

CURRICULUM FOR

ONE YEAR POST DIPLOMA COURSE IN

=====  
: INDUSTRIAL SAFETY :  
: Effective from Session :  
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: Annual System :  
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=====  
UNDER DEVELOPMENT  
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Prepared By

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: Curriculum Development Cell :  
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INSTITUTE OF RESEARCH DEVELOPMENT  
& TRAINING, U.P., KANPUR

APPROVED BY

=====  
: BOARD OF TECHNICAL EDUCATION :  
: U.P. LUCKNOW, :  
:CORRECTED AS SYLLABUS COMMITTEE OF:  
: B.T.E. MEETING HELD ON 04.05.2017:  
=====

STUDY AND EVALUATION SCHEME  
FOR  
ONE YEAR POST DIPLOMA COURSE IN "INDUSTRIAL SAFETY"  
(Effective From Session )

I YEAR

Curriculum				S U B J E C T	Scheme of Examination								
Periods Per Week					Theory			Practical			Grand Total		
Lecture	Tutorial	Lab	Total		Examination	Sess. Marks	Total Marks	Examination	Sess. Marks	Total Marks			
				Dur.	Marks	Marks	Dur.	Marks	Marks	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	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	150	
2	--	--	2	1.7 Safety in Chemical Industry	2.5	100	--	--	--	--	100		
2	--	--	2	1.8 Elective- Any One	2.5	100	--	--	--	--	100		
				i. Safety in Engineering Industry									
				ii. Safety in Textile Industry									
				iii. Dock Safety									
				iv. Safety in Construction Industry									
				v. Fire, Explosion, Toxicity & Risk Assessment									
	2	4	6	1.9 Project				viva	100	100	200	200	
	--	--	2	1.10 Term Work	--	--	--	Viva	50	50	100	100	
		4	4	1.11 Student Centred Activities	--	--	--	--	--	--	--	--	
16	6	16	36	<-----TOTAL----->	--	800	--	800	--	200	200	400	1200

- NOTE:-
- (1) Each session will be of 32 weeks.
  - (2) Effective teaching will be at least 25 weeks.
  - (3) Remaining periods will be utilised for revision etc.
  - (4) Each period will be of one hour.
- Minimum Passing Marks In Theory 33%
  - Minimum Passing Marks in Practical & Viva 40%
  - Minimum Passing Marks in sessionals 50%
  - First Division 66% and above
  - First Division with Honors 80% and above.

PATTERN OF EXAMINATION :

The examination question papers should covers basic concepts of all topics. The questions covering the length and breadth of the syllabus of the respective papers should be included so that degree of knowledge acquired by the students during a course of study cab evaluated.

Eassy type long questions prompts students to do selective memory based study thus should be discouraged in order to judge their skill, knowledge and aptitude, the question paper of each papers must be set with following marking system.

TYPES OF QUESTIONS	No. OF QUESTION	MARKING	TOTAL MARKS
Discriptive & Narrative Type Questions	4	10 Each	40
Short Questions	8	5 Each	40
Very Short Questions	10	2 Each	20

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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 Hygeine, 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 Hygeine 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                      ICI India ltd.  
fire & safety                      fertilizers, Kanpur
2. Sri P.K. saxena                      Dy. Director                      R.L.I. Kanpur  
(safety)
3. Sri S.K. Srivastava                      Dy Director                      R.L.I. Kanpur  
(IH)
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                      Reasional Labour  
charge                      Institute,  
Sarvodaya Nagar,  
Kanpur
2. Shri D.Govandarajan                      Manager                      I. C. I. India Ltd.  
Fire & Safety                      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. Gupts 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. Rastogi 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 Bhadauri Asstt. Professor, I.R.D.T., Kanpur

On dated 09-12-2013 the following experts contribution and suggestions in revision of curriculum is a matter of obligation to I. R. D. T., U.P., Kanpur.

1. Dr. Brij Mohan Dy. Director, R. L. I., Kanpur
2. Shri R. K. Verma Secretary, B. T. E., Lucknow
3. Shri A. K. Chakraborty Asstt. Director, R. L. I., Kanpur
4. Shri Karunash Srivastava Add. Asstt. Director, R. L. I., Kanpur
5. Shri P. N. Singh R. M., (E. H. S.), Cadbury India  
Limited, Bhind (M. P.)
6. Shri Z. Ansari HOD (ESH), Moser Bayer India  
Limited, Noida
7. Shri Mohd. Tariq Dy. Director, I.R.D.T., Kanpur
8. Shri Dinesh Sharma Lecturer(Electrical), I.R.D.T., Kanpur

On dated 03-11-2015 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 H. Chattopadhyaya Director(Incharge), R. L. I., Kanpur
2. Shri G. S. Pandey Dy. Director, R.L.I., Kanpur
3. Shri S. B. Mishra Dy. Director, R.L.I., Kanpur
4. Shri A. K. Das Asstt. Director, R.L.I., Kanpur
5. Shri Lal Ji Patel T.B.O., I.R.D.T., U.P., Kanpur

On dated 21-10-2016 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 D. P. Singh Deputy Chief Inspector of Factories  
Uttar Pradesh, Kanpur
2. Shri H. Chattopadhyaya Director(Inchrge), R. L. I., Kanpur
3. Shri S. K Dwivedi Dy. Director, R.L.I., Kanpur
4. Shri Kuranesh Srivastava Dy. Director, R.L.I., Kanpur
5. Dr. S. B. Mishra Dy. Director, R.L.I., Kanpur
6. Shri A. K. Das Asstt. Director, R.L.I., Kanpur
7. Shri P. G. Sutbuta Asstt. Director, R.L.I., Kanpur
8. Shri Ashish Gupta Deputy Director, I.R.D.T., U.P., Kanpur

L	T	P
2	1	-

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 system.

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 and international SHE Management System	4	-	-
		50	25	-

### 1.1 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. Role of insurance company in safety, Role of loss control managers, Types of accidents, Energy

sources and transformation mechanisms- Hazard. Energy needs and deficiency mechanisms.

## 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 and Multiple causation theories of accident occurances. 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 & safety department

Safety Officer :

Role, responsibility authority, power & 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 & attitudes towards safety & health.

#### 1.6 SAFETY EDUCATION AND TRAINING

Training for Safety :

Assesment of needs. Design & developemnt of training programmes. Training methods and strategies. Training programmes for new entrants e.g managers and technical staffs. Evaluation of training programmes.

Training Programmes :

In-plant training programmes. Out-of-plant training programmes. Seminars, Conferences and 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 Behaviour :

Individual differences. Behavior 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 Mcgreore's and Adman's equity theories of motivation and their application to safety. Role of management, supervisors and safety dept. 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.

#### 10. SAFETY MANAGEMENT INFORMATION SYSTEM

1.10.1 Source of information on safety, health and environment, compilant. Processing retrival and analysis of information.

1.10.2 Status and future scope of computer utilization in safety. Health and Envorinment (SHE) Serives in Industries.

1.11 INTRODUCTION TO NATIONAL AND INTERNATIONAL SHE MANAGEMENT SYSTEM :

1.11.1 Total Quality Management and its application to SHE, occupational Healtha nd Safety appraisal system 18001 and 15001

1.11.2 National Policy on Safety, Health and Environment at Work Place

L T P  
2 - -

## 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 on safe use of machines. This paper covers various other mechanical and other hazards which are encountered at the work place.

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Safeguarding of Machines	8	-	-
2.	Manual handling & storage of materials	8	-	-
3.	Mechanical handling of materials	8	-	-
4.	Working at heights	8	-	-
5.	Hand tools and portable tools	10	-	-
6.	Safety at work place	8	-	-
		50	-	-

## 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. MANUAL HANDLING AND STORAGE OF MATERIALS

Basic principle of correct lifting and handling of materials. Avoidance of excessive muscular effort. 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.

## 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.

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.

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.

6. SAFETY AT WORK STATION

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.

L T P  
2 1 2

Rationale:-

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

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Plant design and House keeping	10	5	-
2.	Industrial Lighting	8	5	-
3.	Ventilation & heat control	8	5	-
4.	Electrical Hazards	8	5	-
5.	Noise & Vibration	8	5	-
6.	Hot working of metal & cold workding	8	-	-
		50	25	50

#### 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.

#### 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. Maintenance . Lighting and colour.

#### 3. VENTILATION AND HEAT CONTROL

Purpose of ventilation. Classification of Ventilation as General Ventilation (Natural and Mechanical Ventilation modes). Local Exhaust Ventilation, Special methods for thermal Stress Control Such as Air Conditioning, Radiant Heat Control

#### 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 equipments, precautions in their selection, installation, maintenance and use. Control of hazards due to static electricity.

5. NOISE AND VIBRATION

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

Vibration :

Effects, Measurement and control

6. HOT WORKING OF METAL AND COLD WORKING :

Flow sheet for foundry operations including use of different types of furnaces in each of the operation. Forging operation : Different forging operation hazards inclusive of heat radiation. safe work practices in the above. Power presses (all types), Shearing, Bending, Grinding

SAFETY ENGINEERING - II

LABORATORY WORK

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

L T P  
2 1 -

Rationale:-

Measurement, assessment and reporting system 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
1.	Plant & equipment safety appraisal and control techniques.	12	4	-
2.	Hazards identification Techniques	14	8	-
3.	Accident investigation & Reporting and analysis	12	8	-
4.	Measurement and control of performance	12	5	-
		50	25	-

1. PLANT AND EQUIPMENT SAFETY APPRAISAL & CONTROL TECHNIQUES

Objectives. Plant safety observations. 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.

2. HAZARD IDENTIFICATION TECHNIQUES

Hazard Identification techniques with examples such as FMEA, CMA, Fault Tree Analysis, Preliminary Hazard Analysis (PHA), Hazard and Operability (HAZOP), 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 connection contours).

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. MEASUREMENT AND CONTROL OF PERFORMANCE

Lost time accident. Disabling injury. Accidents reportable under the factories Act and E.S.I. Act. Frequency rate. Severity rate. 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

L T P  
2 - -

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 status. Some of such provisions are covered in this paper.

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Introduction To ILO	3	-	-
2.	History of safety Legislation in India	3	-	-
3.	Factories Act 1948 and the factories Rules	14	-	-
4.	Employees welfare and legislation	10	-	-
5.	Provision Relating to Safety, Health & Environment issues in other Important Legislations	20	-	-
		50	-	-

1. INTRODUCTION TO ILO :

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

2. HISTORY OF SAFETY LEGISLATION

3. FACTORIES ACT, 1948 AND THE FACTORIES RULES-

Provision made under the Factories Act and the rules framed there under

4. EMPLOYEES WELFARE AND LEGISLATION

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

5. PROVISION RELATING TO SAFETY, HEALTH AND ENVIRONMENT IN OTHER IMPORTANT LEGISLATIONS :

Indian Boilers Act and Regulations. Indian Electricity Act and Rules. Indian Explosives 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 and Regulation. Building and other construction works Act Rules. Provision 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 and Hazardous Waste (Management, Handling and Tran boundary



1.6 INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH

L T P  
2 1 2

Rationale:-

Good health is a prerequisite of efficiency in an industrial worker. Providing hygienic working conditions and minimising occupational health hazards (unavoidable due to nature of industry) is a must. A safety officer in the industry must be well aware to such situation to take preventive measures effectively.

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Industrial Hygiene	14	7	-
2.	Work Physiology	12	6	-
3.	Occupational Health	12	6	-
4.	Personal protective equipments	12	6	-
		50	25	50

1. INDUSTRIAL HYGIENE

1.1. CHEMICAL HAZARDS :

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.

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

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.

1.1.4 Control of airborne contaminants by substitution, isolation, enclosure, Wet methods, Industrial Ventilation - Dilution and local exhaust systems, House keeping, Personal Hygiene and Maintenance

1.2 PHYSICAL HAZARDS :

1.2.1 Effect 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.

## 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.

## 3. OCCUPATIONAL HEALTH

Common occupational diseases. Occupations involving risks of contracting these diseases. Mode of causation of the diseases and its effects. Diagnostic methods, Physical 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.

## 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. 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 device.

INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH

LABORATORY WORK

1. Calibration of Rotameter by Sope Bubble Meter.
2. Calibration of Rotameter by Wet Test Meter.
3. Detection of Carbon Monoxide, NOx, 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

L   T   P  
2   -   -

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 results enomous damage to life and property both inside and outside the works, etc, render it necessary to include additional Safety consideration for chemical industries. Accordingly, the special feature for ensuring safety in chemical industries are being included in this paper.

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Safety in transportation, storage and handling of hazardous chemicals	10	-	-
2.	Chemical process hazards and their controls	10	-	-
3.	Safety aspects of maintenance in chemical plants	10	-	-
4.	Major accident hazard control	10	-	-
5.	Safety and health in selected chemical industries	10	-	-
		50	-	-

### 1. SAFETY IN TRANSPORATION, STORAGE AND HANDLING OF HAZARDOUS CHEMICALS:-

- 1.1 Hazardous properties of chemicals and appreciation of information provided in material safety data sheets.
- 1.2 Classification of dangerous materials with pictorial symbols, common hazard and common precautions for each class.
- 1.3 Safety in transporation of dangerous materials by road, rail, ships and pipelines.
- 1.4 Safety in bulk storage of hazardous substances.
- 1.5 Safety in shelf storage of hazardous substances.
- 1.6 Safety in handling of chemicals in the plant by pipelines.

### 2. CHEMICAL PROCESS HAZARDS AND THEIR CONTROL :-

- 2.1 Hazards of chemical reactions and possibilities of reactions going out of control.
- 2.2 Common hazards of important chemical reactions and their control.
- 2.3 Common hazards of important unit operations and their control.
- 2.4 Safety considerations in process control instrumentation.
- 2.5 Safety start up, shut down and emergency shut down procedures.
- 2.6 Safety in sampling and gauging.

- 2.7 Safety aspects of plant modifications.
3. SAFETY ASPECTS OF MAINTENANCE IN CHEMICAL PLANTS :-
- 3.1 Proper identification of plants and equipments.  
 3.2 Maintenance of component failure history  
 3.3 Corrosion prevention for safety.  
 3.4 Preventive maintenance of vulnerable equipments.  
 3.5 Safe entry into confined spaces.  
 3.6 Permit to work system for safety in chemical plants.  
 3.7 NDT in chemical plants.
4. MAJOR ACCIDENT HAZARD CONTROL :-
- 4.1 Major accident hazards and roles of management, local bodies and public.  
 4.2 Safety while site selection and lay out planning  
 4.3 Fire and explosion in chemical plants.  
 4.4 Outline of quantitative risk analysis (or hazard analysis or HAZAN or hazard assessment).  
 4.5 Preparation of safety reports.  
 4.6 On site emergency planning and off site emergency planning.  
 4.7 Hazard and operability (HAZOP) studies.  
 4.8 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-dioxide 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. Dow (Index), Fire and Explosion Index System of Risk Analysis and toxicity index.
- 4.9 Case studies of following major accidents - Bhopla, Mexico, Fixborough, Seveso and Feyzin disasters.
5. SAFETY AND HEALTH IN SELECTED CHEMICAL INDUSTRIES :-
- 5.1 Chlorine-caustic, soda-hydrochloric acid manufacturing plants (Mercury cell and Membrane cell process).  
 5.2 Ammonia-Urea manufacture.  
 5.3 Manufacture of Sulphuric acid by double conversion double absorption (DCDA) process.  
 5.4 LPG Storage and bottling plants.

## 1.8 ELECTIVES

### 1. SAFETY IN ENGINEERING INDUSTRIES

L T P  
2 - -

Rationale:-

Engineering industry is a major industry employing large number workers who are engaged in hard and assiduous jobs detrimental and health deteriorating. Here the safety situations differ a lot from those in other industries. Hence the paper.

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Introduction	3	-	-
2.	Hot working of metals	10	-	-
3.	Cold working	10	-	-
4.	Other operations	8	-	-
5.	Heat treatment	8	-	-
6.	Safety statutes	3	-	-
7.	Health & welfare	8	-	-
		50	-	-

#### 1. INTRODUCTION

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

#### 2. HOT WORKING OF METALS

- 2.1 Health hazards and safe methods of operation in the above.
- 2.2. Preventive maintenance of forging machines Safe work practice of forge.
- 2.3. Operations in hot and cold rolling mills.

#### 3. COLD WORKING

Safety in the use of

- (1) Rolling
- (2) Drawing
- (3) Turning
- (4) Boring
- (5) Milling
- (6) Planing

inclusive of the need for selection and care of tools. Preventive maintenance and periodic checks for safe

operation. Associated hazards and their prevention.

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 and
- (3) Buffing and related hazards

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

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.

6. SAFETY STATUTES

Relevant provision of factories Act and Rules.

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.

2- SAFETY IN TEXTILE INDUSTRY

L T P  
2 - -

Rationale:-

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

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Section 1	16	-	-
2.	Section II	12	-	-
3.	Health & Welfare	12	-	-
4.	Safety statutes	10	-	-
		50	-	-

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, warping.

2. SECTION II :

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.

3. HEALTH & WELFARE

Health hazards in textile industry. Dust and fly. Noise generated and control measures. Occupational hazards. Occupational diseases. Personal protective equipment. Health & welfare measures. First-Aids facilities and other appropriate measures. Hospitals, clinics. Special precautions for specific work environments.

4. SAFETY STATUTES

Relevant provision of Act and Rules and other statutes

applicable to textile industry.

3- DOCK SAFETY

L T P  
2 - -

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.	History of safety legislation	2	-	-
2.	Dock safety statutes	6	-	-
3.	Working on board ships	6	-	-
4.	Lifting appliances	6	-	-
5.	Loose gears	6	-	-
6.	Handling cargo	6	-	-
7.	Transport equipments	6	-	-
8.	Containerisation	6	-	-
9.	Health & welfare	6	-	-
		50	-	-

1. HISTORY OF SAFETY LEGISLATION :

ILO Convention and recommendation in providing safety, health and welfare to Dock workers.

2. DOCK SAFETY STATUTES :

The Dock workers (safety, health and welfare) Act and Rules framed there under.

3. WORKING ON BOARDSHIPS :

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.

4. LIFTING APPLIANCES :

Differents 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.

5. LOOSE GEARS :

Use and care of fibre ropes, wire ropes, chain ropes, differents slings and loose gears, Examination and

certification of loose gears.

6. HANDLING CARGO :

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

7. TRANSPORT EQUIPMENTS :

Safety of transport equipments and their operation. Dock railways. Conveyors. Transport of workers by water. Importance of road safety in dock.

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.

9. HEALTH AND WELFARE :

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

4- SAFETY IN CONSTRUCTION INDUSTRY

L T P  
2 - -

Rationale:-

Step rise in construction activities has brought in several new hazards to which the construction workers are exposed. With the advance of building and other construction workers statutes in 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.	Meaning of safety in construction	2	-	-
2.	Safety in construction operations	16	-	-
3.	Safety in demolition operation	6	-	-
4.	Safety with regard to storage and handling of materials of construction	6	-	-
5.	Safety planning and accident prevention	6	-	-
6.	Health and welfare	6	-	-
7.	Statutory obligations	8	-	-
		50	-	-

1. MEANING OF SAFETY IN CONSTRUCTION :

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

2. SAFETY IN CONSTRUCTION OPERATIONS :

(a) Underground Works :

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

(b) Above Ground Works :

Scaffolding, centring, formwork, 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) Underwater Operations :

River Training, well sinking, caissons, cofferdams and special operations connected with irrigation works. Safety in use and operation of related machinery and equipment.

(d) Movement of Materials And Personnels :

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

(e) Special Works :

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

(f) Fire prevention and protection.

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.

4. SAFETY WITH REGARD TO STORAGE, STOCKING AND HANDLING OF MATERIALS 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.

5. SAFETY PLANNING AND ACCIDENT PREVENTION :

Policy statement. Safety budget. Organisation. Training. Implimentation. Rewards and Penalties.

6. HEALTH AND WELFARE :

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

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.

5- FIRE, EXPLOSION, TOXICITY AND RISK ASSESSMENT

Sr.No.	Units	Coverage Time		
		L	T	P
1.	Unit- I	10	-	-
2.	Unit- II	10	-	-
3.	Unit- III	10	-	-
4.	Unit- IV	10	-	-
5.	Unit- V	10	-	-
		50	-	-

**UNIT- I FIRE**

Statutory provisions regarding fire safety - Factors contributing toward fire - Physics and 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 fire extinguishers - Water systems - Carbon-di-oxide suppression systems - Foams Systems - Dry chemical extinguishing system - Fire detection and alarms - Sprinkler systems - Flammability Gases and Vapour - Ignition Models - Radiant Heat Transfer -

**UNIT- II EXPLOSION**

Explosion - Detonation - Deflagration - Prevention and Protection - Venting of Vessels ducts and pipes - Reactors and Vessels - Effects of Explosion - Dust Explosion -BLEVE( Boiling Liquid Expanding Vapour Explosion) - Explosion Protection Systems

**UNIT- III TOXIC RELEASE**

Toxicology - Toxic Effects - Toxic Substances - Toxicity Assessment - Hygiene Standard - Exposure Limits - Exposure Assessment Study - Gas Toxicity - Carcinogens- Toxic Gases Detection - Toxic Releases Risk - Hazard Assessment

**UNIT- IV CONSEQUENCE MODELLING**

Gas Dispersion - Release Sources- Dispersion - Release Rates - Dispersion Pattern - Damage Effects - Over pressure - Heat Burn - Thermal Radiation -

**UNIT- V RISK ASSESSMENT**

Risk - Storage Risk - Transport Risk Risk Analysis - Risk Assessment - Qualitative and Quantitative Risk Assessment - Failure Data and Sources - Analysis - Fractional dead time - Risk Reduction in Design, Operation and Maintenance - Human Error - Use of available Software in Risk Assessment

## 1.9 PROJECT

Part A : 90 Marks

1. Safety audit
2. HAZOP study
3. Preparation of emergency plan
4. Design of management information system
5. Assessment of fire & explosion potential & 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.

Part B : 10 Marks

Minimum 5 (Five) Industrial visit of one day should be made Compulsory and it shall be followed by the submission of the Visit report.

## 1.10 TOPICS OF TERM WORK (ANY ONE)

### TERM WORK

1. Design of need based training programme
2. Safety organisation and management
3. Study of employees participation in safety
4. Safeguarding 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 & 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.	
2.	Modeling of drilling, lathe, milling, shaper and grinding machines showing the various safety guards used on them.	
3.	A set of guards to be used on various wood working machines, such as circular saw, planer, spindle moulder, thickner, mortisingchisel etc.	
4.	Type inflating device.	
5.	Pipe welding guard.	
6.	A set of common lifting tackles, used in materials handling with view to highlight their correct usage.	
7.	Samples of wire ropes, fibre ropes, chains etc. showing their construction.	
8.	A working model to show the load on sling legs due to variation of angle of lift.	
9.	Working model of conveyor belt safety device.	
10.	A model demonstrating the principles of manual handling.	
11.	A set of anti-slip devices used for ladder safety.	
12.	A set of different types axtinguishers.	
13.	Panels depicting the various principles of safety in the use of electricity.	
14.	Electric safety devices- schok control leakage indicator etc.	

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

ii- EQUIPMENTS FOR INDUSTRIAL HYGIENE LABORATORY

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

iii- LIST OF AUDIO VISUAL EQUIPMENTS

S.No.	Name of Equipment	Qty	Amt.in Rs.
1.	Multimedia Media Projector	2	
2.	Projector Screen	2	
3.	Overhead projector	1	
4.	Epiidiascope	1	
5.	A set of flip charts produced by national safety Council, U.S.A.	1 set	
6.	Computers	2	
7.	Sound System with recorded Facilities	1	
8.	LED Monitor/48 inches TV	2	
9.	Safety Films in DVD	5	

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	
2.	Lecturer's room - 3 Nos	
3.	Class room	
4.	Industrial Hygiene Laboratory	
5.	Safety Centre/laboratory	
6.	Office room	
7.	Staff room	
8.	Library	
9.	Canteen	
10.	Facilities including laboratories and bathroom.	

STAFF REQUIREMENT OTHER THAN NON-TEACHNIG STAFF

S.No.	Name of Post	Qualification	Requirement
1.	Senior Lecturer Head	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 & Occu- pational Health.	1 No.
2.	Lecturer (Safety)	Same as above with 2 years experience.	1 No.
3.	Lecturer (Industrial Hygiene)	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.

REFERANCE BOOK

1. Douglas Mcgregor - The human side of enterprise  
Mc Grow Hill
2. H. W. Henrich - Industrial Accident prevention &  
Engineering Mc Graw Hill
3. Willi Hammer - Occupational Safety  
Management & Engineering  
Prentice Hall
4. Simonds & Gribaldi - Safety Management  
Richard D. Irwin
5. Handley - Industrial Safety handbook  
Mc Graw Hill
6. Brid - Management Guide to loss  
Control International  
Institute of Loss Control
7. Willi Hammer - Handbook of system  
& Product safety  
Prentice Hall
8. National safety Council,  
Chicago - Accident Prevention Manual  
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 Engi-<br>neering Society of<br>North America | - IES Lighting Handbook :<br>Reference Vol I & II                              |
| 21. Frank P. Lees   | - Loss Prevention in Process<br>Industries Vol I & II<br>Butterworths          |
| 22. National Fire<br>Protection Association<br>USA            | - Industrial Fire Hazards<br>Handbook  |
| 23. I.L.O. Geneva   | - Encyclopedia of Occupational<br>Health and safety                            |
| 24. Barbara A Plog  | - Fundamentals of Industrial<br>Hygeine<br>National Safety Council,<br>Chicago |
| 25. Dan Petersan  | Industrial Safety Mgt.   |
| 26. Industrial Safety Manual<br>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)

if yes then

- (a) Duration of training -----  
(b) Mode of training 1. Spread over different semesters  
2. After completion of course  
3. Any other mode

10. What mode of recruitment is followed by your organisation.

1. Academic merit
2. Written test
3. Group discussion
4. Interview
5. On the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Industrial Safety.

- (a) Technical knowledge -----  
(b) Practical skill -----  
(c) Etiquettes and behaviour -----  
(d) Aptitude -----  
(e) Health habit and social background -----  
(f) Institution where trained -----

12. Does your organisation have any system for the survey of Home articles of different countries/States. Yes/No

13. Does your organisation conduct field survey to know users views regarding. Yes/No

1. Home Articles for different age groups and sex.
2. Effect of climatic conditions
3. Any other  
If yes ; Please give brief account of each.

14. Which type of assignment do you suggest for an entrepreneur in Industrial Safety.

15. In which types of organisations can a diploma holder in Industrial Safety can work or serve.

- |   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

16. Job prospects for the diploma holder in Industrial Safety. the next ten years in the state / country.

17. In your opinion what should be the subjects to be taught to a diploma student in Industrial Safety.

Theory Practical

18. Kindly mention particulars regarding topics/areas which should be given more emphasis in the curriculum .

Theory Practical

19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field. Yes/ No  
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:-

Ashish Gupta  
Deputy Director  
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 )