



**IPS Academy, Institute of Engineering & Science**  
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)  
**Fire Technology & Safety Engineering Department**

**Minor in Industrial Safety**

(To be offered to students of other departments excluding FT&SE)

S. No.	Semester	Subject Name	Contact Hours per week			Total Credits
			L	T	P	
1.	V	Industrial Safety Management	3	1	0	4
2.	VI	Safety, Health & Environment Laws	4	0	0	4
3.	VII	Safety Engineering & Its Industrial Application	3	0	2	4
4.	VIII	Industrial Hygiene & Occupational Health	2	0	2	3
		<b>Total</b>	12	1	4	15
		<b>Total Academic Engagement and Credits</b>	<b>17</b>			<b>15</b>



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	<b>Industrial Safety Management</b>	<b>3L:1T:0P (04 hrs)</b>	<b>04Credits</b>
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**Course Objective:**

To impart of knowledge on safety concept, legislation, performance and training in an organization for accident prevention purpose.

**Module 1 (06 Hrs)**

**LEGISLATION:** Objective, Definition, Application & provisions related to safety fire prevention and fire protection in Factories Act 1948, M.P. Factories rules 1962 ,Indian Explosive Act 1884, Gas Cylinder Rules 2004, Petroleum Act 1934 with Rules 2002. Overview of OHSAS 18001.

**Module 2 (08 Hrs)**

**CONCEPTS & TECHNIQUES:** Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety, incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

**Module 3 (08 Hrs)**

**ACCIDENT INVESTIGATION AND REPORTING:** Concept of an accident, reportable and non reportable accidents, unsafe act and condition –principles of accident prevention, Supervisory role- Role of safety committee – Accident causation models - Cost of accident. Overall accident investigation process - Response to accidents, India reporting requirement, Planning document, Planning matrix, Investigators Kit, functions of investigator, four types of evidences, Records of accidents, accident reports-Class exercise with case study.

**Module 4 (08 Hrs)**

**SAFETY PERFORMANCE MONITORING:** Permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – problems.

**Module 5 (08 Hrs)**

**SAFETY EDUCATION AND TRAINING:** Importance of training-identification of training needs-training methods – programme, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

**Course Outcomes:**

At the end of this course student will be able to:

1. Know definition, application & provisions related to safety & fire prevention.
2. Apply the knowledge of safety concept and techniques in conducting plant inspections.
3. Evaluate accident indices used in safety performance monitoring.
4. Contribute in documentation process of accident investigation..
5. Understand the different approaches needed to impart safety education and training.

**List of Text/Reference Books:**

1. Accident Prevention Manual for Industrial Operations”, N.S.C.Chicago, 1982
2. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980.
3. Krishnan N.V. “Safety Management in Industry” Jaico Publishing House, Bombay, 1997.
4. John Ridley, “Safety at Work”, Butterworth & Co., London, 1983.
5. Blake R.B., “Industrial Safety” Prentice Hall, Inc., New Jersey, 1973
6. All Relevant Acts & Rules.
7. Fire Services Acts & rules of different states.



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	<b>Safety, Health &amp; Environment Laws</b>	<b>4L:0T:0P (04 hrs)</b>	<b>04 Credits</b>
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**Course Objectives:**

1. To teach the significance of Factories Act and Rules in Safety Engineering.
2. To learn the provisions related fire prevention and protection in different laws, related to Safety, Health & Environment.
3. To teach the provisions and rules related to pollution control in important legislations.
4. To learn the other important legislations from safety, fire prevention and protection point of view.
5. To learn the provisions related to fire prevention and protection in fire service act and rules

**Course Content:**

**Module 1**

**(06 Hrs)**

Objective, Definition, Application including chapter-IV, Chapter-IVA, Chapter-IX of Factories Act 1948 and Chapter IX, Chapter-X of M.P. Factories rules 1962, Madhya Pradesh Control of Industrial Major Accident Hazard Rules 1999..

**Module 2**

**(06 Hrs)**

Objective, Definition, Application & provisions related to safety, fire prevention and fire protection in Laws such as Indian Explosive Act 1884, Gas Cylinder Rules 2004, Static and Mobile Pressure Vessel Rules, Petroleum Act 1934 with Rules 2002, Calcium Carbide Rules 1987.

**Module 3**

**(08 Hrs)**

Objective, Definition, Application provisions and rules related to control of pollution in important legislation such as Water (Prevention and Control of Pollution) Act, Air (Prevention and control of pollution) Act, Environment (Protection) Act 1986 with MSIHC Rules, Chemical Accident (EPPR) Rules 1996

**Module 4**

**(09 Hrs)**

Objective, Definition, Application & provisions related to safety, fire prevention and fire protection in Other Important Legislations like-Boilers Act 1923, Electricity Act 2003 with rules, Dock workers (Safety, Health & Welfare) Act & Rules. Safety & Health provisions of Building & other construction workers (R.E.C.S.) Act 1986 and central rules 1998 and Mines Act.

**Module 5**

**(05 Hrs)**

Provisions related to fire prevention and protection in Delhi fire service Act2007 and Delhi fire service rules 2010, fire insurance assessment, Public liability insurance Act 1991 with Rules. Objective, Definition, Application, Provisions and Rules related to accidents, Occupational Diseases and Compensation in Employees State Insurance Act..

**Course Outcome:**

At the end of the this course student will be able to:

1. Explain significance of Factories Act and Rules in Safety Engineering.
2. Explain provisions related fire prevention and protection in different laws.
3. Explain provisions and rules related to pollution control in important legislations.
4. Know other important legislations from safety, fire prevention and protection point of view.
5. Explain provisions related to fire prevention and protection in fire service act and rules..

**List of Text/Reference Books:**

1. Factories Act 1948, M.P. Factories rules 1962
2. Indian Explosive Act 1884, Gas Cylinder Rules 2004
3. Petroleum Act 1934, Petroleum Rules 2002
4. Environment (Protection) Act 1986
5. Boilers Act 1923
6. M.P. C.I.M.A.H. Rules 1999
7. Delhi Fire Service Act 2007 with Rules 2010.
8. Employee State Insurance Act & Rules.
9. Building & other Construction workers, (R.E., C.S.) Act. 1996
10. Other Important Laws related to Health Safety and Environment.



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	<b>Safety Engineering &amp; Its Industrial Application</b>	<b>3L:0T:2P (05 Hrs)</b>	<b>04 Credits</b>
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**Course Objective:**

To understand the fundamental of safety engineering in material handling, operation at different levels with major industrial hazards and their application in emergency planning of an organization.

**Course Content:**

**Module 1**

**(09hrs)**

**Material Handling and Mechanical Hazards:** Principles of Material handling, Material characteristics, Major equipments categories- Positioning equipment, Conveyors and Automatic Guided vehicles, Mechanical injuries- Safe guards and their requirement, Point of operation for guards and devices. Sensing devices for guards- mechanical limit switches and non mechanical actuation, Guard locking systems and devices, Sensor for motion detection, Presence sensing devices- Trip devices, Mechanical trip switches, Trip wires, Pressure sensing mats, Edge detections, Opto electronic presence detector, Light curtains, Control devices for safety.

**Module 2**

**(09hrs)**

**Hazards and Control at Different Level:** Causes and kind of falls, Walking and slipping, Impact and acceleration hazards, Lifting and standing hazards, Forklift safety. Lockout- tagout, log-in procedure, Loto hardware, Energy isolation release from lockout or tagout, Special procedure. Confined space entry- Identification and hazards, Confined space entry procedure and permits, Duties and responsibilities of entrants, Attendants and rescue team, Hot work procedure and permits. Behavior based Safety.

**Module 3**

**(08hrs)**

**Pressure Hazards and Vessel Testing:** Pressure hazard sources, Boilers and pressure hazard, High temperature water hazard, Hazard of unfired pressure vessels, Measurement and reduction of pressure hazards. Pressure vessels definition, Classification and grading, Examination intervals and principles, Defect and failure, Pressure testing, Types of pressure test, Safety precaution in pressure and hydraulic testing, Leak testing and detection, Leak location methods and leak rate.

**Module 4**

**(07hrs)**

**Emergency Planning:** Safety in industries involving hazardous processes- types of hazards in chemical industries, Introduction, Onsite Emergency planning, Developing Emergency plan, Essential function and Nominated personnel, Off-site Emergency planning, Emergency Incidents and emergency Scenarios – case studies.

**Module 5**

**(07hrs)**

**Industrial Hazards and Control:** Hazards and their control in the manufacture of articles from refractory materials, hazards in solvent extraction plants and their control, safety in industries, manufacturing rayon by viscose process, hazards and their control in fertilizer industries, hazards and their control in LPG bottling plant.

**Course Outcome:**

At the end of the this course student will be able to:

1. Recognize major material handling equipment and design safe guards for mechanical hazards prevention.
2. Illustrate hazards during operation at different levels and develop safe operating procedures.
3. Visualize the pressure hazards and plan vessel testing for the organization.
4. Demonstrate emergency planning of an organization in onsite and offsite situations.
5. Identify the major industrial hazards and their control measures.

**List of Text/Reference Books:**

1. Sam Mannan, Lees' Loss Prevention In The Process Industries, Third Edition Volume-2 Section-19
2. Sam Mannan, Lees' Loss Prevention In The Process Industries, Third Edition Volume-2 Section-24
3. Paul A. Erickson, Practical Guide To Occupational Health And Safety, Academic Press
4. David L. Goetsch. Occupational Safety And Health For Technologist, Engineers And Manager- Third Edition, Prentice- Hall Inc.
5. Dave Macdonald, Practical Machinery Safety, Newnes
6. Dr. K.U. Mistry, Fundamentals Of Industrial Safety & Health, Siddhart Prakashan.

**List of Experiment:**

1. To visualize and demonstrate the function of mechanical limit switches in EOT crane with the help of sample working model.
2. To plan the requirement and design the safe guards for a sample working model of bucket elevator.
3. To define and demonstrate trip wire function for emergency lock inside the sample working model of conveyor belt.
4. To schematize the safe operating procedure for confined space entry and demonstrate confined space entry operation within the sample model of confined space entry.
5. To perform the pressure vessel test for a given sample of pressure vessel with the help of ultra sonic thickness tester and hand/electric operated hydraulic pump.
6. To recognize and relate the rated load capacity of a sample working model of EOT cranes and interpret it with safe load capacity.
7. To schematize the safe operating procedure for prevention of chlorine leakage and demonstrate the chlorine leakage and its control with the help of emergency kit and neutralization process.
8. To measure the efficiency of exhaust fan for removal of toxic fumes through exhaust duct in a given sample of "acid spread" model..



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	<b>Industrial Hygiene &amp; Occupational Health</b>	<b>2L:0T:2P (04 Hrs)</b>	<b>3 Credits</b>
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**Course Objectives:**

- To have the knowledge of types of storage & handling process of hazardous material.
- To learn about the understanding of impact of noise during working hours..
- To have the knowledge to develop confidence for training & workers regarding occupational diseases.
- To learn about stress related to work hazard.
- To learn about various communicate risk factor in handling hazardous material. .

**Course Content:**

**Module 1**

**(08hrs)**

**Introduction to Chemical Hazards.** Dangerous properties of chemicals, dust, gases, fumes, mists, vapors and smoke. Exposure evaluation and air sampling, There sold limit values. Chlorine Exposure effects. Personal monitoring. Introduction to chemical processes and safety. Storage, Transport and handling of hazardous chemicals. Industrial ventilation. Natural ventilation. Opening in work area.

**Module 2**

**(08hrs)**

**Physical hazards.** Improper illumination, Thermal radiation, ultra violet radiation, ionizing and non ionizing radiation. Preventive and control measures. Noise-Measurement, Noise-control techniques – Noise Survey, vibration. Thermal stress, heat balance, heat-stress, heat disorders, control measures.

**Module 3**

**(08hrs)**

**Work Physiology** Classification of workload. Work capacity and man- Job alignment. Fatigue, Physiological tests – diet and exercise for work stress control. Ergonomics, Application of ergonomics in safety and health management, methods of reducing postural strain.

**Module 4**

**(07hrs)**

**Occupational Health** Common occupational diseases such as silicosis, asbestosis, and toxicity related to lead, nickel, chromium, and manganese. Causation of diseases and its effects. Methods of prevention. Compensation of occupational diseases. Occupational dermatitis, occupational cancers, Medical examination of workers, occupational health center, health records, fundamentals of first aid.

**Module 5**

**(09hrs)**

**Personal Protective Equipments:** Non respiratory personal protective devices: Head protection , Ear protection. Face and Eye protection. Head protection. Feet protection. Body protection. Supply, use, care maintenance of personal protective equipments. Requirements under safety laws. Respiratory personal protective devices: classification of hazards. Selection of respirators. Instructions in use of breathing apparatus. Supply, Training for use, care & maintenance of breathing apparatus



**Course Outcome:**

At the end of the this course student will be able to:

1. Demonstrate the knowledge of types of storage & handling process of hazardous material.
2. Show the understanding of impact of noise during working hours..
3. Develop confidence for training & workers regarding occupational diseases.
4. Understand common occupational diseases with their preventive measures.
5. Communicate risk factor in handling hazardous material.

**List of Text/Reference Books:**

1. Occupational Health & Safety in manufacturing Industries – M K Potty.
2. Diseases of occupation – D. Hunter.
3. Code of Practice for Hazardous goods by NFPA
4. Dangerous properties of Industrial materials by Irvin Sex.
5. Handbook of occupation Health & Safety NSC Chicago 1982
6. Encyclopedia of occupational Health & Safety Vol I & II I.L.O. Geneva 1985.
7. Human Factors in Engineering & Design Tata McGraw-Hill 1982

**List of Experiment:**

1. To carry out survey of noise level by Integrated Sound Level Meter.
2. To evaluate the lung function capacity of human body by Spirometer.
3. To monitor the presence of Ammonia and its control measures.
4. To diagnose the personal hearing capability and hearing loss by the use of pure tone audiometer (Arphi 500 series)
5. To detect the presence of flammable gas by the use of flammable gas detection monitor.
6. To carry out the air sampling survey and dust monitoring using air sampling pump.
7. To evaluate noise dose for a personnel working in noisy area with the help of noise dosimeter.
8. To carry out survey of illumination levels by use of Lux meter.