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ADVANCED DIPLOMA IN INDUSTRIAL SAFETY & ENVIRONMENTAL

GURUKUL

EDUCATIONAL AND RESEARCH INSTITUTE, HARIDWAR

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Subject and Syllabus

ADVANCED DIPLOMA IN INDUSTRIAL SAFETY & ENVIRONMENTAL

DURATION:- 1 YEAR

338 ENVIRONMENT AND SAFETY PHILOSOPHY

Ethics of environmental conservation: Need for conservation and concept of sustainable development. Environmental Policy and Laws: Environmental policy issues and Planning – Corporate Environmental Policies – Provisions of Environment (Protection) Act 1986 and Rules, Factories Act and Rules, Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and control of pollution) act 1981, Public Liability Insurance Act 1991 – Coastal Regulation Zone (CRZ) Notification.

Environmental impact assessment (EIA): Process and methodologies, administrative procedure for environmental clerances.

Environmental economics: Rules of taxation, cess, water charges, biodiversity damage assessment and price evaluation

Safety Philosophy: Physical, Physiological and Psychological Factors of Safety. Safety Education and Training. Employees Participation in Safety. Economics of Safety. Behavioral Safety culture and motivation. Safety Laws: Provisions of Factories Act and Rules, Employees State Insurance Act.

Planning for safety: Strategic planning and tools of implementation. Management by objectives and its role in safety, health and environment (SHE). Policy formulation and implementation.

Organizing for safety: Organization structure, functions and responsibilities. Coordination of three components of SHE. Line and staff functions for safety, health and environment.

Directing for safety: Leadership, role, functions and attributes of a leader. Communication: purpose, process, types and channels. Essential rule in communication. Two ways communication. Barriers in communication. Essentials of effective communication. Communication and group dynamics. Team building.

Principles of Accident Prevention. Incident accident, injury, dangerous occurences, unsafe acts, unsafe conditions, hazards, errors, oversight, mistakes. Measurement of safety performance

Key elements of Safety Management system (ISO 14001, OHSAS 18001 etc.). ILO Legislations – Convention and Recommendation concerning Safety, Health and Environment –Safety, Health and Environment as Human Right Issue.

APPRAISAL, ANALYSIS, INSPECTION AND CONTROL PROCEDURES

Plant and equipment safety appraisal and control techniques: Objectives. Plant safety observation. Plant safety inspections. Safety sampling. Safety surveys. Job safety analysis. Safety inventory system. Product safety. Permit to work systems. Safety tag systems. Loss control. Damage control and system safety.

Laws and Regulation: Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000,Chemical Accidents (Emergency Preparedness, Planning and Response) Rules 1986,Hazardous Waste (Management, Handling and Trans boundary Movement) Rules 2008.

Hazards and Risks: Hazard identification techniques: Hazard analysis: Inductive, deductive, FMEA and CMA. Fault tree analysis. Understanding of Hazards and Risks. Risk Assessment Techniques. Accident Investigation Reporting and Analysis Techniques – Measurement and Control of Performances. Hazard analysis techniques and measurements.

Major Accident Hazard Control: Conception of Major Accident Hazard. Evaluation of major hazards. Types and consequences of major accident hazards. Role of management, local authorities and public. Onsite and Offsite Emergency Planning – Case Studies. Implementation of control procedures and systems

Importance of Disaster Management: Concept – Emergency preparedness at local level – Contingency Plans – Emergency planning and preparedness in international standards like ISO 14001, OHSA's 18001 and OSHA's Process Safety Management System.

339 SAFETY ENGINEERING – I

Safe guarding of machines: Statutory provision related to principles in machine guarding. Types 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 repair of guards, incidental safety devices and tools. Safety in Workplace – Plant / Work area Design

Manual handling and storage of materials: Hazards in manual handling. Avoidance of excessive muscular effort. Kinetic methods of correct lifting and handling of materials. Maximum loads that may be carried. Lifting and carrying of object of different shapes, sizes and weights. Safe use of accessories for manual handling. Storage of materials.

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, fibre and wire rings, hooks, shackles, swivels, eye bolts. Salient safety features. Calculation of safe working load.

Hand tools and 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.

Electrical hazards: Dangers from electricity. Safety limits of amperages. Voltages. Safe distance from lines. Capacity and protection of conductors. Joints and connection. Means of cutting off power. Overload and short circuit protection. Earth fault protection.

Earth, insulation and continuity tests. Protection against overvoltage hazards arising out of “borrowed” neutrals. Precautions. Portable electrical apparatus. Flame proof. Electrical equipment: precautions in their selection, installation, maintenance and use. Control of hazards to static electricity. Role of electricians in controlling electrical accidents. Relevant provisions of the Indian Electricity Act and Rules.

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

Safety of pressure vessels. Fired and unfired. Statutory provisions. Testing requirements. Different kinds of testing. Design and construction aspects of safety. Safety in boilers, safety precautions and operation of boilers.

Ventilation and heat control. Purpose of ventilation. Thermal environment and its measurements. Physiology of heat regulation. Thermal comfort. Indices of heat stress. Thermal limits for comfort. Efficiency and freedom from health risk. Natural ventilation. Mechanical ventilation. Air conditioning.

Process ventilation. Control of heat exposures. Control at source. Insulation. Local exhaust ventilation. Control of radiant heat. Dilution ventilation. Local relief.

Housekeeping – Concept of 5S and its significance. Management responsibility. Safety engineers' stake in good housekeeping. Need for proper planning and follow up. Need for overall cooperation. Typical accidents due to poor housekeeping. Typical items of unsafe housekeeping. Disposal of scrap and other trade wastes. Prevention of spillage. Marking of gangways and other locations. Use of colaor as an aid for good housekeeping. Clean up campaigns. Cleaning methods. Employee assignments. Inspection and inspection checklist. Results of good housekeeping.

Special Precautions – Working at Height – Working in Confined Spaces – Work Permits for Working at Height and Working in Confined Spaces.

Laws and Regulations – Relevant Provisions of Factories Act and Rules, Indian Electricity Act and Rules, Explosive Act and Rules, Gas Cylinders Rules.

340 POLLUTION SOURCES AND MEASUREMENTS

Pollutants – Air pollutants – Measurement of air pollutants

Water and soil pollutants – Pathogens. Solid wastes.

Environmental toxicology

Noise Pollution Measurements – Community Noise Sources and Industrial Noise Sources – Noise Pollution Measurements.

Measurement of water/soil pollutants – Physical, Chemical and Biological Determinations.

SAFETY ENGINEERING, FIRE LABORATORY AND FIRST AID PRACTICAL

Measurement of illumination level, assessment of heat stress in work environment, measurement of the number of air changes, measurement of sound levels, determination of concentration of inflammable vapors, determination of fire load, types and uses of different types of fire canisters, fire hose and fire truck, measurement of vibrations of machines and equipment, continuity test for electrical circuits, earthing continuity test, measurement of insulation resistance.

First Aid: In Consultation with St. John Ambulance.

SAFETY ENGINEERING – II

Safety in Construction Industry: Meaning and scope of safety in construction. Safety in Construction and Demolition Operation: underground works, above ground works, underwater portions, movements of construction machinery, special works, safety in use of explosives. Safety in stacking, storage and transport of construction materials: reinforcements, cement, sand, aggregates, chemicals, organic binders, gas cylinders. Safety in use of construction machineries and equipments: batching plant, mixers, earth moving equipment, cranes, pile driving equipment, excavators, drilling equipment, welding equipment, gas cutting equipment, grinding equipment, derricks, compressors, crushers, layers. Safety in special Construction Operations: transmission towers, railways, power plants, transformer installations. Working at heights and prevention of falls of persons: high incidence of serious accidents in working at heights, types of operations, planning operations, safety features associated with construction, design and use of gangways, floors, ladders of different types, scaffolds of different types, other safety requirements while working at height, prevention of falls at floor level. Potential tripping, slipping hazards. Precautions from falling of materials. Laws and Regulations – Relevant Provisions of Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act and Rules – National Building Codes.

Safety in Engineering Industry: Introduction. Hot working: foundry operation, forging operation, hot rolling mills operation. Cold working, heat treatment. Safety in Operations of Hazardous Machines – Safety in welding and gas cutting – Safety in cold forming and hot working of metals – Work Permits for hot Work and Cold Work – Safety of Pressure vessels – Safety in inspection and testing – Safety in radiography. Laws and Regulations – Relevant Provisions of Factories Act and Rules, Static and Mobile Pressure Vessels (Unfired) Rule.

Safety in Chemical Industries – Introduction, different types of hazards in chemical industries and their precautions. Bulk and isolated storages, types of storages, atmospheric and pressurized storage vessels, double and integrated vessels. Pipeline safety. Different components and safety devices of pipelines. Piping and instrumentation diagram (P&I diagram. Causes of pipeline failure. Maintenance of pipelines. Safe operations. Planning for safe plant operation. Satart up and shut down procedures. Work permit application. Runaway reactions, control precaution and prevention. Toxic releases in various chemical industries and their engineering controls. Risk assessment. Assessment of DOW index Risk analysis. Dispersion modeling. Probability criteria (HAZOP, HAZAN). Emergency planning and preparedness. On site and off site emergency plans for toxic releases. Fire and explosions. Emergency preparedness, rehearsal and exercises. Inspection: Inspection techniques for chemical processes and plants. Reaction vessels. Distillation towers. Checklists for routine checks, specific maintenance and breakdown, inspectionsof loading/unloading, compressors, pumps. Asserting reliability of vessels. Corrossion,

location, causes, prevention inspection. Safety audit. Evaluating risks in chemical processes. Engineering control of chemical contaminants. Laws and Regulations – Relevant Provisions of Factories Act and Rules.

Safety in textile industries Safety in jute textile. Special purpose machines. Safety in cotton textile industry

Safety in dock and port Dock safety statutes in India. Responsibility of different agencies for safety, health and welfare involved in dock work. Working on board the ship. Lifting appliances. Loose gears ropes and chains. Handling of cargo. Major accident hazards control. Container operations. Transport equipment. Investigation of accident and dangerous occurrences. Health and welfare.

342 FIRE ENGINEERING AND EXPLOSION CONTROL

Fire – Introduction – Fire Chemistry and its Physics – Fire Engineering – Theories of Fire – Fire Protection, Prevention and Control – Fire Design – Fire load.

Explosion – Theories of Explosion – Types of Explosions – Explosion Protection, Prevention and Control.

Laws and Regulations – Relevant Provisions of Factories Act and Rules – Explosive Act and Rules– Petroleum Act and Petroleum (Amendment) Rules – Calcium Carbide Rule.

343 INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH

Industrial Hygiene Concept, definition and importance of hygiene in industry. Difference between domestic hygiene and industrial hygiene. Physical hazards – heat stress and its control, ventilation, noise, vibration, illumination, thermal radiation, X rays, ultra violet radiation, ionizing and non-ionizing radiations, permissible exposure limits, effects of exposure, preventive and control measures.

Air sampling, the concept of threshold limits, acute and chronic exposure effect, personal monitoring, biological monitoring and control measures, risk management at work places, emergency control measures, awareness for ensuring ideal hygiene.

Noise and vibration, the effect of noise on man, measurement and evaluation of noise, vibration damping, noise isolation, noise absorption, silencers, practical aspects of control of noise, case studies on impact of noise from compressors and generators. Vibration effects, measurement and control

Industrial physiology, classification of workload, work capacity and man-job alignment, fatigue and rest allowances, physiological list in occupational health assessment, ergonomics, man-machine differences, man-machine interface, fitting the man to the job, prevention work related limb disorders and repetitive strain injury (RSI)

Occupational Health Meaning of occupational health and occupational health hazards. Awareness programme, types of occupational health hazards in industries, physical, chemical, biological, mechanical and psychological hazards, common work related or occupational diseases, occupations involving risk of contracting these diseases, mode of causation of the diseases and its effect, diagnostic methods, methods of prevention, notifiable occupational diseases, compensation for occupational diseases, evaluation of injuries, medical services in an industrial establishment and its functions, occupational health service and its activity, occupational hazards in hospitals, action programmes for work related diseases at the national level, major accident hazards control, medical provision, occupational health audit and survey, occupational diseases relating to construction work, emergency medical treatment of injuries and rehabilitation at construction site.

Personal protective equipment Introduction and requirements and assessment of PPE, type of PPE. Non respiratory personal protective devices: head protection, ear protection, face and eye protection, hand protection, feet protection, body protection. Supply, use, care and maintenance of personal protective equipment. Requirements under Factories Acts and Rules. Respiratory personal protective devices. Classification of hazards, classification of respiratory personal protective devices, selection of respirators, instructions and hints in the use of breathing apparatus, supply, use, care and maintenance of breathing apparatus, training in the use of breathing apparatus