORAGE, STOCKING AND HANDLING OF MATERIAL OF CONSTRUCTION:

Hazards, Ill-effects and safety measures with respect to materials such as cement, limes aggregates, fly ash, timber, steel, glass, paints, varnishes, petroleum products.

1.5 SAFETY PLANNING AND ACCIDENT PREVENTION:

Policy statement, safety budget, organization, training, implementation, rewards and penalties.

1.6 HEALTH AND WELFARE:

Occupational hazards, Occupational diseases, Personal protective equipments, and Health and welfare measures, first –aid facilities and other appropriate measures, Hospital, Clinics, Special precautions for specific environments

1.7 STATUTORY OBLIGATIONS:

Various statutory provisions for regulation of employment and condition of work in construction industry., I S and Brief idea of NB codes , Local by-laws, Accident investigation and reporting, Monitoring safety performance, Treatment of injuries and rehabilitation.

1.9 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

(Common with all discipline)

A diploma student must have the knowledge of different types of pollution caused due to industrialization and construction activities* so as he may help in balancing of ecosystem and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.
Topic Wise Distribution Of Periods.

Sr No.	Topic	L	T	P
1	Introduction	6		
2	Pollution	3		
2.1	Water Pollution	8		
2.2	Air Pollution	8		
2.3	Noise Pollution	3		
2.4	Radio Active Pollution	4		
2.5	Solid Waste Management	5		
3	Legislations	3		
4	Envt. Impact Assessment	4		
5	Disaster Management	6		
	Total	50		

DETAILED CONTENTS

1. Introduction:

Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system Mining and deforestation and their effects.

Lowering of water level, Urbanization.

Biodegradation and Biodegradability composting, bio remediation of Microbes. Use of bio-pesticides and bio-fungicides.

Global warning concerns, Ozone layer depletion, Green house effect, Acid rain etc.

2. Pollution:

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION:

Factors contributing water pollution and their effect. Domestic waste water and industrial waste water. Heavy metals? Microbes and leaching metal.

Physical, Chemical and Biological Characteristics of wastewater.

Indian Standards for quality of drinking water. Indian Standards for quality of treated wastewater.

Treatment methods of effluent (domestic waste water and industrial/ mining waste water) its reuse/safe disposal.

2.2 Air pollution :

Definition of Air pollution/ types of air pollutants i.e. SPM, NOX, SO₂, CO, CO₂, NH₃, FCL, causes and its effects on the environment.

Monitoring and control of air pollutants Control measures techniques. Introductory Idea of control equipment in industries i.e.

A. Settling chambers

B. Cyclones

C. Scrubbers (Dry and Wet)

D. Multi Clones

E. Electro Static Precipitations

F. Bag Filters

Ambient air quality measurement and their standards.

Process and domestic emission control

Vehicular Pollution and Its control with special emphasis of Euro- I, Euro-II, Euro-III and Euro IV.

2.3 Noise Pollution:

Sources of noise pollution, its effect and control.

2.4 RADIOACTIVE POLLUTION:

Sources and its effect on human, animal, plant and material means to control and preventive measures.

2.5 Solid Waste Management:

Municipal solid waste, Biomedical waste Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATIONS:

Preliminary knowledge of the following Acts and rules made there under-The Water (Prevention and Control of Pollution) Act - 1974.

- The Air (Prevention and Control of Pollution) Act - 1981.

- The Environmental Protection (Prevention and Control of Pollution) Act - 1986. Rules notified under EP Act - 1986 Viz.
- The Manufacture , Storage and Import of Hazardous Chemical (Amendment) Rules 2000
- The Hazardous Wastes (Management and Handling) Amendment Rule 2003.
- Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
- The Noise Pollution (Regulation and Control) (Amendment) Rule 2002.
- Municipal Solid Wastes (Management and Handling) Rules 2000 .
- The Recycled Plastics Manufacture and Usage (Amendment) rules 2003.

4 . ENVIRONMENTAL IMPACT ASSESSMENT

- Basic concepts* objective and methodology of EIA.

Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction) .

5. DISASTER MANAGEMENT:

Definition of disaster - Natural and Manmade. Type of disaster management. How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country? Meaning and benefit of vulnerability reduction, factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

1.10 TOPICS OF PROJECTS (ANY ONE)

1. Safety audit
2. HAZOP study
3. Preparation of emergency plan
4. Design of management information system
5. Assessment of fire & explosion potential and their prevention
6. In-plant safety inspection
7. Preparation of safety report
8. Any other topic as per the syllabus and approval of the faculty

1.11 TOPICS OF TERM WORK (ANY ONE)

1. Design of need based training programme
2. Safety organization and management
3. Study of employee's participation in safety
4. Safe guarding of machinery
5. Material handling
6. Working at height
7. Design of work place
8. House keeping
9. Lighting
10. Ventilation (for Heat control)
11. Electrical hazards
12. Noise control
13. Job safety analysis
14. Fault tree analysis
15. Hazards identification
16. Accident investigation and reporting
17. Measuring safety performance
18. Study of cases under Factories Act
19. Any other topic as per the syllabus and approval of the faculty

I- LIST OF EQUIPMENT FOR INDUSTRIAL SAFETY LABORATORY

S.No.	Name of Equipment	Approximate Cost (Rs)
1.	Models of safety guards such as fixed, automatic, interlock, photo-electric and two hand control device for demonstrating the principles of machines guarding.	30000
2.	Modeling of drilling, lathe, milling, shaper and grinding machines showing the various safety guards used on them.	10000
3.	A set of guards to be used on various wood working machines, such as circular saw, planer, spindle moulder, thickner, mortisingchisel etc.	6000
4.	Type inflating device.	500
5.	Pipe welding guard.	500
6.	A set of common lifting tackles, used in materials handling with view to highlight their correct usage.	10000
7.	Samples of wire ropes, fibre ropes, chains etc. showing their construction.	1000
8.	A working model to show the load on sling legs due to variation of angle of lift.	1000
9.	Working model of conveyor belt safety device.	2000
10.	A model demonstrating the principles of manual handling.	1000
11.	A set of anti-slip devices used for ladder safety.	500
12.	A set of different types axtinguishers.	2000
13.	Panels depicting the various principles of safety in the use of electricity.	5000
14.	Electric safety devices- schok control leakage indicator etc.	1500

S.No.	Name of Equipment	Approxmate cost (Rs)
15.	Models demonstrating importance of earthing and time delay machanism.	4000
16.	A set of models of various exhaust hoods.	1500
17.	Models of emergency safety shower.	2500
18.	A set of panels highlighting the recognition, evaluation and control of enviromental hazards.	6000
19.	A set of panels and exhibits demonstrting the principles of lighting such as age and need for light, effect of contrasts, light & shape, speed & light, fundamental ways of lighting etc.	12000
20.	A set of panels on colour in industry.	10000
21.	A full range of personal protective equipment for head, eye, ear, hand, foot, leg, respiratory protection and safety belts.	15000

ii- EQUIPMENTS FOR INDUSTRIAL HYGIENE LABORATORY

S.No.	Name of Equipment	Qty	Amt.in Rs.
1.	Sound Level Meter	1	10000
2.	Octave Band Analyser	1	10000
3.	Sound Survey Meter	1	5000
4.	Illumination Level Meter	2	6000
5.	Globe Thermometer	5	5000
6.	Kata Thermometer	5	5000
7.	Whirling Hygrometer	5	500
8.	Aspirating Hygrometer	1	6000
9.	Anemo Therm Air Meter	1	10000
10.	Detector tubes- Instruments for Assessment of Toxic Chemicals in Air Spot Testers For Various Gases.	1 Set	6000
11.	Electrostatic Air Sampler	1	10000
12.	Standard Impinger	1 set	6000
13.	Midget Impinger With Hand Operated Pump.	1	7000
14.	Light Weight Vaccum Pump	1	2500
15.	Wet Test Meter	1	5000
16.	Rotameter	1 set	5000
17.	Filter Holder	3	6000
18.	Battery Operated Personal Sampler.	1	7000
19.	Explosimeter	1	5000
20.	Flammable Gas Detector	1	5000
21.	Thermal Precipitator Air Sampler.	1	20000
22.	Konimeter	1	10000
23.	Velometer	1	20000
24.	Spectrophometer- Visible Range	1	15000
25.	PH Meter	1	5000
26.	Colorimeter	1	5000
27.	Gas Ohromatograph	1	70000
28.	Centrifuge	1	3000
29.	Mucry Analyser	1	7000
30.	Hot Plates and heating mentals	2 Sets	5000
31.	Magenetic stirrer	1	3000
32.	Muffel furnance	1	4000
33.	Hot air oven	1	3000
34.	Vacuum pump	1	3000
35.	Chemical balance	1	3000
36.	Glass wares and chemicals		30000
37.	Fuel gas arrangement	1	2000
38.	Distilled water facility	1	3000
39.	Laboratory Microscope	1	5000
40.	WBGT Meter	1	

iii- LIST OF AUDIO VISUAL EQUIPMENTS

S.No.	Name of Equipment	Qty	Amt.in Rs.
1.	16 mm film projector	2	30000
2.	35 mm slide projector	1	5000
3.	Overhead projector	1	5000
4.	Epiidiascope	1	3000
5.	A set of flip charts produced by national safety Council, U.S.A.	1 set	10000
6.	Films on various aspects of Safety & Occupational Health	50	200000
7.	Tape recorder	1	2000
8.	Public address system	1	3000
9.	Colour Video System (Camera, V.C.R., T.V.)	1 set`	40000

iv- MEDICAL/PHYSIOLOGICAL EQUIPMENTS :

1. Eye Vision Tester
2. Hand Steadiness Teste
3. B. P. Equipment
4. Peak Flow Water
5. Clinical Thermometer
6. Spirometer
7. Audiometer
8. Computer facility
(Computer assisted learning system
with software, PC/AT, printer,
Platter, Mouse, Digitiser)

BUILDING REQUIREMENTS

S.No.	Name of Equipment	Floor Area (Sq meter)
1.	Head/Senior Lecturer room	36
2.	Lecturer's room - 3 Nos	50 each
3.	Class room	60
4.	Industrial Hygiene Laboratory	50
5.	Safety Centre/laboratory	100
6.	Office room	50
7.	Staff room	25
8.	Library	60
9.	Canteen	50
10.	Facilities including laboratories and bathroom.	20

STAFF REQUIREMENT OTHER THAN NON-TEACHNIG STAFF

S.No.	Name of Post	Qualification	Requirement
1.	Director (Safety) and Incharge	Degree in Mech./Elec. Engineering of a recognised university or equivalent. About 5 years experience in an Engg. Workshop or Establishment of repute or in a Govt. Department dealing with administration of factories act and having specialised knowledge of a modern factory construction, accident prevention and safety measures in factories. Organising & conducting training programmes and surveys in the field of Industrial Safety & Occupational Health.	1 No.
2.	Dy. Director/Asstt. Director(Safety)	Same as above with 2 years experience.	1 No.
3.	Dy. Director/Asstt. Director(Industrial Hygine)	Master's Degree in Chemistry of a recognised University or equivalent. 5 years research experience in Industrial Hygiene including experience in chemical analysis of a samples in a Research Institute or Govt. Department, dealing with problems of Industrial Hygiene and experience in organising and conducting training programmes in Industrial Hygiene & Occupational Health.	1 No.
4.	Technical Assistant (Safety)	Diploma in Mech. Engg. of a recognised university or equivalent with 3 years parctical experinece in an engineering workshop or a factory or repute.	1 No.

S.No.	Name of Post	Qualification	Requirement
5.	Assistant Director (Industrial Hygiene)	Degree in Science with Chemistry as a principal subject of a recognised university or equivalent with 3 years experience in Laboratory work including analytical work.	1 No.

Note:

Guest lectures by experts on 'safety' may be arranged as per requirement.

REFERENCE BOOK

1. Douglas McGregor - The human side of enterprise
Mc Grow Hill
2. H. W. Henrich - Industrial Accident prevention &
Engineering Mc Grow Hill
3. Willi Hammer - Occupational Safety
Management & Engineering
Prentice Hall
4. Simonds & Gribaldi - Safety Management
Richard D. Irwin
5. Handley - Industrial Safety handbook
Mc Grow Hill
6. Frank Bird - Management Guide to loss
Control International
Institute of Loss Control
7. Willi Hammer - Handbook of system
& Product safety
Prentice Hall
8. National safety Council, - Accident Prevention Manual
Chicago for Industrial Operation
Vol I & II
9. Singleton - Introduction to ergonomics
World Health Organisation
10. ACGIH - Industrial Noise Control
Manual
11. Hopkinson - Lighting, HMSO London
12. HMSO - Principles of Exhaust
Ventilation.
13. ACGIH - Industrial Ventilation-
Manual of Recommended
Practice
14. D. Hunter - Diseases of occupation
English University Press
15. SAX IRWIN - Dangerous Properties of
Industrial Materials
Van Nostrand Reinbold
16. Schilling - Occupational Health Practice
Buttre Worth
17. ACGIH, USA - Encyclopedia of Industrial
Hygeine Instrument
18. Redgrave - Health & Safety in factories
Butterworth
19. Srivastava K.D. - Commentaries of Factories
Act Eastern Book Company

- | | |
|---|---|
| 20. Illuminating Engineering Society of North America | - IES Lighting Handbook :
Reference Vol I & II |
| 21. Frank P. Lees | - Loss Prevention in Process Industries Vol I & II
Butterworths |
| 22. National Fire Protection Association USA | - Industrial Fire Hazards Handbook |
| 23. I.L.O. Geneva | - Encyclopedia of Occupational Health and safety |
| 24. Barbara A Plog | - Fundamentals of Industrial Hygiene
National Safety Council,
Chicago |
| 25. Dan Petersan | Industrial Safety Mgt. |
| 26. Industrial Safety Manual,
Chicago | |

NOTE:

Revision of curriculum does not create any new need for running the course. Existing Staff, space and other resources-Building, Lab equipments, books, staff etc. as mentioned here are already existing with the institute. So no additional facility wanted for running the course.

ANNEXURE- IV QUESTIONNAIRE

INSTITUTE OF RESEARCH,DEVELOPMENT AND TRAINING U.P.KANPUR -208024

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Industrial Safety.

PURPOSE: To design and develop One Year diploma curriculum in Industrial Safety.

NOTE: 1.Please answer the questions to the points given in the questionnaire.
2.Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1.Name of the organisation:_____

2.Name & Designation of the officer _____
filling the questionnaire _____

3.Name of the department/section/ _____
shop _____

4.Importent functions of the _____
department/section/shop _____

5.Number of diploma holder employees
under your charge in the area of _____
Industrial Safety

6.Please give names of modern equipments/machines handled by a diploma holder in Industrial Safety.

1. 2. 3.

4. 5. 6.

7.What proficiencies are expected from a diploma holder in Industrial Safety.

1. 2. 3.

4. 5. 6.

8.Mention the approximate percentage of the following desired in Diploma teaching.

1. Theoretical knowledge -----%
2. Practical knowledge -----%
3. Skill Development -----%

9. Do you think " on the job training" / Industrial training
should form a part of curriculum. (Yes/ No)

can contribute towards improvement of curriculum in above field.

If yes : Please give names of experts in your organisation to whom contact.

20. Kindly give your valuable suggestions for being considered at the time of finalisation of curriculum.
21. What changes in technologies are to be incorporated in the development of curriculum in Industrial Safety.

(Signature)

Kindly mail the above questionnaire duly filled to:-

M. P. Singh Bhadauria
Asstt. Professor
Institute of Research, Development & Training, U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential for the use of curriculum design only)