COURSES OF STUDIES

FOR
ONE YEAR POST DIPLOMA IN INDUSTRIAL SAFETY (PDIS)

Challengers Academy of S.H.E

(Safety, Health & Environment)

Under

Skill Development & Technical Education Department

GOVERNMENT OF ODISHA

Course Conducted by S.C.T.E & V.T. Bhubaneswar

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PDIS : 2015-16


PDIS : 2016-17


PDIS : 2017-18


PDIS : 2018-19


PDIS : 2019-20


PDIS : 2021-22

POST DIPLOMA IN INDUSTRIAL SAFETY

Duration : 1 Year (Two Semesters)

Eligibility for Admission :

A recognized Degree in any branch of Engineering or Technology, preferably from in Institute under UGC recognized University securing a minimum aggregate of 55% of marks.

OR

A recognized Degree in Science having subjects Physics and Chemistry preferably from a Institute under UGC recognized University securing a minimum aggregate of 55% of marks.

OR

A recognized Diploma in any branch of Engineering or Technology recognized by SCTE & VT, Odisha securing a minimum aggregate of 55% of marks.

TEACHING & EVALUATION FOR FIRST SEMESTER OF THE POST DIPLOMA COURSE IN INDUSTRIAL SAFETY

Sl. No.	Subject Code	Subject of Study	Contact Periods/ Week			Examination Scheme						Full Marks
						Theory			Practical			
			Lecture	Tutorial	Practical	CT	End Exam	Total	Sessional	End Exam	Total Marks	
1.	PDIS-101	SAFETY MANAGEMENT	04	01	-	20	80	100	-	-	-	100
2.	PDIS-102	INDUSTRIAL SAFETY ENGINEERING-I	04	01	-	20	80	100	-	-	-	100
3.	PDIS-103	HAZARD IDENTIFICATION & RISK CONTROL	04	01	-	20	80	100	-	-	-	100
4.	PDIS-104	SAFETY IN CHEMICAL INDUSTRY	04	01	-	20	80	100	-	-	-	100
5.	PDIS-105	**ELECTIVE (ANY ONE)**	04	01	-	20	80	100	-	-	-	100
		E1 SAFETY IN ENGINEERING INDUSTRY										
		E2 APPLIED ERGONOMICS										
		E3 SAFETY IN MINING INDUSTRY										
6.	PDIS-106	PROJECT (ONE AND HALF MONTH)	-	-	14	-	-	-	150	100	250	250
		TOTAL	**20**	**05**	**14**	**100**	**400**	**500**	**150**	**100**	**250**	**750**

TEACHING & EVALUATION FOR SECOND SEMESTER OF THE POST DIPLOMA COURSE IN INDUSTRIAL SAFETY

Sl. No.	Subject Code	Subject of Study	Contact Periods/ Week			Examination Scheme						Full Marks
						Theory			Practical			
			Lecture	Tutorial	Practical	CT	End Exam	Total	Sessional	End Exam	Total Marks	
1.	PDIS-201	SAFETY & LAW	04	01	-	20	80	100	-	-	-	100
2.	PDIS-202	ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT	04	01	-	20	80	100	-	-	-	100
3.	PDIS-203	INDUSTRIAL HYGIENE & OCCUPATIONAL HEALTH	04	01	-	20	80	100	-	-	-	100
4.	PDIS-204	INDUSTRIAL SAFETY ENGINEERING-II	04	01	-	20	80	100	-	-	-	100
5.	PDIS-205	**ELECTIVE (ANY ONE)**	04	01	-	20	80	100	-	-	-	100
		E1 ADVANCED SAFETY MANAGEMENT										
		E2 SAFETY IN CONSTRUCTION INDUSTRY										
		E3 DOCK & PORT SAFETY										
		E4 BEHAVIOUR BASED SAFETY MANAGEMENT										
6.	PDIS-206	TECHNICAL SEMINAR (PPT PRESENTATION) & EVALUATION OF COMMUNICATION SKILL	-	-	02	-	-	-	50	-	50	50
6.	PDIS-207	I. INDUSTRIAL HYGIENCE & OCCUPATIONAL HEALTH LAB	-	-	06	-	-	-	50	50	100	100
		II. SAFETY AND ENVIRONMENT ENGINERING LAB.	-		06	-	-	-	50	50	100	100
		TOTAL	**20**	**05**	**14**	**100**	**400**	**500**	**150**	**100**	**250**	**750**

NOTE:

1. Effective teaching will be at least 15 weeks per semester

2. Each period will be of 55 minutes duration.

Minimum Passing Marks in Theory (External)	40%
Minimum Passing Marks in Theory (Internal)	50%
Minimum Passing Marks for Project	50%
Minimum Passing Marks for Individual Paper	50%
First Division 60% & above	
First Division with Honors 70% and above	

TA-Teaching Assessment
CT-Class Test

SAFETY MANAGEMENT

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 101	in First Semester	100	80	20

Chapter – 1 Management Practice:

History of Safety Movement in India, USA, UK; Need for Safety (Legal,human, economic & social considerations). General Principles of Management, Managerial role, Authority and span of Management, Delegation and decentralization of authority.

Chapter – 2 Safety Management Systems:

i. Planning

Definition, purpose, nature, scope, and procedure. Range of planning, variety of plans, strategic planning and process of implementation. Management by objectives and its role in Safety, Policy formulation, On-site Emergency Plan, Off-site Emergency Plan,Implementation of OHSAS 18001.

ii. Organizing for Safety

Definition, need, nature and principles. , Organization structure and safety department, Structure and functions of Safety Committee, Line and Staff functions for safety.

Chapter – 3 Accident Prevention

Role of management in Industrial safety management, principle and practices. Definition & concept of Incident, accident, injury, dangerous occurrence, unsafe act, unsafe condition, hazard. Theories & Principles of accident causation and its prevention. Cost of accident (to victim and family, organization, society); Compilation procedure, utility and limitations of cost data. Budgeting for safety, accident investigation, accident reporting, learning from accidents.

Chapter – 4 Management Information System for Safety

Source of Information on Safety, health and accidents, Compilation and collection of information. Analysis and use of modern methods of programming, storing and retrieval of MIS for safety, health and environment.

Chapter – 5 Behaviour Based Safety

i. Safety Education and Training

Element of training cycle, assessment of needs, Techniques of training, design and development of training programmes, Training methods and strategies. Types of training. Evaluation and review of training programmes. Infrastructure for training, developing training module with audio visual mode for SOP, SMP & induction training.

ii. Employee Participation in Safety

Purpose, areas of participation, Safety committee meeting, methods. Role of trade union in safety and health, Safety suggestion schemes. Safety competitions. Safety incentive schemes, Audio visual publicity. Other promotional methods like safety week celebration etc.

iii Organizational Behaviour and Safety

Human factors contributing to accidents, Individual difference, behavior as function of self and situation, perception of danger and acceptance of risks, knowledge, and responsibility vis-à-vis safety performance, theories of motivation and their application to safety, role of management, supervisors and safety department in motivation, correcting behavior –the challenge.

INDUSTRIAL SAFETY ENGINEERING – I

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 102	in First Semester	100	80	20

Chapter – 1 Safe Guarding of Machine.

Concept of substantial machine guarding, Statutory provision related to principles in machine guarding. Type of guard, their design and selection. Guarding of different type of machinery including special precautions for wood working, paper, rubber and printing machinery, machine, tools, guarding end pulleys of conveyors, coupling guards, V- belts & pulleys of moving machinery, front and rear guards of hydras etc. Built-in-safety devices, maintenance and repair of guards, incidental safety devices and tools.

Chapter – 2 Manual Material Handling & Storage of Materials.

Hazards in manual handling. Avoidance of excessive muscular effort. Kinetic methods of correct lifting and handling of material. Maximum load that may be carried. Lifting and carrying of object of different shapes, size and weight. Safe use of accessories for manual handling. Storage of materials.

Chapter – 3 Mechanical Handling of Materials.

Lifting machinery (Cranes, Elevators, Conveyors, Dumpers, Pay loaders, etc) – Safety aspects considered during design, construction, and testing of Lifting Machinery - training of operator on safe operation, signaling, inspection and maintenance of Lifting Machinery. Power trucks and tractors, safety features in design and Construction, safe operation, inspection and maintenance. Lifting tackles: Chain slings, Rope slings, (fiber and wire) rings, hooks, Shackles, Swivels, Eye-bolts – salient safety features. Calculation of Safe Working Load; testing of lifting tools and tackles with reference to relevant IS codes and provisions of Factories Act & Rules, work of competent persons.

Chapter – 4 Hand Tools & Portable Power Tools.

Main causes of tool accidents – Control of tool accidents – Centralized tool control – Purchase, storage and supply of tools – inspection, maintenance and repair of tools. Detectable causes of tools failure – need for tempering, safe ending and dressing of certain tools – handles of tools – safe use of various tools – types of hand tools used for metal cutting, wood cutting, miscellaneous cutting work – material handling and other hand tools such as Torsion Tools, Shock Tools, Non Sparking Tools – Portable power tools and their selection, inspection, maintenance and repair for safe use. Special precaution in selection and use of tools in high hazard installation like LPG & OIL installations, oxygen plants and explosive manufacturing factories etc.

Chapter – 5 Working at Height

What is height work? Hazards associated & remedial measures required to be taken in height work, Safety features associated with design & construction of stair ways, ramps, working platforms, gang ways, ladders of different types, scaffolds of different types including boatswains chair and Safety harness. Hazards associated with working on roofs & measures required. Other safety requirements while working at eight, Prevention of fall of persons at floor level – Potential tripping / slipping hazards, working on fragile roofs with reference to Rule 62-A of OFR 1950, screening of workers & work permit system for height work, precautions for working at height with special reference to construction of high rise building, chimney, painting of high rise structures, PPE and use of fall arrester and Safety net for height work.

HAZARD IDENTIFICATION & RISK CONTROL

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 103	in First Semester	100	80	20

Chapter–1 Plant & Equipment Safety and Appraisal & Control Techniques

Objective, Plant Safety observation, Plant Safety Inspection. Safety Sampling. Safety Survey. Job Safety Analysis. Safety Inventory System. Product Safety. Permit to Work system. Safety Tag system. Loss Control, Damage Control, System Safety. Interpretation of flow diagram and P & I drawing.

Chapter – 2 Hazard Identification Techniques

Hazard Analysis: Inductive, deductive. FMEA & CMA. Fault Tree Analysis. Examples of each. Risk Analysis Techniques: HAZOP, HAZAN, Safety Audit, Safety Report, Evaluating risks in chemical process. Concept of reaction vessels in fertilizer plants, pesticide industry, and other complex process plants.

Chapter – 3 Accident Reporting, Investigation and Analysis

Purpose. Identifying the key factors and causes, root causes and contributing causes. Writing reports and report forms. Corrective action. Standard classification of factors associated with accident. Method of collecting and tabulating data. Recording and investigating near miss, first aid and reportable accidents. Importance of accident statistics.

Chapter – 4 Measurement and Control of Performance

Lost time accident. Disabling injury. Accidents reportable under the Factories Act and E.S.I. Act. Frequency rate. Severity rate. Incidence rate per 1000 workers and man-days lost. Temporary and Permanent

disablement. Partial and Total disablement. Time charges scheduled in Workmen's Compensation Act and the Indian Standard. Study of appraisal report of the Department of Labour, Government of West Bengal.

Chapter – 5 Major Accident Hazard Control

i. Major Accident Hazards:

Introduction, type and consequence of major accident hazards. Role of management, local authorities and public, Role of Safety Officer.

ii. On-Site and Off-Site Emergency Planning:

Definition, scope and objectives. Statutory back ground, Identification and assessment of hazards. Risk Analysis. Implementation of control procedures and systems. Emergency preparedness, Emergency Control Room, rehearsal and exercises, mock drills. Check list for inspecting MAH factories dealing with chlorine, ammonia, LPG/ propane gas, Coke oven gas, mixed gas, BF Gas, Oil installations; basic concept for preparation of On-Site Emergency Plan and Off-Site Emergency Plan and their approval, Importance of training and sensitization for emergency management.

SAFETY IN CHEMICAL INDUSTRY

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 104	in First Semester	100	80	20

Chapter – 1 Introduction

Different types of hazards in chemical industries and their precautions - UN and other classification for Chemicals – Use of Material Safety Data Sheet – safety in receiving, storing, handling and transportation of chemicals – Compatibility and Considerations –– Fulfillment of Statutory requirements for transporting Hazardous / Toxic / Flammable / Explosives by all modes - Safety in Chemical Industry :- Batch Process and Continuous process - Criteria for the plants to be under MAH category.Chemical hazards: toxic chemicals, dust, gases, fumes, mists, vapour & smokes – exposure, evaluation.

Chapter – 2 Storage &Transportation of Chemicals

i. Bulk/Isolated Storages

General consideration – types of storages - atmospheric and pressurized storage vessels – double and single integrated vessels – layout of storages of LPG, Chlorines, Ammonia, reaction vessels etc. - specific reference to bunds, flooring, catch pit, alarms, safety valves etc. - safe entry procedures to confined spaces – Inspection techniques of isolated storages (checklist method)

ii. Pipeline Safety

Transfer of chemicals by pipelines – different components and safety devices of pipelines – Pipeline and Instrumentation (P&I) diagram – colour coding – Identification of contents – precautions in breaking pipelines (probable causes of pipeline failure) – integrating of pipelines (pipeline integrity) – maintenance of pipelines - preparation of maintenance schedule - safe operations, precaution during

transport of hazardous substances with special reference to transport of LPG bullets, compressed gas cylinders, chlorine tonners, Ammonia tankers etc.

Chapter – 3 Planning for Safe Plant Operations

Start up and shut down procedures - work permit application –vapour cloud formation hazards and combating such chemical spillage control procedures. Runway reactions - its control, precaution and prevention. Introduction to specific safety measures in certain Chemical Plants using chemicals, resulting in health disorders which are notified like Fertilizer, Insecticide, Pesticides – Chloro-alkali Explosives. Polymer plants, Toxic releases in them and their engineering controls.

Chapter – 4 Inspection & Risk Assessment

Concept of inspection of risk assessment, DOW index - Risk analysis – Dispersion modeling – Probability Criteria (HAZOP, HAZAN). Inspection techniques for chemical process plants, Reaction vessels, Distillation Towers, etc. Checklist for routine inspections - Checklist for specific maintenance and breakdown activities - Checklist for inspection of loading / unloading bay - Checklist Inspections of Compressor, Pumps etc. Assessing reliability of vessels - test checks. Corrosion location - causes – preventive inspection. Crushing Coring – locations and causes – prevention and inspection.

Chapter – 5 Disaster Management Plan

Assessment of DOW index - Risk analysis – Dispersion modeling – Probability Criteria (HAZOP, HAZAN). Case studies of some major accidents, viz. Fluxborough disaster, Seveso disaster, Bhopal Gas tragedy etc.

SAFETY IN ENGINEERING INDUSTRY (ELECTIVE)

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 105(E1)	in First Semester	100	80	20

Chapter – 1 Hot Working Process

i. Hot Work

Basic concept of hot work with examples ,Foundry Operation : Flow sheet for foundry operation including use of different types of furnaces. Health hazards and safe methods of operation in Die casting. Fettling operations, Shot blasting, sand blasting etc. Forging Operation : Hazards in forging operation, Preventive maintenance of forging machines. Safe work practices in forging operations. Safety in use, handling and storage of dies. Safety on die changing. Hot Rolling Mills Operation : Hazards in hot rolling operations and their control measures, safety in hot rolling mills, Selection and use of PPE for hot work

ii. Furnaces: Hazards associated with DRI Kilns and their remedial measures, concept of safety accretion cutting, DSC cleaning etc, Induction Furnaces, Laddel Refining Furnaces, Electric Arc Furnaces, Submerged Arc Furnaces, Blast Furnaces, Basic Oxygen Furnaces etc. SOP/SMP, use of PPE & effective supervision in hot work.

Chapter – 2 Cold Working Process.

Safety in the use of 1) power press (all types), 2) shearing, 3) bending, 4) rolling, drawing, 6) turning, 7) drilling, 8) boring, 9) milling / shaping, 10) planning / broaching, 11) Grinding, 12) Computerized Numerically Controlled Systems. Need for selection and care of cutting tools. Preventive maintenance, periodic checks for safe operation. Associated hazards and their prevention. Safety in use of the machine tools.

Chapter – 3 Other Operations

Safety precautions in 1) Welding, 2) Cutting, 3) Brazing, 4) Soldering, 5) Metalising, 6) Chiseling, and 7) Blasting Operations. Safety in selection, use and maintenance of the associated equipment and instruments. Safety in finishing operation like a) cleaning, b) polishing and c) buffing and their related hazards. Safety during maintenance and use of these machines.

Chapter – 4 Heat Treatment

Concept of heat treatment, safety during stress reliving activities in power plants and steam pipe lines, Hazards in various heat treatment operations. Assessment, Control and Preventive measures. Selection & use of PPEs.

Chapter – 5 Safety in Power Generating Industry

Introduction –basic concept of power generation, concept of LP, MP & High Pressure boilers, description of the processes with their flow charts – safety aspects of mechanical and electrical equipment viz. boiler, turbine, pump, compressor, motor, transformer – safety manuals, safety during erection and commissioning and operation of power stations.

PROJECT

Subject Code	Course offered	Full Marks	End Exam	Sessional
PDIS 206	in First Semester	250	150	100

TOPICS OF PROJECTS (ANY ONE)

1. Safety Audit
2. HAZOP study
3. Preparation of Emergency Plan
4. Design of Management Information System
5. Assement of Fire & Explosion Potentials & their Prevention
6. In plant Safety Inspection
7. Preparation of Safety Report
8. Any other topics as per the Syllabus and approval of the Faculty

SAFETY AND LAW

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 201	in Second Semester	100	80	20

Chapter – 1 Safety

The Factories Act, 1948 (Amended) and Rules-Provisions under the Act and Rules made there-under with Amendments Case Laws under the Factories Act. - The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act.

- The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Rules.

Chapter – 2 Social Security Legislation

- Workmen's Compensation Act and Rules.
- ESI Act and Rules.
- Contract Labour (Abolition and Regulation) Act.
- Public Liability Insurance Act.
- Social Accountability SA-8000.
- The Building and other Construction Worker's Welfare Cess Act and Cess Rules.

Chapter – 3 Safety, Health and Environment (SHE) related Important Legislation

Salient Feature:

- Sections pertaining to Safety Health & Environment aspects.
- Boilers Act, 1923 and Indian Boiler Regulation 1950. Indian Electricity Act, 2000 and Rules, Indian Explosives Act, 1984 and Rule. Petroleum Act and Rules. Gas Cylinder Rules. Calcium Carbide Rules. The Insecticides act and Rules

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

Chapter – 4 Environmental Protection Legislations

- Water (Prevention & Control of Pollution) Act. 1974 and Rules, Air (Prevention & Control of Pollution) Act. 1981 and 1982 and Rules. Motor Vehicles Act. 1988 as amended in 2000. The Central Motor Vehicles Rules, 1989 as amended in 2000. Transport of Hazardous Goods Rules.
- Environmental Protection Act, 1986 and Rules. Noise Pollution Act, 1998. Bio-Medical Waste, Hazardous Waste Management Rules.
- Chemical accidents (Emergency Planning Preparedness and Response) amendment Rules, 1996.
- Manufacture storage and import of hazardous chemical Rules 1989.

Chapter – 5 ILO Convention &Recommendations

Role of ILO. Relevant ILO convention and recommendations related to Safety health & welfare issues which are binding on India.

ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 202	in Second Semester	100	80	20

Chapter – 1 Introduction

Basics of ecology, ecosystem, environment, pollutant.

Chapter – 2 Types of Pollution

Types & sources of pollution

i. Water Pollution

Definition and sources of Water Pollution, Type of water pollutants, Causes of water pollution and its effects on eco-system, Monitoring and analysis of water pollution. Control Measures

ii. Air Pollution

Definition of Air pollution, Types of air pollutants, cause of air pollution and its effects on eco-system and human health, Basics of air pollution control equipment like ESP, Bag Filter, Cyclone, Scrubbers and dust suppression system, Monitoring and analysis of air pollution and control measures.

iii. Noise Pollution

Definition, Sources & types of noise pollution, Effect on human being, Noise monitoring, analysis and remedial measures, noise induced deafness

iv. Land Pollution

Definition, causes of land pollution, types of solid wastes, methods of collection, storage, discharge, treatment and disposal of municipal solid waste, concept of hygienic landfill site creation.

Chapter – 3 Legislations

Preliminary knowledge of the following Acts and Rules made there under-The Water Act - 1974, Air Act- 1981, Environment Protection Act-1986,The Manufacture , Storage & Import of Hazardous Chemical

(Amendment) Rules , The Hazardous Wastes (Management and Handling) Amendment Rule ,The Bio-Medical Waste (Management and Handling) Amendment Rules, The Noise Pollution (Regulation and Control) (Amendment) Rule, Municipal Solid Wastes (Management and Handling) Rules, The Battery Management & Handling Rules.

Chapter – 4 Disaster Management

Definition of disaster – Natural, Manmade and technological disaster. Types of disaster management. How disaster occurs, Destructive power, Causes and Hazards, Case study of Tsunami Disaster and Bhopal tragedy, National policy- Its objective and main features, National Environment Policy, Need for central Govt. intervention, State Disaster Management Authority.

Chapter -5 Disaster Management Frame Work

Duties and powers, Case studies of various disasters in the country, Meaning and benefit of vulnerability reduction, factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication. Formulation of On-Site Emergency Plan & Off-Site Emergency Plan, its approval/ acceptance by competent authority, Infrastructure for disaster management, Emergency Response Centre, Hazchem vehicles, Disctrict Cris Group & State Crisis Group functioning, mock drills(On- Site & Off- Site), training programmes for sensitizing community & first responders of state.

INDUSTRIAL HYGIENE & OCCUPATIONAL HEALTH

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 203	in Second Semester	100	80	20

Chapter - 1 Industrial Hygiene

Chemical Hazards: Introduction to Chemical hazards, dangerous properties of Chemicals, dust, gases, fumes, mist, vapours, smoke and aerosols. Route of entry to human system, recognition, evaluation and control of basic hazards, degree of hazards, concept of dose-response relationship, bio-chemical action of toxic substance, concept of threshold limit values, air sampling strategies, personal exposure monitoring, workenvironment monitoring, biological sampling and analysis. Industrial Hygiene Control Methods: Substitution, Changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures.

Chapter - 2 Personal Protective Equipment:

Need for personal protection equipment, selection, applicable standards, supply, use, care and maintenance of respiratory and non-respiratory personal protective equipment.

a) Non-respiratory personal protective devices: Head, Ear, Face, Eye, Hand, Foot and Body protection.

b) Respiratory personal protective devices: Classification of hazards. Classification of respiratory personal protective devices. Selection of respirators. Instruction and hints in use of breathing apparatus. Training for correct use of breathing apparatus.

Chapter - 3 Occupational Health

a) Common occupational diseases – occupation involving risk of contraction of these diseases –mode of causation of the diseases and their effects- Diagnostic methods – Biological monitoring –

methods of prevention – compensation for occupational diseases- Evaluation of injuries – occupational Health services at the place of employment.

b) Occupational physical Health Hazards- Adverse health effects of noise, vibration, improper illumination, thermal radiation, X-ray, ultra-violet radiation, lionizing and non- ionizing radiations. Permissible industrial exposure limits – short term and long term effects of exposurepreventive and control measures, Supervision of working environment, health education & Counseling - various aspect of the working environment such as temperature, lighting, ventilation, humidity, noise, cubic space, air pollution and sanitation.

c) Occupational dermatitis, occupational cancer, medical surveillance for control of occupational diseases – health records. Fundamentals of first- aid, burns, fractures suffocation, toxic ingestion- bleeding wounds – artificial respiratory techniques.

Chapter - 4 Work physiology

Physiology of respiration, cardiac cycle, muscle contraction, nerve conduction system etc. Anthropometry & fundamentals of bio-mechanics, assessment of workload based on human physiological reaction – energy cost of work, assessment of work capacity, physical fitness, physiological fatigue and reset allowance, physiological test for assessment of occupational health, nutritional values of diets for exercise and work. Nutrition and physical fitness relationship. Environmental physiology.

Chapter – 5 Ergonomics

Introduction to Ergonomics, Constituents of Ergonomics. Application of Ergonomics in industry for Safety & Health- Environment Ergonomics, Ergonomics of Automation / Assembly, Visual Fatigue, Ergonomics of Rehabilitation while assigning alternate jobs.

INDUSTRIAL SAFETY ENGINEERING – II

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 204	in Second Semester	100	80	20

Chapter – 1 Plant Design and Housekeeping

Plant Layout and design. Study of engineering drawing, Need for planning and follow-up. Safety and good housekeeping. Typical accidents due to poor housekeeping. 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. Housekeeping contests. Cleaning methods. Employee assignment, Inspections and check-lists. enefits of good housekeeping.

Chapter – 2 Light, Heat & Ventilation

Purpose of lighting. Design of lighting installation. Maintenance, Standards relating to lighting Sources and types of artificial lighting. Principles of good illumination, Benefits of good illumination. Recommended optimum standards of illumination. Physiology of heat regulation. Thermal environment and its measurement, Thermal comfort. Indices of heat stress. Control of heat exposures, control at source, insulation, Thermal limits for comfort, efficiency and freedom from health risk. Purpose of ventilation. Natural ventilation. Mechanical ventilation. Air conditioning. Process ventilation, local exhaust ventilation.

Chapter – 3 Electrical Hazards

Hazards of electrical energy. Safe limits of amperages, voltages. Safe distance from lines, Capacity and protection of conductors. Joints and connections. Means of cutting protection. Earth fault protection. Earth insulation and continuity tests. Earthing standards. Protection against surges and voltage fluctuation. Hazards arising out of 'borrowed' neutrals.

Other precaution, Types of protection for electrical equipment in hazardous atmosphere. Criteria in their selection, installation, maintenance and use. Control of hazards due to static electricity.

Chapter – 4 Noise and Vibration

Continuous and impact noise. Effect of noise on man. Measurement and evolution of noise, Noise isolation. Noise absorption techniques. Silencers. Practical aspects of control of noise, Case studies on impact of noise from compressors, generators and other sources. Vibration : Effects, measurement and control measures such as vibration damping.

Chapter – 5 Fire Safety

Chemistry of fire & fire triangle. Classification of fires. Common causes of Industrial fires. Determination of fire load. Fire resistant building materials. Design of building, plant, exits, etc. for fire safety. Prevention of fire. Portable fire extinguishers. Water systems, Carbon-dioxide systems. Foam extinguisher system. Dry chemical extinguisher system, Industrial fire detection and alarms. Sprinkler systems. Special precautionary measures for control of fire and explosion in course of handling & processing of flammable liquids, gases, vapors, mists and dusts etc. BLEVE (Boiling liquid expanding vapour explosion), Confined and unconfined vapour cloud explosion, Fire emergency action plan.

SAFETY IN CONSTRUCTION INDUSTRY (ELECTIVE)

Subject Code	Course offered	Full Marks	End Exam	CT
PDIS 205(E2)	in Second Semester	100	80	20

Chapter – 1 Meaning and Scope of Safety in Construction

- Basic philosophy peculiarities and parameters governing safety in construction such as site planning and layout, safe access, good housekeeping.
- Safety in use of construction machinery.
- Seismic structural soundness, structural safety, accident and hazards, their causes and effects.

Chapter – 2 Safety in Construction Operations

a) Underground Works: Excavation, drilling and blasting prematic, trenching, shorting porklain type of shorting, strutting, tunneling, piling and safety in using and operating machinery and equipment relating to the above works. Foundations: Plant & Machinery and Structure.

b) Above Ground Works: Scaffolding, shuttering / form work, ladders, concrete, cofferdams and special operation connected with irrigation work. Safety in use and operation of related machinery and equipments. Safety while working on fragile roof. Working at Heights.

c) 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 operations.

d) Movements of Construction Machinery: Heavy /Long Items, Earth Movers equipments Railway wagons, motor trucks. Materials Vehicles etc. Hazardous Materials, Material handling equipments.

e) Special Works: High rise buildings, bridges and tunnels, roads, railways, asphalting, pneumatic caissons, electrical installations.

f) Safety for Protection of work Site including prevention of collapsing of the structure.

g) Safety in use of explosives: Open cast machinery quarrying.

h) Project Management and Construction in Safety: Introduction, Manpower utilization, utilization of material, equipment and tools. Temporary installation and structures.

Chapter – 3 Safety in Stacking, Storage and Transport of Construction Materials

- Reinforcements
- Cement
- Sand
- Aggregates
- Chemicals
- Organic binders
- Gas Cylinders
- Others

Chapter – 4 Safety in use of construction machinery & equipment

Hazards involved and safety precautions to be taken for:

- Batching plant
- Mixers
- Earth Moving equipment
- Cranes
- Pile driving equipment
- Excavators
- Drilling equipment
- Welding equipment
- Gas cutting equipment
- Grinding equipment
- Derricks
- Compressors
- Crushers
- Layers

Chapter – 5 Special construction operations (Special Operations)

- Transmission Towers
- Railways
- Power Plants
- Transformer Installations

TECHNICAL SEMINAR

Subject Code	Course offered	Full Marks	Sessional
PDIS 106	in Second Semester	50	50

1. Power Point (PPT) Presentation before faculty & experts.

2. Group Discussion before faculty & experts

3. Evaluation of Communication Skill

a. The students should demonstrate effective verbal communication in one to one and group situation.

b. Present written information in different formats as prescribed.

c. Outline/ acquire the skills needed to effectively organize, conduct & control both formal & informal meeting.

INDUSTRIAL HYGIENE & OCCUPATIONAL HEALTH LAB

Subject Code	Course offered	Full Marks	Sessional	End Exam
PDIS 107(i)	in Second Semester	100	50	50

1. Lung function test on medsprior.
2. Ear testing by audio meter & demonstration of various models of audio meter.
3. Study of notified diseases by use of models.
4. Study of various models of lungs (section of lungs)
5. Demonstration of Personal Protective Equipment such as Nose Mask, various types of Safety goggles etc.
6. Explanation on the charts of industrial Noise, Notifiable diseases, Physical health hazards, chemical health hazards, industrial dermatitis, prevention & control.
7. Explanation of charts on control of noise in industry, noise levels in some industry and permissible levels of exposure to noise in industry.

SAFETY & ENVIRONMENT ENGINEERING LAB

Subject Code	Course offered	Full Marks	Sessional	End Exam
PDIS 107(ii)	in Second Semester	100	50	50

1. Learn Water Analysis & its interpretation.
2. Demonstration & Calibration of Air Sampling equipment.
3. Sampling & estimation of gases in (High volume sampler & personal sampler) work environment monitoring by colorimetric methods for:
    a. NOx
    b. SOx
    c. NH3
    d. Cl2
4. Sampling & Estimation of Dust Gravimetric method.
5. Personal Protective Equipments.
    a) Respiratory & Non respiratory (Demonstration & use)
    b) Fall arrestor & Full body harness (Demonstration & use)
    c) For Hot Work
    d) For toxic work environment
    e) For High noise work environment.
6. Noise Level Measurements
    a) Measurements of sound level.
    b) Frequency analysis of noise. (Sound level meter)
7. Measurement of illumination in work environment by photo meter.

REFERENCE BOOKS

1	Douglas McGregor	The human side of enterprise Mc Grow Hill
2	H.W.Henrich	Industrial Accident Prevention Engineering Mc Graw Hill
3	Willi Hammer	Occupational Safety Management &Engineering Prentice Hall
4	Simonds & Gribaldi	Safety Management Richard D.Irwin
5	Handley	Industrial Safety Handbook Mc Graw Hill
6	Frank Bird	Management Guide to loss Control International Institute of Loss Control
7	Will Hammer	Handbook of System & Product Safety Prentice Hall.
8	National Safety Council, Chicago.	Accident Prevention Manual for Industrial Operation, Vol-I & II.
9	Singleton.	Introduction to ergonomics World Health Organization.
10	ACGIH	Industrial Noise Control Manual.
11	Hopkinson.	Lighting. HMSO London.
12	HMSO	Principles of Exhaust Ventilation.
13	ACGIH	Industrial Ventilation- Manual of Recommended Practices.
14	D.Hunter.	Diseases of occupation English University Press.
15	SAX IRWIN.	Dangerous Properties of Industrial Materials Van Nostrand Reinbold.
16	Schilling.	Occupational Health Practice Butter Worth.
17	ACGIH, USA.	Encyclopedia of Industrial Hygiene Instrument.
18	Redgrave.	Heal & Safety in factories Butterworth.
19	Srivastava K.D.	Commentaries of Factories Act Eastern Book Company.
20	Illuminating Engineering Society of North America.	IES Lighting Handbook: Reference Vol-I & II.
21	Frank P.Lees.	Loss Prevention in Process Industries Vol-I & II Butterworths.
22	National Fire Protection Association USA.	Industrial Fire Hazards Handbook.
23	I.L.O. Geneva.	Encyclopedia of Occupational Health & Safety.
24	Barbara A Plog.	Fundamentals of Industrial Hygiene National Safety Council, Chicago.
25	Dan Peterson.	Industrial Safety Management.
26		Industrial Safety Manual, Chicago.
27	Dr. K.U.Mistry, 2012 Edition	Fundamental of Industrial Safety & Health.

NOTE:

Revision of curriculum does not create any new need for running the course. Existing Staff, space and other resources- Building, Lab equipments, books, staff etc. as mentioned here are already existing with the institute, so as additional facility wanted for running the course.


PDIS : 2015-16


PDIS : 2016-17


PDIS : 2017-18


PDIS : 2018-19


PDIS : 2019-20


PDIS : 2021-22

OUT OF THIS NETTLE, DANGER, WE PLUCK THIS FLOWER, SAFETY.

William Shakespeare

SAFETY IS A CHEAP AND EFFECTIVE INSURANCE POLICY.

The Challengers