

POST-GRADUATE DIPLOMA IN ENVIRONMENT, HEALTH AND SAFETY

A. Course Overview

Modern life is dependent on things provided by Industry. The curriculum honours expectations of the Industry. The Industries employ the successful candidates in the Management Cadre in Safety, Health and Environment at the level of Safety Professionals as required under the Environment Protection Act, enlisting Legislation and other Acts in various capacities like Consultant, Expert Safety Auditor under the Statutes of the Government of India and Govt. of Gujarat. Supervisory/Inspector cadre, as management cadre which has respect in the society.

This curriculum is designed to develop professionals who demonstrate not just strong problem solving acumen and analytical skills but also great interpersonal skills. The student of this course imbibe in them a sense of ownership towards the business and the society at large. Curriculum through this course gives insights for managing Safety, Health & Environment in industries and this helps to develop safe work culture in industries & in societies.

The aims of this course are:

To induce lifelong learning knowledge skills, attitudes for social & personal development.

1. To provide trained Human Resource.
2. To provide leadership qualities.
3. To create awareness of “The Quality of Life Protection” through Safety, Health and Environment.
4. To create awareness of hazards & operational hazards.
5. To assist in development of new methods & process of Safety, Health and Environment skills and analytical techniques.
6. To develop managerial abilities and analytical skills ,training, communicate with the community and interaction with government and statutory authorities
7. To train the people concerned.

B. Why to Choose This Course?

This is a short term skill based program. Demand of Environment, Health and Safety professional is increasingly growing in Industries across the globe. More than 50,000 professionals would be needed by 2020 in India, Middle East and Europe. The rapid advancement in technology and extensive automation in industries such as Engineering Industries, Chemical, Petrochemical, Construction activities, etc. have led to convoluted Health, Safety and Environmental problems in these industries. Hence, to cope with these issues the industry requires skilled safety professionals at their place. Recognizing this need; the short term course Post-Graduation Diploma in Industrial Environment, Health and Safety program is tailored to meet these industrial requirements.

The curriculum is designed based on the Environment, Health and Safety requirements that are covered from a wide spectrum of international and national legislation. By completing this program one will able to practices workplace compliance, including labour, inspection and auditing, public and worker safety, and environmental protection. The program offers a unique comprehensive combination of industrial practices in all aspects of environmental compliance as well as health and safety, which will give a superior edge to the peers while hiring. By acquiring knowledge through this course one will expertise in inspection and investigation relating to occupational health and safety legislation and environmental law. This course will enable to plan and implement training to create a safe work environment and learn the legal aspects and procedures of inspection,

monitoring, investigation and enforcement. This program will provide perfect platform to become Industry-ready Graduate.

☒ Salient Features of Course

- Learning from experienced faculties and leading industrial personal
- Courses are designed based on National and International legislation, which will make one internationally job-ready
- 4 month Industrial Practices in EHS, which will make one Industry-ready.

C. Sectors Identification

- Chemical, Petro-chemical, Engineering, Textile, Construction, Pharmaceutical, Food & Paint Industries in which Environment, Health & Safety (EHS) matters involving and activity is carried out for raw, intermediate and finished products, designs and processes including Transportation.
- To start own Consultancy / Advisory Services, Auditing of EHS and Co-ordinate with approval By and GPCB (Gujarat State Pollution Control Board) DISH, MOE, F&CC to carry out Analysis as per the recommended Standards for various products and as well as for air, water and industrial effluents.

D. Job Profile

- Safety Steward
- Safety Instructor
- Safety Supervisor
- Safety Officer
- Safety Manager

E. Skills and Outcome

- Will reduce the industrial accidents.
- Build Safe Work Culture
- Improve the production and efficiency
- Motivate the employees

F. Course Structure:

- Total Credits: 40
- Trimester system
- 8 compulsory modules (24 credits) + 2 elective modules (based on field; 6 credits)
- Last semester Industrial Practices (10 credits)

G. Eligibility Criteria

- Any Science Graduate / Board or Degree in Engineering / Technology / Science
- Any Diploma Holder with two years of experience.



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CURRICULUM FOR POST GRADUATE DIPLOMA IN ENVIRONMENT, HEALTH AND SAFETY PROGRAMME

Trimester : 1	Minimum Semester Credit Required : 16 Cumulative Semester Credit Required : 12		
Course Code	Subject Name	L-T-P	Credits
EHS4101	EHS MANAGEMENT AND CONTROL	4-1-0	5
EHS4102	EHS IN ENGINEERING INDUSTRIES	4-0-2	5
EHS4103	ENVIRONMENT AND DISASTER MANAGEMENT	2-1-0	3
EHS41E1	Elective – 01	2-1-0	3
	Total	12-3-2	16
Trimester : 2	Minimum Semester Credit Required : 14 Cumulative Semester Credit Required : 24		
Course Code	Subject Name	L-T-P	Credits
EHS4201	EHS LEGISLATION, STANDARDS AND AUDIT	4-1-0	5
EHS4202	FIRE SAFETY AND EXPLOSION CONTROL	2-1-1	3
EHS4203	INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH	2-0-2	3
EHS42E2	Elective – 02	2-1-0	3
	Total	10-3-3	14
Trimester : 3	Minimum Semester Credit Required : 10 Cumulative Semester Credit Required : 40		
Course Code	Subject Name	L-T-P	Credits
EHS4301	PROJECT (Industrial)	0-0-20	10
	Total	0-0-20	10
Course Code	Elective Subject Name		
EHS41E11	SAFETY IN CONSTRUCTION INDUSTRY		
EHS41E12	SAFETY IN PETROLEUM INDUSTRY		
EHS42E21	CHEMICAL AND PROCESS SAFETY MANAGEMENT		
EHS42E22	SAFETY IN TEXTILE AND PHARMACEUTICAL INDUSTRIES		

Date:



Indrashil University

First Trimester, 2020-21

Course Syllabus

Course Code: EHS4101

Course Title: EHS MANAGEMENT AND CONTROL

Credit Structure (L-T-P-C): 4-1-0-5

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Explain the importance of safety, health and environment in industry.
- Inculcate the Management Principles and Techniques for better practices of Environment, Health and Safety (EHS).
- Explain Hazard identification, Risk assessment and control.
- Implement the Knowledge of Major Accident Hazards (MAH) Control System

Syllabus:

Unit-1

08 Hours

Introduction: Safety Management, Safety Management Principles and Types of Safety Management, Managerial Role, Authority, Responsibility and Power, Scope of Management, Delegation and decentralization of authority, Occupational Safety, Health and Environmental Safety Management – Principles & practices, Role of Management in Industrial Safety, Organisational Behaviour on Human factors contributing to accident.

Planning for Safety:

Planning: Definition, purpose, nature, scope and procedure. Range of planning, variety of plans.

Strategic planning and tools of implementation.

Management by objectives and its role in Safety, Environment, Health and Safety (EHS).

Policy formulation and implementation.

Unit-2

08 Hours

Organizing for Safety:

Organizing: Definition, need, nature and principles. Organizing for Safety, Health and Environment Organization structure, functions and responsibilities.

Safety Committee: Structure and functions.

Line and Staff Functions for Safety, Health and Environment.

Directing for Safety:

Direction: Definition, process, principles and techniques, Leadership: Role, functions and attributes of a leader Communication: Purpose, process, types and channels Essential rules in communication, two ways communication. Barriers in communication, essentials of effective communication. Communication and group-Dynamics, Team building

Introduction to Monitoring for Safety, Health & Environment: Occupational Safety, Health and Environment Management System, Bureau of Indian Standards on Safety and Health: 14489 –1998 and 15001- 2000, ILO and EPA Standards.

Unit - 3

10 Hours

Principles of Accidents Prevention: Definition: Incident, accident, injury, dangerous, occurrences, unsafe acts, unsafe conditions, hazards, error, oversight, mistakes etc.

Accident Prevention: Theories/Models of accident occurrences. Principles of accident Prevention. Accident and Financial implication.

Major Accident Hazards (MAH) Control System: Major Accident Control, Definition of major accident hazards, Identification and assessment of MAH installations, Roles of Government, Management, Local Authorities and Public, ILO Code of Practice for major accident control.

Environment, Health and Safety (EHS) Education and Training: EHS: Element of training cycle, Assessment of needs. Techniques of training, design and development of training programs. Training methods and strategies types of training. Evaluation and review of training programs.

Competence Building Technique (CBT), Concept for training, safety as a on-line function. Role of Multi-Media, Communication, Applications of Computers.

Unit - 4

08 Hours

Employee Participation in Safety: Employee Participation: Purpose, areas of participation, methods. Role of trade union in Safety Health and Environment Protection. Safety Promotion and Safety Awards and Suggestion Schemes, Safety Competitions Safety Incentives Publicity Schemes, Audio Visual Publicity, other Promotional Methods.

Behaviour Based Safety (BBS): Human behaviour - Individual differences, behaviour as function of self and situation, perception of danger and acceptance of risk, knowledge, and responsibility vis-a-vis safety performance, theories of motivation and their application to safety, role of supervisors and safety departments in motivation.

Management information System:

Sources of information on Safety, Health and Environment Protection. Compilation and collation of information, Analysis & use of modern methods of programming, storing and retrieval of MIS for Safety, Health and Environment.

QCC HS Computer Software Application and Limitations.

Status and future goals of computer utilization in Environment, Health and Safety (EHS) Services in Industries.

Unit-5

08 Hours

Hazard identification, Risk assessment and control: Hierarchy of hazard control, Hazard Identification and Risk Assessment (HIRA), HAZard ANALysis (HAZAN), Maximum Credible Accident Analysis (MCAA)/ Quantitative Risk Assessment (QRA)

Emergency Preparedness and response plans: On-site emergency response plan, Off-site emergency response plan Mutual Accident Response Group (MARG), Major accident control system at local, state, national and international levels

Unit-6

08 Hours

Accident/incident analysis: Methods of collating and tabulating data, Record-keeping, Accident/ incident/ occupational illness trend analysis

Measurement and evaluation of safety performance: Indian standard IS-3786 and its salient features, Definition of terminology used to define type of accident, man-hours worked/ exposure hours, scheduled charges for disabilities, statistical period, Restricted Work Case (RWC), first-aid case, etc.

Safety performance indicators: Frequency Rate (FR), weighted frequency rate, Severity Rate (SR), incidence rate, Frequency-Severity Index (FSI), Safe-T-Score, cost factor, cost severity rate, activity rate, Fatal Accident Frequency Rate (FAFR), time charges in the Employee's Compensation Act, 1923, Leading & Lagging indicators.

Classification of industrial accidents and special cases according to IS-3786

Accident / incident / near-miss / dangerous occurrence reporting, investigation:

Accident/incident reporting and investigation, purpose and process. Accident Report forms, Accidents reportable under various statutes like Factories Act 1948, the BOCW Act 1996, the ESI Act 1948, etc., Agencies investigating accident. Identifying the key factors and the immediate and basic causes, Accident investigation report, Corrective Action and Preventive Action (CAPA).

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. Heinrich H.W, 'Industrial Accident Prevention', Mcc Graw-Hill.
2. IS : 3786 – 1983, 'Method for computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Accidents', Indian Standards Institution, New Delhi.
3. 'Antiac' (Lepburn, H.A.),, 'The Fundamental Causative Factors of an Industrial Accidents', ' , The British Journal Industrial Safety.
4. Eapburn, H.A, 'The Causation of an Industrial Accident', British Journal of Industrial Safety, Vol. 6, No. 63, 1963.
5. Dr. K. U. Mistri, Fundamentals of Industrial Safety and Health, Siddarth Prakashan.
6. H.W. Heinrich, Dan Petersen, and Nestor Roos , Industrial Accident Prevention , McGraw-Hill Book Company, New York / New Delhi
7. Prevention of Major Industrial Accidents (ISBN: 92-2-107101-4 , International Labour Office (ILO), Geneva (Switzerland)
8. Accident Prevention Manual for Industrial Operations, Techniques of Safety Management, National Safety Council444, North Michigan Avenue, Chicago, I 11 – 60611
9. By Dan Petersen (ISBN: 978-18-8-558139-6), Techniques of Safety Management, McGraw-Hill Book Co. Ltd., New York, N.Y. (USA).
10. By A.K. Gupta, Industrial Safety and Environment, Laxmi Publications, New Delhi.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 08)

Sr. No.	Assignment
1	Training Module For Induction Training
2	Training Module for Accident Prevention
3	Preparation of Model Occupational Health & Safety Policy
4	Annual Training Calendar
5	Preparation of MIS Form
6	BBS Observation Form
7	One Point Lesson
9	FR,SR and Index
10	Designing Accident Report Form
11	Designing Accident Investigation Form
12	Accident Prevention Programme

Evaluation Scheme:

EC No	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%

4	Comprehensive Exam	180	55%
Total			100%

Date:



Indrashil University

First Trimester, 2020-21

Course Syllabus

Course Code: EHS4102

Course Title: EHS IN ENGINEERING INDUSTRIES

Credit Structure (L-T-P-C): 4-0-2-5

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Implement risk assessment while operating machines in industries.
- Implement the Knowledge, Skill and Mechanism of functioning of machine, tools and safe use of the same.
- Deal with different hazards at work place.
- Apply Ergonomics in industry for Safety.

Syllabus:

Unit-1

08 Hours

Machine Operation and Guarding: Principles in machine guarding. Ergonomics of machine guarding. Type of guards, their design and selection. Guarding of different types of machinery including special Precautions for wood working, paper, rubber and printing machinery, machine, tools etc. Built-in-safety devices, maintenance and repairs of guards, incidental safety devices and tools. Concept of zero access guarding.

Safety in the use of Machines: Safety in the use of power presses (all types), shearing, bending, rolling, drawing, turning, boring, milling, shaping, planning, broaching, plating, grinding, CNCs, robotics, etc.

Safety in the use of Hand Tools and Power Tools: Main Causes, Prevention and Control of accidents in the use of hand and power tools. Centralized and personal tool issues System. Purchase, storage and supply of tools. Inspection, maintenance and repair of tools. Portable power tools and their selection, inspection, maintenance, repair and safe use. Non-sparking tool.

Mechanical: Lifting machinery, lifts and hoists; design, use and care, signalling, inspection and maintenance. Safety in design and construction, operation, inspection and maintenance of industrial trucks, lifting tackles and loose gears, conveyors. Safety features, safe locations, testing, inspection and maintenance of lifting tackles, safe working load for all mechanical material handling equipment. The competent persons in relation to safety legislation - duties and responsibilities.

Unit-2

08 Hours

Material Handling and Storage: Manual: Kinetics of manual handling. Maximum loads that could be carried. Lifting and carrying of objects of different shapes, size and weight. Safe use of accessories for manual handling Storage of materials. Safety in stacking and un-stacking, floor loading conditions. Layout condition for safety in storage, ergonomics of manual handling and storage.

Plant Layout Design and Housekeeping: Plant layout, design and safe distance. Need for planning and follow-up. Safety and good Housekeeping. Typical accidents due to poor house-keeping. Disposal of scrap and other trade wastes. Prevention of spillage. Marking of aisles space and other locations.

Use of colour as an aid for good housekeeping. Cleaning methods. Benefits of good housekeeping. '5S' system.

Inspections and check-lists. Safety Check list for buying new machinery for the plant. Role of preventive maintenance in safety and health. Importance of standards and codes of practice for plant and equipment.

Unit-3

08 Hours

Electrical Hazards at Workplace:

Hazards of electrical energy. Safe limits of amperages, voltages. Safe distance from lines. Capacity and protection of conductor. Joints and connections. Means of cutting off power. Overload and short circuit protection. No load protection. Earth fault protection. Earth insulation and continuity tests. Earthing Standards. Protection against voltage fluctuation. Hazards arising out of 'borrowed' neutrals. Types of protection for electrical equipment in hazardous atmosphere. Hazardous area classification. Criteria for selection, installation, maintenance and use of equipment in hazardous area.

Static Electricity:

Introduction, Electro-Static charge. Electro Static dissipaters. Electro Static hazards and their control. Earthing and bonding. Recommended earthing resistance.

Lightning Arrestors:

Definition, lightning splash, lightning strokes, lightning protection systems. Characterization of health effects of lightning stroke (electrical effects, side flashers, thermal effects, mechanical effects. Function of lightning arrestors.

Unit - 4

10 Hours

Safety in Engineering Industries:Engineering Industries, Automobile Manufacturing activity like pattern making, melting, moulding, machining, forging, chipping, grinding, Metallurgy: Ferrous and Non Ferrous Industry Foundry, Steel Plant. Hazards associated with Process of melting (furnaces), casting, foundry, forging and hot & cold rolling operations and their control measures

Hazards at workplace: Welding, Gas Cutting, Brazing, Soldering, buffing and polishing hazards, Mechanical hazards, electrical hazards, Noise/Vibration Hazards, Fire Hazards, Physical, Toxic and Chemical Handling Hazards

Hazard identification and risk control approaches and techniques: Reactive approach: Incident recall technique (after-the-event approach), Proactive approaches: Critical incident review technique (before-the-event approach), Deductive technique, Inductive technique

Cause/consequence finding techniques: What-if, Fishbone, Why-Why, Root Cause Analysis (RCA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA), Cause-Consequence Analysis (CCA), Management Oversight and Review Technique (MORT), Failure Mode and Effects Analysis (FMEA), Job Safety Analysis (JSA).

Unit - 5

08 Hours

Destructive Testing, Non Destructive Testing and Heat Treatment: Break load test, Tensile Stress Load testing, etc. NDT-testing, significance and limitations. Types of NDT – Die Penetration Radiography, Ultrasound, Magnetic Particle Methods, Eddy-Current Method, Thermography etc

Safety in IT and Electronic Industry and Service Sector

Various hazards in IT, Electronic, related Service sectors and their control measures. Ergonomic hazards / Musculoskeletal Disorder (MSD), electrical hazards, physical hazards, radiation hazard, fire hazards, Computer Vision Syndrome (CVS), Carpal Tunnel Syndrome (CTS), Repetitive Strain Injury (RSI), Various hazards in Malls, Cinema Halls, Parking Lots and Commercial Sectors, etc. - Preventive and Control measures.

Safety in Textile Industry: Processes and Various hazards in textile industries and their control measures.

Safety in Agro-Industry / Sugar Industry: Processes and Various hazards in agro/sugar industries and their control measures.

Safety in Docks Operations: Hazards in Handling of cargo – On Board Operations, On Shore and along Shore Operations, Warehouse Operations, Dangerous Goods, Container

operations, Lifting appliance, Loose Gears and wire ropes, Responsibility of different agencies for safety and health involved in dock work.

Unit - 6

08 Hours

Introduction to Ergonomics: Definition, Aims and Scope, Man-machine (Job), Environment System, Constituents of Ergonomics, Application of Ergonomics in industry for Safety, Health and Environment. Ergonomics of Automation/Assembly, Visual Fatigue and Ergonomics of Rehabilitation while assigning alternate jobs. Working postures Its effect on cardio-vascular and musculoskeletal system and implications on health, Anthropometry and fundamental of bio-mechanics: Basic and applied aspects: Anthropometric measurements and their usefulness in industry, Permissible limits of load for manual lifting and carrying.

Ergonomic Design of Work Station: Concept of workstation and its design. Improving safety and productivity through work station design. Technical and Engineering control measures. Economics consideration.

Physiology at Work: Physiology of respiration, cardiac cycle, muscle contraction, nerve conduction system etc. Assessment of Workload based on Human Physiological reactions. Criteria for fixation limits. Nutrition and its importance in manual work. Nutritional requirements and nutritional of diet. Assessment of Work Capacity Fatigue and Rest Allowances. Physiological Test for Assessment of Occupational Health. Nutrition: Nutritional requirements and the Diets for Exercise, Work and Physical Fitness Aerobic work capacity (physical work capacity), methods of its determination (use of bicycle, ergometer, treadmill, step-stool ergometer). Factors affecting aerobic capacity and work performance.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. Safety code for Scaffolds and Ladders, (Part II) – Ladders, IS : 3696 , (Part II).
2. Glossary of terms relating to wire ropes , IS 2363.
3. Steel wire ropes for general engineering purposes , IS 2266.
4. Wire rope slings and sling legs , IS 2762.
5. Frank P. Lees, Loss Prevention in the Process Industries (Vol. 1, 2 & 3) (ISBN: 0-7506-1547-8), Butterworth-Heinemann Waltham, Massachusetts (USA)
6. Chemical Process Quantitative Risk Analysis (ISBN-13: 978-08-1-690720-5), Center for Chemical Process Safety, American Institute of Chemical Engineers, New York, N.Y. (USA)
7. Dr. K. U. Mistri, Fundamentals of Industrial Safety and Health, SiddarthPrakashan.
8. Accident Prevention Manual for Industrial Operations, Techniques of Safety Management, National Safety Council, 444, North Michigan Avenue, Chicago, I 11 – 60611.
9. By A.K. Gupta, Industrial Safety and Environment, Laxmi Publications, New Delhi.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 08)

SR. NO.	ASSIGNMENT
1	Design of a machine guard

2	Development of a plant Layout
3	Preparation of a safety Inspection Check list for Dock Area
4	Prepare Tool Box on Good Housekeeping
5	List out the Hazards at IT / Electronic Industries
6	Preparation of Housekeeping Checklist
7	List out the Hazards at Engineering Industries
8	HIRA/ HAZOP/ JSA
9	Preparation of a safety Inspection Check list for Housekeeping
10	Development of a SOP for any one machine
11	List out the Hazards at Textile Industries

Evaluation Scheme:

EC No.	Evaluation Component	Duration (Mins)	Weightage	
1	Attendance	Continuous	5%	
2	Assignment	Continuous	10%	
3	Mid-sem exam	50	30%	
4	Comprehensive Exam	Theory	180	30%
		Practical	120	25%
Total			100%	

Date:



Indrashil University

First Trimester, 2020-21

Course Syllabus

Course Code: EHS4103

Course Title: Environment and Disaster Management

Credit Structure (L-T-P-C): 2-1-0-3

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Deal with different type of disasters.
- Apply concepts of disaster management.
- Implement environment management system as well as environmental policy, laws, economics which are very much essential from the point of view of today's environmental problems.

Syllabus:

Unit-1

05 Hours

Basics of Disaster Management: Understanding the Concepts and definitions of Disaster, Hazard, Exposure, Risk, and Capacity – Disaster and Development, and disaster management.

Unit- 2

05 Hours

Type of Disasters:

Man-made Disasters (building collapse, rural and urban fire, road and rail accidents), Technological Disasters (chemical, industrial, radiological, nuclear), Geological Disasters (earthquakes, landslides, tsunami, mining), Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves), Biological Disasters (epidemics, pest attacks, forest fire), Global Disaster Trends–Emerging Risks of Disasters–Climate Change, global warming, GHG effects and Urban Disasters

Unit-3

05 Hours

Disaster Management Cycle: Prototype Shift in Disaster Management,

Pre-Disaster: Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness

During Disaster: Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation, Monitoring devices for detection of gases in the atmosphere

Post disaster: Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment.

Unit-4

05 Hours

Introduction to Sustainable Development: Environmental Impact Assessment, Bio Diversity, Atmospheric pollution-Global warming and Ozone Depletion, ODS banking and phasing out-Sea level rise, El Nino and climate changes, Eco friendly products, Green movements, cleaner production, Environmental Policies.

Sustainability Reporting: Elements of Sustainability Reports, Purpose & advantages of Sustainability Reporting. GRI G 4 guidelines, Eco system, concept and structure, Monitoring and analysis of industrial effluents

Energy Conservation: Key elements of energy management system ISO 50001, use of clean technologies, energy conservation measures Water Conservation, Recycling, Harvesting, Power Saving Measures, Paper Saving measures, Raw Material Saving, Depletion of natural resources, Renewable Energy, Life Cycle Assessment, Product Stewardship, Green Supply Chain, Eco Friendly environment good practices & innovations, etc.

Unit - 5**05 Hours**

Environmental education: Population and community ecology, Natural resources conservation, Environmental protection and law, Research methodology and systems analysis-Natural resources conservation, Policy initiatives and future prospects, Risk assessment process, assessment for different disaster types, national policies, objectives and standards.

Waste Management: Statutory Provisions for Bio Medical Wastes, E waste management, Battery waste management, treatment, transportation and disposal. Hazardous Waste Management: Hazardous waste, PCB requirements and transportation of hazardous wastes, Manifest, TREM Card, Solid Waste management, ETP and STP , Management of Hazardous waste by industries. Four R-Concept: Reduce, Recycle, Reuse & Reprocessing of Waste.

Unit - 6**05 Hours**

Environmental Important Regulations: Water and Air Acts and Rules, Environment (Protection) Act and Rules, Water Cess Act & Rules, Public Liability Act & Rules, MSIH Rule 1989, Role of State Pollution Control Board under Water and Air Act.

Environmental Monitoring: Environment related terms/definitions, Principles & practices for monitoring of air pollution, water pollution, and solid waste management. Cleaner technologies. Ambient Air quality, Environmental Noise Pollution, Stack Monitoring, Effluent Monitoring, Effluent Treatment Plant-Key process, Air Pollution Control Devices, Scrubber System, and Parameters of Effluent monitored.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Prentice Hall.
3. Editor: R. B. Singh, Natural Hazards and Disaster Management: Vulnerability and Mitigation, Nature
4. Keith Smith, Environmental Hazards: Assessing Risk and Reducing Disaster, Routledge.
5. Venugopal Rao, Environmental Engineering, Prentice-Hall of India Pvt., New Delhi
6. Nicholas & Madelyn , Environmental Health & Safety Management , Jaico PublishingHouse, Mumbai
7. Wastewater Engineering: Treatment, disposal, Reuse , Metcalf & Eddy, Inc., TMGHI, New Delhi.
8. Erach Bharucha, Text book of Environmental Studies , Universities Press (India), Hyderabad

Assignments:**LIST OF ASSIGNMENTS (Attempt any 8)**

SR. NO.	ASSIGNMENT
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1	Development of Disaster management cycle for any one natural disaster
2	Development of Disaster management cycle for chlorine gas leakage
3	Development of Disaster management cycle for oil-well blast
4	Development of Disaster management cycle for nuclear plant failure
5	Environment Impact Assessment on Biodiversity for mining activity
6	Checklist for Air monitoring
7	Bio medical waste checklist
8	Checklist for a ETP
9	List out elements of Sustainability Reporting
10	Assignment of Internal Audit of any unit based on ISO 14001

Evaluation Scheme:

EC No	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%
4	Comprehensive Exam	180	55%
Total			100%

Date:



Indrashil University

Third Trimester, 2020-21

Course Syllabus

Course Code: EHS41E11

Course Title: Safety in Construction Industry

Credit Structure (L-T-P-C): 2-1-0-3

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Identify the Hazards in Construction Sector.
- Carry out various construction activities and general safety measures at construction site.
- Recognize hazard during electrical work and demolition work.

Syllabus:

Unit-1

05 Hours

Safety in Construction Industry: Hazards in Construction Sector and their preventive measures - Basic philosophy, peculiarities and parameters governing the safety in construction - site planning and design layout, safe access, good housekeeping, safety in the use of construction machinery and transport equipment, signs and indication liaison for safety with local authorities, structural soundness.

Safety in the use of construction machinery: Heavy/Long Items. Earth Moving equipments, Railway wagons, motor trucks, Materials Vehicles etc., Hazardous Materials, Material handling equipments, Seismic structural soundness and Structural stability.

Good Safety Practices / Initiatives in Construction Safety.

Unit- 2

05 Hours

Types of Construction Activity: Working below ground level: Excavation, drilling and blasting pneumatic, trenching, Excavation equipment, shoring, strutting, tunneling, piling and Safety in using and operating machinery and equipment relating to the above works. Foundations: Plant & Machinery and Structure

Working at height: Scaffolding, shuttering / form work, ladders, concrete, cofferdams and special operation connected with irrigation work. Safety in use and portion of related machinery and equipments. Safety on working on fragile roof. Precautions on Tower Cranes, Temporary installation and structures.

Unit-3

05 Hours

General Safety Measures:

At Ground Level: Housekeeping, Electrical Hazards, Handling and Storage of construction material at site. Safety precautions in storage handling and staking of material.

Underwater portions: Well sinking, caissons underwater concreting, cofferdams and special operations connected with irrigation work. Safety in use of machinery and equipments related to underwater portions.

Unit-4

05 Hours

Electrical Hazards at Workplace

Special Works: High rise buildings, bridges and tunnels, roads, railways, asphaltting, pneumatic caissons, electrical installations and lifts. Safety in Prevention and Protection at Work Site including the collapsing of the structure.

Project Management in Constructions Safety: Introduction, Manpower and material utilization-equipment and tools.

Safety in use and handling of explosives: Open cost machinery, quarrying.

Unit - 5

05 Hours

Special precautions for works of Engineering construction: like distilling / fractionating columns, chimney, silos-oil and gas installations, transmission/ communication lines, Cooling towers, cable car installations, air fields.

Unit - 6

05 Hours

Safety in Demolition Operations: Planning and Permit, sequence of demolition, Safety Precautions to be taken for and during demolition carrying out repairs, additions and alterations

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. The Chain Testers' Handbook, Chain Testers Association of Great Britain, 430 Barking Road, London.
2. Rigging Manual, Construction Safety Association of Ontario, Ontario, Canada.
3. W.E. Rossnagel, Handbook of Rigging for Construction and Industrial Operations, McGraw- Hill Book Co., 1221, Avenue of the Americans, New York, N.Y. 10020.
4. H.R Blackwooll, Illumination Engineering Vol. 54, P-317-353, 1959. , IS 2762.
5. Dr. K. U. Mistri, Fundamentals of Industrial Safety and Health , Siddarth Prakashan
6. V.R & B.K.S, Forthlight roofs, Ind. J. of Tech. Vol. 3. No. 3, Pg. 72-74, 1965.
7. Rigging Manual, Construction Safety Association of Ontario.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 8)

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

Evaluation Scheme:

EC No	Evaluation Component	Duration (Mins)	Weightage
.			

1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%
4	Comprehensive Exam	180	55%
Total			100%

Date:



Indrashil University
School of Engineering
Third Trimester, 2020-21
Course Syllabus

Course Code: EHS41E12

Course Title: Safety in Petroleum Industry

Credit Structure (L-T-P-C): 2-1-0-3

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Identify the Hazards in Petroleum Sector.
- Identify hazards associated with off-shore and on-shore drilling.
- Recognize hazard during electrical work and demolition work.
- Carry out risk assessment at oil well site.

Syllabus:

Unit-1

05 Hours

Introduction to petroleum Industry: Global and Indian hydrocarbon industries, about up-stream and down-stream industries. Petroleum and Petroleum products, Fuels, Petroleum solvents, Lubricating oils, Petroleum wax, greases, miscellaneous product.

Introduction to Drilling Rig and Components Hoisting System:Component Parts; Derricks, Mast, Substructures, Weight Indicator, Wire Line and Draw Works, Power System: Prime Moves, Transmission System, Rotary System: Swivel, Kelly, Rotary Table

Fundamentals of Drilling tubulars& Circulation (8 hours) Tubulars: Drill Pipe, Tool Joint, Casing Pipe, Design Consideration, Circulation System: Drilling Fluid Types, Preparation and Conditioning System, Additive, Pumping System, Cutting Removal, Pressure Loss Circulation, Drilling Practices: Bit Choice, Weight on Bit, Rotary Speed, Hydraulic Effect, Air- Gas Drilling, Coring, Drilling Efficiency.

Unit- 2

05 Hours

Cementation & Safety Issues in Drilling Cementing Operations: Cement Types, Additives, Process and Equipment, Complication: Lost Circulation, Fishing, Blow Outs, Well Planning: GTO, Safety Consideration in well Completion

Basics of Well Control: Oil field Pressure, Kick Causes and Indicators, well control equipment's, Types of Well control, Kill Sheet.

Unit-3

05 Hours

Hazards in Up-stream operation:Well-site analysis, On and off shore oil operation, Construction of Installation, Pipe line Construction, Maintenance and repair activities, Safety and associated hazards.

Drilling operation, Drilling accidents, Oil spills, Technique and equipment, Work position, Working condition, safety and associated hazards, lighting and its effects

Hazards in Down-stream operation:

Petroleum Extraction and transport by sea, Oil field products, Transport of crude by sea, Crude oil hazards. Petroleum product storage and transport, Storage equipment, Precaution, Tank cleaning.

Unit-4

05 Hours

Environmental issues and management:Environmental impact and management, Impact of petroleum industry in marine environment, petroleum hydrocarbons in marine environment, Chemical disposal of offshore industry and environmental management, Dispersion models and atmospheric pollution, Dispersion models continued, Hazard assessment.

Unit - 5

05 Hours

Accidents in Offshore Platforms: Sleipner A Platform, Thunder Horse Platform, Timor Sea Oil Rig

HAZOP analysis: Understanding process flow diagram, process and instrumentation diagram, Equipment specifications, MSDS.

Unit - 6

05 Hours

Case Study: Maxican oil spill, Chennai oil spill accident.

Case Study of HAZOP: Example Problem of a Group Gathering Station

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

8. Forman J. Hyne, Dictionary of Petroleum Exploration, Drilling & Production, PennWell Books.
9. Norman J. Hyne, Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production.
10. Srinivasan Chandrasekaran, Health, Safety, and Environmental Management in Offshore and Petroleum Engineering, Wiley.
11. Ione L. Taylor, Methods of Exploration and Production of Petroleum Resource.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 8)

SR. NO.	ASSIGNMENT
1	To demonstrate the various safety issued considered during drilling
2	To detail and suggest prevention of Kick Causes and Indicators
3	To describe about Safety Issued in Oil and Gas Production
4	Outline the tools, standards, measurement, competency requirements and controls applicable to Process Safety Management (PSM) in the oil and gas industries
5	Explain the role and purpose of a permit-to-work system.
6	Explain the key principles of safe shift handover.
7	Explain the importance of safe plant operation and maintenance of hydrocarbon containing equipment and processes.
8	Identify the main hazards of and suitable controls for land transport in the oil and gas industries
9	Outline the principles, procedures and resources for effective emergency response.
10	Make step of in HAZOP

Evaluation Scheme:

EC No	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%
4	Comprehensive Exam	180	55%
Total			100%

Date:



Indrashil University
Second Trimester, 2020-21
Course Syllabus

Course Code: EHS4201

Course Title: EHS Legislation, Standards and Audit

Credit Structure (L-T-P-C): 4-1-0-5

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Explain National and International Acts for Environment Protection.
- Implement Rules, Conventions pertaining to Health and Safety.
- Explain other rules and regulations such as factory act, Building and other Construction Workers acts.
- Implement various standards for Environment, health and safety.
- Implement ways for Energy Conservation and ISO 50001 standard for energy conservation.
- Explain basics of safety audit.

Syllabus:

Unit-1

08 Hours

The Factories Act, 1948 and Rules:

Provisions relating to Safety, Health and welfare, under the Act and Factories Rules made there-under, Amendments Process to the Act and Rules, The Gujarat Factories Rule, Important Case Laws under the Factories Act, 1948.

The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, and Central Rules, 1998 and State Rules: The Building and other Construction Worker's Welfare Cess Act, 1996 and State Rules, 1998.

Unit-2

09 Hours

Environment Protection Legislations: Water (Prevention & Control of Pollution) Act 1974 and Rules. Air (Prevention and Control of Pollution) Act 1981 and 1982 and Rules.

Environment (Protection) Act, 1986 and Rules.

Manufacture Storage and Import of Hazardous Chemical Rules, 1989, Noise Pollution Act, 1998, Bio-Medical Waste, E-Waste Rule, Batteries Rule, Hazardous Waste Management (Trans boundary) Rules, Chemical Accidents (Emergency Preparedness, Planning and Response) Rules 1996, Kyoto protocol, UNDP Zero emission, Ozone Treaties, UNEP Environmental Law Instruments, UNFCCC Paris Agreement.

Environment, Health and Safety (EHS) related Important Legislation: Sections pertaining to SHE in Indian Boilers Act, 1923 with allied Regulations, 1961, Indian Electricity Act, 2003 and Rules, latest CEA guidelines, Indian Explosives Act, 1984 and Rules. Petroleum Act and Rules, Gas Cylinders Rules. Calcium Carbide Rules, the Insecticides Act and Rules.

Radiation Protection Rules, Hazardous Materials Transportation Rules, Static and Mobile (Unfired) Pressure Vessel Rules, 1981 as amended in 2000.

The Dock Workers (Safety, Health & Welfare) Act 1996 and Rules and Regulations. Hazards arising out of 'borrowed' neutrals.

Types of protection for electrical equipment in hazardous atmosphere. Hazardous area classification. Criteria for selection, installation, maintenance and use of equipment in hazardous area.

Unit - 3

10 Hours

Social Security Legislations: Employees Compensation Act and Rules, ESIC Act and Rules, Contract Labour (Abolition and Conditions of Service) Act and Rules, Public Liability Insurance Act, 1991 and Rules, Responsible Care (RC),

Motor Vehicles Act, 1988 and Rules the Central Motor Vehicles Rules, 1989, Transport of Hazardous Goods by Road Rules, Fire Prevention and life Safety Measures Act 2006 and rules.

ILO Convention and Recommendation concerning Occupational Health & Safety: Relevant Conventions and Recommendation of ILO in the furtherance of Safety, Health and Environment (SHE). SHE a human right issue.
Trade Policy affecting OHS.

Unit-4

08 Hours

Environmental Management Systems: EMS Audit- ISO 14001: 2015, Aspects and impact of Environment Management, Environmental Policy, Environment Management Programmes, Administrative Procedure for Environmental Clearances, Environmental Impact Assessment (EIA), Process and Methodologies. Air Pollution and control measures, Water Pollution and control measures, Soil Pollution and Control measures, Plastic Pollution & control measures. Ecosystem' and the components of ecosystem.

Concept of Common Effluent Treatment Plant (CETP). Floating aquatic plant system and its design and operation. Sludge characteristics and disposal methods –design and operation of sludge drying bed. Design and operation of treatment plant. Trouble shooting and trouble free operation.

Energy Conservation: Key elements of energy management system ISO 50001, use of clean technologies, energy conservation measures Water Conservation, Recycling, Harvesting, Power Saving Measures, Paper Saving measures, Raw Material Saving, Depletion of natural resources, Renewable Energy, Life Cycle Assessment, Product Stewardship, Green Supply Chain, Eco Friendly environment good practices & innovations, etc.

Unit-5

10 Hours

ISO 45001 Occupational Health and Safety Management Systems

Introduction: Scope, Normative References, Terms and Definitions, Context of the Organization, Leadership and Worker Participation, Planning, Support, Operation, Performance Evaluation, Improvement, Requirements.

Use of colour as an aid for good housekeeping. Cleaning methods. Benefits of good housekeeping. '5S' system.

Inspections and check-lists. Safety Check list for buying new machinery for the plant. Role of preventive maintenance in safety and health. Importance of standards and codes of practice for plant and equipment.

IS : 14489: 1998 code of practice on occupational safety health audit: Audit goals, objectives and responsibilities

Auditing methodology

OS&H audit completion

Action for implementation of OS&H audit report.

Unit - 6

05 Hours

International Labour Standards on Occupational Safety and Health: Key instruments on occupational safety and health

Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187): Occupational Safety and Health Convention, 1981 (No. 155), Occupational Health Services Convention, 1985 (No. 161)

Health and safety in particular branches of economic activity: Hygiene (Commerce and Offices) Convention, 1964 (No. 120)Occupational Safety and Health (Dock Work) Convention, 1979 (No. 152).

Safety and Health in Construction Convention, 1988 (No. 167).

Safety and Health in Mines Convention, 1995 (No. 176)

Safety and Health in Agriculture Convention, 2001 (No. 184)

Protection against specific risks: Radiation Protection Convention, 1960 (No. 115), Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No. 148), Asbestos Convention, 1986 (No. 162), Chemicals Convention, 1990 (No. 170)

Codes of Practice.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. The Factories Act, 1948 & Factories Rules , Bare Act
2. Environment (Protection) Act, 1986 and Rules , Bare Act
3. The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, and Central Rules, 1998 and State Rules, Bare Act
4. Employees Compensation Act, 1923 and Rules , Bare Act
5. Indian Electricity Act, 2003 and Rules CEA guidelines, Indian Explosives Act, 1984 and Rules. , Bare Act
6. The Petroleum Act & Rules, Bare Act
7. The Dock Workers (Safety, Health & Welfare) Act 1996 and Rules and Regulations, Bare Act
8. Indian Boilers Act, 1923 with allied Regulations, 1961, Bare Act.
9. Environmental Management Systems, ISO 14001 :2015
10. Code of practice on occupational safety health audit, IS : 14489: 1998.
11. ISO 45001 Occupational Health and Safety Management Systems, ISO 45001 :2018
12. International Labour Standards on Occupational Safety and Health
13. Energy Management ISO 50001

Assignments:

LIST OF ASSIGNMENTS (Attempt any 10)

SR. NO.	ASSIGNMENT
1	List out the Health Provisions under Factories Act / Rule
2	Identify the Duties of Occupier under Factories Act / Rule
3	List out the Key Statutory Provisions under BOCW Act / Rule
4	List out the rules under Environment (Protection) Act, 1986
5	Case Law on Social Security Act
6	Case Law on Dock Safety Act, 1986
7	Case Law on Factories Act
8	Duties Of Safety Officer
9	List out the Key Elements in PCB Consent to Operate
10	Checklist for IS 14489
11	Preparation of audit requirement of ISO 45001
12	Preparation of audit requirement of ISO 14001
13	Case Study on ISO 45001
14	Case Study on ISO 14001

Evaluation Scheme:

EC No .	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%
4	Comprehensive Exam	180	55%
Total			100%

Date:



Indrashil University
Second Trimester, 2020-21
Course Syllabus

Course Code: EHS4202

Course Title: Fire Safety and Explosion Control

Credit Structure (L-T-P-C): 2-1-0-3

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Determine fire hazards and the physics and chemistry of the fire.
- Implement concept of Fire Prevention and Protection.
- Implement Fire Detection System and Accessories and Explosion Protecting Systems.
- Use Industrial Fire Protection Systems and Hydraulic system

Syllabus:

Unit-1

05 Hours

Physics of Fire: History of fire service - Basic physics - Units – Measurement system - Force, resultant force – Laws of force - Laws of motion - Mass and weight, work, power, energy
Law of conservation of energy - Mechanics – rest and motion - Distance and displacement
-Speed and velocity

Chemistry of Fire: Fire properties of solid, liquid and gases -fire spread -toxicity of products of combustion -theory of combustion and explosion –vapour clouds –flash fire –jet fires –pool fires –unconfined vapour cloud explosion, shock waves -auto-ignition –boiling liquid expanding vapour explosion.

Characteristics of Fire: Energy changes - Effects of heat on matter - Combustion - Temperature - Specific heat capacity - Catalyst – Neutralization – Sublimation - Heat of decomposing - Chemical reaction – Exothermic reaction and endothermic reaction - Transmission of heat - Flash and fire point - Ignition temperature - Flammables and combustible chemicals - Spontaneous combustion - Triangle of combustion - Tetrahedron fire - Spread of fire.

Unit- 2

05 Hours

Fire Prevention and Protection: Sources of ignition fire triangle – principles of fire extinguishing –active and passive fire protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers –fire stoppers – hydrant pipes –hoses –monitors –fire watchers –layout of stand pipes –fire station.

Unit-3

05 Hours

Fire Detection System and Accessories: Addressable & Non Addressable systems – Communication devices - Fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations –fire drills –first aid for burns. Hose, Types of hose and its Characteristics, Frictional loss, Material used, Causes and prevention of mildew, shock & rubber acid - Care and maintenance, Types of hose fittings, Couplings, Component parts of inter locking couplings, Suction coupling wrenches, Branches, nozzles and branch holders.

Unit-4

05 Hours

Industrial Fire Protection Systems

Sprinkler – hydrants – standpipes – special fire suppression systems like deluge and emulsifier, selection criteria of the above installations, reliability, maintenance, evaluation and standards – alarm and detection systems.

Other suppression systems –CO₂ system, foam system, Dry Chemical Powder (DCP) system, halon system –need for halon replacement –smoke venting. Portable extinguishers –flammable liquids –tank farms –indices of inflammability-fire fighting systems.

Unit - 5

05 Hours

Explosion Protecting Systems

Principles of explosion - detonation and blast waves - explosion parameters – Explosion Protection, Containment, Flame Arrestors, isolation, suppression, venting, explosion relief of large enclosure - explosion venting - inert gases, plant for generation of inert gas- rupture disc in process vessels and lines explosion, suppression system based on carbon dioxide (CO₂) and halons hazards in LPG, ammonia (NH₃), sulphur dioxide (SO₂), chlorine (Cl₂) etc.

Unit - 6

05 Hours

Hydraulic System

Pumps, primers, tenders and water relay, Introduction, definition, Different types of pumps, Different types of primers, Working principle of various pumps primers, Maintenance and troubleshooting, Testing of pumps, Advantages and disadvantages, Water relay system, Open circuit system, Closed circuit system.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. Derek, James, Fire Prevention Hand Book, Butter Worths and Company, London.
2. Gupta, R.S., Hand Book of Fire Technology, Orient Longman, Bombay.
3. Accident Prevention manual for industrial operations, N.S.C., Chicago.
4. Dinko Tuhtar, Fire and explosion protection.
5. Dr. K. U. Mistri, Fundamentals of Industrial Safety and Health, Loss prevention Association, India.
6. Accident Prevention Manual for Industrial Operations, Fire Prevention and fire fighting, Loss prevention Association, India.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 8)

SR. NO.	ASSIGNMENT
1	Preparation of a safety Inspection Check list for Fire Pump House.
2	Preparation of a safety Inspection Check list for Fire Hydrant system.
3	Preparation of a safety Inspection Check list for Fire Extinguisher.
4	Practical Demonstration of Fire extinguisher
5	Practical Demonstration of Fire Hydrant system.
6	Preparation of a safety Inspection Check list for Fire Detection system.
7	Development of a SOP for Pump Operation
8	Prepare Report for Mock drill.
9	List out the Fire Hazards at Petroleum Industry.
10	List out the Fire Hazards at Textile Industries

Evaluation Scheme:

EC No.	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%

4	Comprehensive Exam	Theory	180	30%
		Practical	120	25%
Total				100%

Date:



Indrashil University
Second Trimester, 2020-21
Course Syllabus

Course Code: EHS4203

Course Title: Industrial Hygiene and Occupational Health

Credit Structure (L-T-P-C): 2-0-2-3

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Maintain Hygiene and Health while working.
- Prevent exposure to dangers by practicing hygiene.
- Explain occupation health and hazards, and First Aid importance.
- Explain importance and use of PPE.

Syllabus:

Unit-1

06 Hours

Industrial Hygiene: Definition of Industrial Hygiene, Industrial Hygiene: Control Methods, Substitution, Changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures.

Introduction to chemical hazards, dangerous properties of chemical, dust, gases, fumes, mist, vapours, smoke and aerosols.

Route of entry to human system, recognition, evaluation and control of basic hazards, concepts of dose response relationship, bio-chemical action of toxic substances.

Personal Sampler. High Volume Sampler. Midget Impinger Tubes. Rota meter. Calibration of Rotameter.

Concept of threshold, limit values TLV-TWA/ PEL /OEL, STEL, IDLH, LC50, LD50 and air sampling strategies, personal exposure monitoring.

Unit- 2

06 Hours

Personal Protective Equipment: Need for personal protection equipment, selection, applicable standards, supply, use, care & maintenance respiratory and non-respiratory personal protective equipment. Non-respiratory personal protective devices: Head protection, Ear protection. Face and Eye protection. Hand protection, Foot protection, body protection. Respiratory personal protective devices.

Classification of hazards: Classification of respiratory personal protective devices. Selection of respiratory personal protective devices. Instructions and training in the use, maintenance and care of self-containing breathing apparatus. Training in the use of breathing apparatus (opens circuits and close unit). Testing Procedures and Standards.

Unit-3

06 Hours

Ventilation and Heat Stress: Purpose of ventilation. Physiology of heat regulation. Thermal environment and its measurement. Thermal comfort. Indices of heat stress. Thermal limits for comfort, efficiency and freedom from health risk. Natural ventilation. Mechanical ventilation. Air conditioning. Control of heat exposures at source, dilution and local ventilation. Recommended values for air changes required for various areas as per Factories Act, 1948 and National Standards.

Industrial Lighting & Illumination: Purpose of lighting. Benefits of good illumination. Phenomenon of lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended optimum standards of illumination. Stroboscopic Effect, Design of lighting installation. Maintenance. IS Standards relating to lighting and color.

Noise and Vibration: Noise and ill-effect of noise on human health- Auditory & non-auditory, Noise Induced Hearing Loss (NIHL). Measurement and evaluation of noise. Control of Noise Hazards- Noise absorption techniques, silencers. Permissible level of

exposure to noise in Industry. Ill effects of vibration, White Fingers (Reynolds's phenomenon), and control measures of vibration.

Unit-4

06 Hours

Occupational Health: Definition: As per WHO, Common Occupational Diseases, Occupations involving risk of contracting these disease - mode of causation of the diseases and its effects - diagnostic methods.

Biological monitoring - Method of prevention Compensation for occupational diseases. Evaluation of injuries Occupational Health Management Services at the work place. List of notifiable diseases Third Schedule of Factories Act, 1948. Occupational Health Surveillance-Pre employment, Periodical, Post employment Medical examination, Role of Factory Medical Officer / Certifying Surgeon. Occupational exposure & Risk based health surveillance

Occupational Health Hazards & Occupational Diseases: Adverse health effects of noise, vibration, cold, heat stress, improper illumination, thermal radiation, ionizing and non-ionizing radiations. Permissible threshold exposure limits - short term and long term effects of exposures - Preventive and control measures.

Common Occupational Diseases as per the Third Schedule of the Factories Act, 1948 Preventive and control measures.

Unit - 5

06 Hours

First Aid: Define First Aid, Purpose, Principles of First aid, First Aider-Role & Responsibilities and Qualities.

Fundamentals of First-Aid- for thermal burns & chemical burns, Fractures, Fainting, Shock, insects and animal bites, Suffocation, Toxic Ingestion - Bleeding Wounds and Bandaging, Artificial Respiratory, Cardiopulmonary Resuscitation (CPR), Techniques. Victim transportation, Rescue Techniques. First Aid Box and its contents.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. Model Code of Safety Regulation for Industrial Establishments , ILO
2. Encyclopedia of Occupational Health and Safety , ILO
3. Cotes J.E, Lung function assessment and application in Medicine, 3rd Edn. Blackwell Scientific Publications
4. S.F.Cleary (Ed.), Biological effects and health implications of microwave radiation. , US HEW Report BRH (DBE2-70), Rockville.
5. Dr. K. U. Mistri, Fundamentals of Industrial Safety and Health , SiddarthPrakashan
6. Factories Act & State Factories Rule
7. National Standards. IS:3103-1975-Code of practice for Industrial Ventilation, National Building Code Part VIII, Building Services.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 8) and LIST OF PRACTICALS (Minimum 10 experiments)

SR. NO.	ASSIGNMENT
1	Personal Protective Equipment (PPE)

2	Noise Level Measurement. (a) Measurement of Sound pressure level in dBA and dB linear. (b) Frequency analysis of noise.
3	Measurement of Ventilation: Measurement of thermal Dry Bulb Temperature Wet Bulb Temperature Determination of relative humidity and effective corrective effective. 1) Aspirator Hygrometer. 2) Kata-Thermometer 3) Globe-Thermometer
4	Lung Function Test Ear Testing on Audiometer
5	Explanation of charts on Industrial noise, notifiable diseases, physical health hazards, chemical health hazards, industrial dermatoses prevention and control
6	Transportation of Victim Rescue of Victim, Bandaging CPR
7	To find out the physical fitness of person by step test
8	Sampling and Estimation of Dust by Gravimetric Method.
9	Measurement of illumination level at working place with the help of digital Lux meter

EQUIPMENTS REQUIRED FOR PRACTICAL

- Rotameter
- Impinger Tube
- Personal Sampler
- Multi Gas Detector
- Gas Detector Tube with pump
- Lux meter
- Noise Decibel meter / Sound Level Meter
- Dry Bulb & Wet Bulb Thermometer
- Psychrometer
- Audiometer
- First Aid Box

Evaluation Scheme:

EC No.	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%
4	Comprehensive Exam	Theory	180
		Practical	120
Total			100%

Date:



Indrashil University

Third Trimester, 2020-21

Course Syllabus

Course Code: EHS42E21

Course Title: Chemical and Process Safety Management

Credit Structure (L-T-P-C): 2-1-0-3

Instructor in Charge:

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Identify the Hazards in Chemical processes.
- Implement safety in designing of chemical equipments.
- Recognize hazard in plant operation and chemical storage.

Syllabus:

Unit-1

05 Hours

Safety in Chemical Equipment Designing: Conceptual design and detail design, Risk Assessment, inherently safer design- chemical equipment, reaction hazard evaluation, assessment, reactor safety, operating conditions, unit operations and equipment, utilities.

Safety in Pressure Equipment Designing: Pressure system, pressure vessel design, standards and codes- pipe works and valves- heat exchangers- process machinery- over pressure protection, pressure relief devices and design, fire relief, vacuum and thermal relief, special situations, disposal- flare and vent systems- failures in pressure system. .

Unit- 2

05 Hours

Safety in Plant Commissioning: Commissioning phases and organization, pre-commissioning documents, process commissioning, commissioning problems, post commissioning documentation, and Stream line color coding.

Inspection and Risk Assessment

Plant inspection, pressure vessel, pressure piping system, non-destructive testing, pressure testing, leak testing and monitoring- plant monitoring, performance monitoring, condition, vibration, corrosion, acoustic emission-pipe line inspection.

Unit-3

05 Hours

Plant Operations: Operating protocols, operating procedure and inspection, emergency procedures- hand over and permit system - start up and shut down operation protocols, safety during taking samples, safety during blending materials, refinery units- operation of fired heaters, driers, storage - operating activities and hazards - trip systems - exposure of personnel.

Unit-4

05 Hours

Plant Maintenance, Modification and Emergency Planning: Management of maintenance, hazards- preparation for maintenance, isolation, purging, cleaning, confined spaces, permit system- maintenance equipment- hot works- tank cleaning, repair and demolition- online repairs- maintenance of protective devices- modification of plant, problems- controls of modifications.

Unit - 5

05 Hours

Safety in Storage: Material safety Data sheet understanding, General consideration, petroleum product storages, storage tanks and vessel- storages layout- segregation, separating distance, secondary containment- venting and relief, atmospheric vent, pressure, vacuum valves, flame arrestors, fire relief- fire prevention and protection- LPG storages, pressure storages, layout, instrumentation, vapourizer, refrigerated storages- LNG storages, hydrogen storages, toxic storages, chlorine storages, ammonia storages, other chemical storages- underground storages- loading and unloading facilities- drum and cylinder storage- ware house, storage hazard assessment of LPG and LNG.

Case Study: Bhopal gas Tragedy, Seveso disaster, Charnibel disaster, London Fog, etc.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. Dr. B.K. Bhaskara Rao, Er. R.K. Jain, and Vineet Kumar, Safety in Chemical Plants/Industry and Its Management, Khanna Publisher.
2. Risk Based Process Safety By Center for Chemical Process Safety (CCPS), American Institute of Chemical Engineers (AIChE) (ISBN: 978-0-470-16569-0), John Wiley & Sons Inc., Somerset, NJ (USA).
3. Accident Prevention Manual (Vol. 1 & 2) (ISBN: 978-08-7-912135), National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143.
4. Prevention of Major Industrial Accidents (ISBN: 92-2-107101-4), International Labour Office (ILO), Geneva (Switzerland).
5. Dan Petersen, Techniques of Safety Management (ISBN: 978-18-8-558139-, McGraw-Hill Book Co. Ltd., New York, N.Y. (USA).
6. Transport of Dangerous Goods – Recommendations of the Committee of Experts of Transportation of Dangerous Goods (ISBN: 978-92-1-139136-7), United Nations, New York, N.Y. (USA).
7. G. Weiss, Hazardous Chemical Data Book (ISBN: 081-551072-1), Noyes Data Corporation, Park Ridge, New Jersey, N.Y. (USA).
8. NIOSH Pocket Guide to Chemical Hazards By National Institute of Occupational Safety & Health (ISBN: 978-15-9-042586-2), U.S. Department of Health and Human Services, Washington, D.C. (USA).
9. Major Hazard Control: A Practical Manual by ILO (ISBN: 978-92-2-106432-9), International Labour Office, Geneva (Switzerland).
10. K.T. Kulkarni, Industrial Safety: Concepts and Practices, Pune Vidyarthi Griha Prakashan, 1786, Sadashiv Peth, Pune - 411 030.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 8)

SR. NO.	ASSIGNMENT
1	Sampling of liquefied flammable gas
2	Safe unloading of a flammable liquid tank-lorry
3	Explain the different types of pressure relief systems provided in your plant
4	Explain the fire-fighting systems provided in your plant
5	Statutory requirements for pressure vessels
6	Explosion and fire at chemical manufacturing plant
7	Safety features of LPG tank farm
8	Preparing a reactor for confined space entry for repair work
9	Development of a SOP for charging-discharging and storing hazardous chemicals
10	List out the Hazards at Chemical Industries

Evaluation Scheme:

EC No	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%
4	Comprehensive Exam	180	55%
Total			100%

Date:



Indrashil University
Third Trimester, 2020-21
Course Syllabus

Course Code:	EHS42E22
Course Title:	Safety in Textile and Pharmaceutical Industries
Credit Structure (L-T-P-C):	2-1-0-3
Instructor in Charge:	

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Identify the Hazards in Textile operation.
- Explain Fire & Explosion Hazards and Controls in Textile industry
- Identify hazard in pharmaceutical industries.
- Understand different type of hazard and hazard management in pharmaceutical industry.

Syllabus:

Unit-1

05 Hours

Need of Safety in Textile Industry

Types of Textile Industry

Statutory Provisions:

General, Health Provisions, Safety Provisions, Welfare Provisions, Cotton Ginning & Pressing Factories Act & Rules, Indian Standards

Flowcharts of Textile Processes: Composite Flowchart, Other Flowcharts, Short & long Staple, Viscose rayon, Synthetic fibre, Spun & Filament Yarn, Jute. .

Unit- 2

05 Hours

Hazards and Safety Precautions of Spinning Preparatory and Spinning Processes: Opening and Blow Room Machines, Carding Machines, Sliver and Ribbon Lap Machines, Combers and Drawing Frames, Roving (Speed) Frames, Ring (Spinning) Frames, Doubling Machines, Rotor Spinning

Hazards and Safety Precautions of Weaving Preparatory and Weaving Processes:

Winding Machines, Warping Machines, Sizing Machines, Looms

Hazards and Safety Precautions of Processing (Finishing) and Folding Machines:

General Precautions, Bleaching Process, Processing Machines (Dyeing, Printing etc.).

Unit-3

05 Hours

Fire & Explosion Hazards and Controls

Health Hazards and Controls: Cotton dust, Heat & Humidity, Noise and other Hazards, Health Hazards in Cotton Textile Industry, Health Hazards in Other Textile Industry

Effluent Treatment and Waste Disposal in Textile Industry.

Unit-4

05 Hours

Need of Safety in Pharmaceutical Industry

Statutory Provisions:

General, Health Provisions, Safety Provisions, Welfare Provisions, Factories Act & Rules, Indian Standards

Flowcharts of Pharmaceutical Industry.

Unit - 5

05 Hours

Air based hazards: Sources, Types of Hazards, Air circulation maintenance industry for sterile area and non-sterile area, Preliminary Hazard Analysis (PHA) Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system.

Chemical based hazards: Sources of chemical hazards, Hazards of Organic synthesis, sulphonating hazard, Organic solvent hazard, Control measures for chemical hazards Management of combustible gases, Toxic gases and Oxygen displacing gases management.

Fire and Explosion: Introduction, Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system mechanical and chemical explosion, multiphase reactions, transport effects and global rates. Preventive and protective management from fires and explosion electricity passivation, ventilation, and sprinkling, proofing, relief systems-relief valves, flares, scrubbers.

Unit - 6

05 Hours

Hazard and risk management:

Self-protective measures against workplace hazards. Critical training for risk management, Process of hazard management, ICH guidelines on risk assessment and Risk management methods & Tools Factory act & rules, fundamentals of accident prevention, elements of safety programme and safety management, Physicochemical measurements of effluents, BOD, COD, Determination of some contaminants, Effluent treatment procedure, Role of emergency services.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Text/Reference books

1. Y.K. Sing, Environmental Science, Publishers, Bangalore, New Age International Pvt.
2. "Quantitative Risk Assessment in Chemical Process Industries", American Institute of Chemical Industries, Centre for Chemical Process safety.
3. T.S.S. Dikshith, Hazardous Chemicals: Safety Management and Global Regulations, CRC press.
4. Marks & Robinson, Principles of Weaving.
5. Dr. K. U. Mistri, Fundamentals of Industrial Safety and Health, SiddarthPrakashan.
6. J. E. Booth, Principles of Textile Testing.
7. Vettriselvan R, JeyaSudhaT, Health and Safety for Textile Industry.

Assignments:

LIST OF ASSIGNMENTS (Attempt any 8)

SR. NO.	ASSIGNMENT
1	Preparation of a safety Inspection Check list for Textile Industry
2	Prepare Tool Box on Fire Hazard in Textile Industry
3	List out the Hazards at Pharmaceutical Industries
4	Preparation of Housekeeping Checklist
5	Preparation of a safety Inspection Check list for waste management in pharmaceutical industries.
6	Preparation of a safety Inspection Check list for waste management in Textile industries.
7	List out the Hazards at Textile Industries
8	List out of Legal requirement of Textile Industries
9	Prepare HIRA of Spinning Processes
10	Prepare HIRA of Weaving Processes

Evaluation Scheme:

EC No	Evaluation Component	Duration (Mins)	Weightage
1	Attendance	Continuous	5%
2	Assignment	Continuous	10%
3	Mid-sem exam	50	30%
4	Comprehensive Exam	180	55%
Total			100%

Date:



Indrashil University
Third Trimester, 2020-21
Course Syllabus

Course Code:	EHS4301
Course Title:	Project
Credit Structure (L-T-P-C):	0-0-20-10
Instructor in Charge:	

Objective

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

Learning Outcome of the Course:

After successful completion of the course, student will be able to

- Perform safety audit.
- Understand scope of safety engineer in the industry.
- Have practical experience of theory subjects.

The Project report should essentially consists of the following

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

IMPLEMENTATION STRATEGY

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

- a) **Project assessment – 50 marks** (To be reported under title term work – **TW**)
- b) **Oral based on Project work – 50 marks** (To be reported under title Oral– **OR**)

IMPORTANT NOTE

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

Refer General Guidelines given below.

GUIDELINES FOR PREPARING THE PROJECT REPORT

Project work is a basic requirement for the award of **POST GRADUATE DIPLOMA IN INDUSTRIAL ENVIRONMENT, HEALTH AND SAFETY**. Project shall be prepared based on any one of the subjects of the Programme. The project work should be comprehensive.

1. TITLE OF THE PROJECT WORK

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

2. CONTENTS

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

3. ACKNOWLEDGEMENT

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

4. PREFACE, OBJECTIVE AND METHODOLOGY

Preface should describe the choice of selected project work and its objective. The preface should be limited to one or two pages. It will be prudent to mention the objective and the methodology used for the project work, e.g., collecting data from various records available in the company, interviewing certain key employees, questionnaires, etc. Thereafter, briefly mention the scope of project work. The objective could be, for example, :

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

5. INTRODUCTION

Brief description of the Organization, the main raw materials used, its processes and the main features of manufacturing and other key operations, including the potential

hazards shall be the contents. It is recommended to limit the description to about 5 to 10 pages.

6. **SAFETY, HEALTH AND ENVIRONMENTAL ACTIVITIES IN THE COMPANY**

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

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

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

7. RECOMMENDATIONS

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

8. PROJECT REPORT FORMAT

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