

**POST GRADUATE DIPLOMA
INDUSTRIAL SAFETY AND MANAGEMENT**

Program Structure

Semester-1

S.No.	Course No.	Nomenclature of Paper	L-T-P (Hours)	Credits	Evaluation Scheme		
					Theory	IA	Total
1	DSC1	Introduction to Environment Health	4-0-0	4	70	30	100
2	DSC 2	Industrial Safety, Hygiene and Occupational Health	4-0-0	4	70	30	100
3	DSC 3	Natural, Industrial and Occupational Hazards	4-0-0	4	70	30	100
4	DSC 4	Safety Philosophy and Principles of Accident Prevention	4-0-0	4	70	30	100
5	SEC1	Practical Course	0-0-8	4	70	30	100
6	VAC1	To be chosen from the value added courses offered by the university	2-0-0	2	35	15	50

Total Credits: 22

SEMESTER-2

S.No.	Course No.	Nomenclature of Paper	L-T-P (Hours)	Credits	Evaluation Scheme		
					Theory	IA	Total
1	DSC5	Environmental Pollution & Toxicology	4-0-0	4	70	30	100
2	DSC 6	Safety Management	4-0-0	4	70	30	100
3	DSC 7	Occupational Health And Safety	4-0-0	4	70	30	100
4	DSC 8	Industrial Safety Legislations	4-0-0	4	70	30	100
5	SEC2	Internship	0-0-8	4	70	30	100
6	VAC2	To be chosen from the value added courses offered by the university	2-0-0	2	35	15	50

Total Credits: 22

DSC1: INTRODUCTION TO ENVIRONMENTAL HEALTH

Max. Marks : 70
Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit: I

Environment and Ecology: Introduction to Natural Environment, Ecosystem, Alterations of ecosystem function: acid rain, ocean acidification, coral bleaching, nuclear winter, global warming and ozone hole, an overview of IPCC. Conceptual framework for assessing vulnerability to climate change; Necessity for adaptation to climate variability, Global Environmental Issues.

Unit: II

Air, Water and Soil Pollution: Air pollution- natural and anthropogenic sources of pollution, Water Pollution- types sources and consequences of water pollution, water quality and standards, Marine pollution, sources of marine pollution and its control, Soil Pollution- control, industrial waste effluents and heavy metals interactions with soil components.

Unit: III

Noise, Radiation, Solid Waste, Electronic Waste Pollution: Noise Pollution- sources of noise pollution, measurement and indices, Radiation Pollution- Measurement and detection of radiation intensity, Effects of radiation on human body, Measurement – disposal of radioactive waste, Solid Waste Pollution- Sources, generation, & composition of solid wastes, Hazardous Waste Management, Electronic Waste- causes and effects on environment and human health.

Unit: IV

Environmental Health Monitoring: Environmental Quality Assessment and Monitoring, Water Quality Assessment and Monitoring, Air Quality Assessment and Monitoring, Soil Quality Assessment and Monitoring and Noise Assessment and Monitoring.

Suggested Readings:

1. Frumkin, H. (2016). Environmental health: From global to local (Third ed.). San Francisco, CA: Jossey-Bass, A Wiley Brand.[

DSC2: INDUSTRIAL SAFETY, HYGIENE & OCCUPATIONAL HEALTH

Max. Marks : 70

Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit: I

Industrial safety: History and development of safety movement, Safety programs, Need for safety, Safety standards and codes, Safety policy: safety organization and responsibilities and authorities of different levels.

Unit: II

Definition of Industrial Hygiene, Phases 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.

Unit: III

Introduction to chemical hazards, dangerous properties of chemical, dust, gases, fumes, mist, vapours, smoke and aerosols, MSDS(Material Safety Data Sheets. Route of entry to human system, recognition, evaluation and control of basic hazards, concepts of dose response relationship, bio-chemical action of toxic substances. Evaluation of toxicity and noise, concept of threshold, limit values.

Unit: IV

Basic concept and history of occupational health, Occupational and work related diseases, Levels of prevention, Characteristics of occupational diseases, Essentials of occupational health service, personal protective equipments (respiratory and non-respiratory), Occupational health hazards : 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.

Suggested Readings:

1. R. K. Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006)
2. Slote. L, Handbook of Occupational Safety and Health, John Willey and Sons, New York .
3. Jeanne Mager Stellman, Encyclopedia of Occupational Health and Safety (ILO) Ms. Irma Jourdan publication

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DSC3: NATURAL, INDUSTRIAL AND OCCUPATIONAL HAZARDS

Max. Marks : 70

Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit I

Natural hazards: Introduction to Natural Hazards and Disaster, Earthquakes and Volcanoes, Floods and Landslides, Weather Related/Coastal Hazards. Environmental Hazards and its mitigation: Physical Hazards, Chemical Hazards, Biological Hazards.

Unit II

Industrial and Occupational Hazards: Mining and Construction Hazards, Agriculture and Allied Sector, Hospital and Health Centre Hazards, Corporate and Office Hazards, Radiation Hazards and their effects on human body, Industrial noise -Sources, and its control, Effects of noise on the auditory system and health, Measurement of noise.

Unit III

Electrical and Explosion Hazards: Electrical Hazards, Safe limits of amperages, voltages, distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthing standards and earth fault protection, Protection against voltage fluctuations, Effects of shock on human body, Electrical equipment in hazardous atmosphere, Criteria in their selection, installation, maintenance and use.

Unit IV

Fire and other Hazards: Definition, classification and causes of fire, Detection of fire, extinguishing methods, fire fighting installations (with and without water). High pressure hazards.

Suggested Readings:

1. Frank P Lees - Loss of prevention in Process Industries, Vol. 1 and 2, Butterworth Heinemann Ltd., London (1991).
2. Industrial Safety - National Safety Council of India.

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DSC 4: SAFETY PHILOSOPHY AND PRINCIPLES OF ACCIDENT PREVENTION

Max. Marks : 70

Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit I

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 Audit.

Unit II

Basic Concept of Industrial Safety, Identification of hazard, theory of accident occurrence, Safety duty at various levels, Safe Working Practices, Personal Protective Equipment (PPE).

Concept of Safety Engineering (Ergonomics, Process Safety), House Keeping (5 S concepts), Safeguarding of Machinery, Special Precautions: Working at Height, Working in Confined Spaces.

Unit III

Introduction to Industrial Accident, Types of Accidents and Its Analysis, Accident Prevention: Theories / Models of accident occurrences, Principles of accident prevention, Accident and Financial implications, Hazard identification and evaluation, Common Accidents at Workplace, Preventive measures to avoid accidents by using safety devices.

Unit IV

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.

Suggested Readings:

1. Frank P Lees - Loss of prevention in Process Industries, Vol. 1 and 2, Butterworth Heinemann Ltd., London (1991).
2. Industrial Safety - National Safety Council of India.
3. R. K. Jain and Sunil S. Rao, Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006).

SEC1: PRACTICAL COURSE

Suggested list of lab experiments.

1. Continuity test for Electrical Circuits
2. Measurement of Biological and Chemical oxygen demand of waste water.
3. Measurement of illumination level at working place with the help of digital Lux meter
4. Noise Level Measurement. (a) Measurement of Sound pressure level in dBA and dB linear. b) Frequency analysis of noise.
5. Demonstration of Personal Protective Equipment (PPE)
6. Sampling and Estimation of Dust by Gravimetric Method and High volume air sampler..
7. Detection of Carbon Monoxide, SO_x, NO_x Hydrogen Sulphide, Ammonia
8. Demonstration of Fire fighting equipments
9. Demonstration of First aid

SEMESTER 2

DSC5: ENVIRONMENTAL POLLUTION & TOXICOLOGY

Max. Marks : 70
Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit I

Definition of pollution; pollutants; classification of pollutants; solubility of pollutants, Biotransformation and bioaccumulation, concept of radioactivity, radioactive decay and half-life of pollutants, organometallic compounds, acid mine drainage.

Unit II

Air pollution- Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants; smog; effects of different pollutants on human health (NO_x, SO_x, PM, CO, CO₂, hydrocarbons and VOCs) and control measures; indoor air pollution; sources and effects on human health. Noise pollution: Sources, measurement and indices, permissible ambient noise levels; effect on communication, impacts on life forms and humans, control measures.

Unit III

Water pollution: Sources of surface and ground water pollution; water quality parameters and standards; eutrophication; effect of water contaminants on human health; water borne diseases; Effluent treatment plants (ETPs). Marine pollution and its effects; coral reefs and their demise; coastal area management; thermal pollution and its effects.

Unit IV

Soil Pollution: causes and effect of soil pollution on environment, control strategies, Principles of Environmental Toxicology and the Dose-Response Relationship Toxicity Testing, Biochemical Effects and Mechanisms of Toxicity of Pollutants, Ecotoxicology, Biomarkers and Bio monitoring, Ecological and Human Health Risk Assessment.

Suggested Readings:

1. Air pollution and control - K.V.S.G. Murlikrishan
2. Industrial noise control - Bell & Bell
3. Introduction to environmental engineering and science- Gilbert
4. Toxicology - principles & applications - Niesink & Jon Devries

DSC6: SAFETY MANAGEMENT

Max. Marks : 70

Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Safety Management: Structure, Function and responsibilities, Job Safety Analysis: Process, Risk assessment and control measures, Safety in Design: Principles of safe design, and Safe Working Practices.

Unit-II

Safeguarding: types of machine guards, approaches for machine guarding and minimum requirements of safeguards, Safety in Material Handling, Mechanised material handling equipment and accessories, Hazards during material handling.

Unit-III

National policy on safety, health and environment at work place. Bureau of Indian standards on safety and health 14489 - 1998 and 15001 – 2000 OSHA, Process Safety Management (PSM) as per OSHA, PSM principles, OHSAS – 18001.

Unit-IV

Electrical Fire and its Prevention in Buildings, Industries, Railways, Hospitals; Oil Industry Safety Directorate (OISD), Standards, Fire Protection and fire safety requirements for high rise buildings, Fire safety regulations in India.

Suggested Readings:

1. Grimaldi and Simonds , Safety Management, AITBS Publishers , New Delhi (2001)
2. Industrial Safety –National Safety Council of India ISHET.
3. Dr. K. U. Mistry - Fundamentals of Industrial Safety & Health, Siddharth Prakashan, Ahmadabad

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DSC7: OCCUPATIONAL HEALTH AND SAFETY

Max. Marks : 70

Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Concepts of Occupational Health and occupational health hazards, Types of occupational health hazards in industries, Occupational Health for Women and Children, Occupational Safety, Health and Working Conditions Code 2020, Occupational health audit and survey.

Unit-II

Occupational diseases, Occupations involving risk of contracting diseases, mode of causation of the diseases and its effect, diagnostic methods, methods of prevention, Compensation for occupational diseases, Concept of National System for Recording and Notification of Occupational Diseases (NSRNOD).

Unit-III

Occupational Safety, Safety in Construction and Demolition Operation, Safety in special Construction Operations: transmission towers, railways, power plants, transformer installations.

Safety in Engineering Industry, Safety in Operations of Hazardous Machines, Safety in welding and gas cutting, Safety in cold forming and hot working of metals.

Unit-IV

Types of hazards and safety in Chemical industry, Mining industry, Agriculture and Allied Sector, Hospital and Health Centre, Textile industries, Dock and Port, Safety in Corporate and Office. Concept and types of storages, atmospheric and pressurized storage vessels, double and integrated vessels. Pipeline safety.

Suggested Readings:

1. R. K. Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006)
2. Slote. L, Handbook of Occupational Safety and Health, John Willey and Sons, New York .
3. Jeanne Mager Stellman, Encyclopedia of Occupational Health and Safety (ILO) Ms. Irma Jourdan publication

DSC8: INDUSTRIAL SAFETY LEGISLATIONS

Max. Marks : 70

Time : 3 Hours

Note: Examiner will set nine questions in total. Answer to question No. 1 will be compulsory comprising questions from all four units and remaining eight questions shall be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to Industrial Acts and Laws: History, Provisions under the Factories Act, 1948 and rules made there under with amendments, Provision of Welfare under Factory Act 1948.

Unit-II

Indian Boilers Act (1923) with allied regulations. Indian electricity act 2000 and rules, Indian Explosives Act 1984 and rules. Petroleum Act and Rules, 2002, Gas cylinder rules 1981, Insecticides Act and Rules, 1968, Radiation protection rules 2004, Hazardous material transportation rules 1989 .

Unit-III

Static and mobile (unfired) pressure vessel rules 1981 as amended in 2000. The Dock Workers (Safety Health and Welfare) Act 1996 and rules and regulations. The Building and other construction workers (Regulation of employment and conditions of service) Act 1996 and rules 1998.

Unit-IV

Social security legislation, Workman's Compensation Act, 1943 and rules, Employees State Insurance Act, 1948 and rules, Child Labour and Women Employee Act., Environment Protection Act 1986, Contract labour (Abolition and Regulation) Act, Public Liability Insurance Act 1991.

Suggested Readings:

1. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai
2. Grimaldi and Simonds, Safety Management, AITBS Publishers , New Delhi, (2001).
3. Industrial Safety - National Safety Council of India.