SCHOOL OF ENVIRONMENTAL AND EARTH SCIENCES

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NAAC RE-ACCREDITED

KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON

SYLLABUS

For

CERTIFICATE COURSE IN

INDUSTRIAL SAFETY AND MANAGEMENT

w.e.f.

JUNE, 2013

CREDITS FOR CERTIFICATE COURSE IN

'INDUSTRIAL SAFETY AND MANAGEMENT'

UNIT	TITLE	CREDITS
ISM 101: Industrial Safety, Hygiene & Occupational Health		
I	Introduction to Industrial Safety	01
II	Risk Assessment & Hazard Identification	01
III	Industrial Hygiene	01
IV	Occupational Health	01
ISM 102: Control of Workplace Hazards		
I	Control of Physical Hazards	01
II	Control of Chemical Hazards	01
III	Control of Electrical Hazards	01
IV	Control of Fire Hazards	01
ISM 103: Safety Legislation & Management		
I	Industrial Safety Legislations	01
II	Industrial Safety Management	01
III	Safety Awareness & Training	01
IV	Plant design & housekeeping	01
ISM 104 : Practical Course		04
ISM105: Research Project		04
	TOTAL CREDITS	**20**

ISM 101: INDUSTRIAL SAFETY, HYGIENE & OCCUPATIONAL HEALTH

Unit I: Introduction to Industrial Safety (15 Lectures)

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

Accident sequence theory, Causes of accidents, Accident prevention and control techniques, Plant safety inspections, Job safety Analysis and investigation of accidents, First aid.

Financial costs-direct and indirect social costs of accidents. Compilation procedure for financial costs. Cost data, quality and its limitations-Budgeting.

Unit II: Risk Assessment & Hazard Identification (15 Lectures)

Checklist procedure, Preliminary hazard analysis, What if analysis, Failure mode effect analysis, Hazard and operability (HAZOP) studies, Hazard analysis techniques: Fault tree analysis, Event tree analysis, General outline of DOW index, Risk estimation and management, Major hazard control, On-site and Off-site emergency preparedness.

Identification of hazard, Categorization methods for elimination of hazard, Mechanical hazards; machine guarding, safety with hand tools/ portable power tools, Pressure vessel hazards and their control, Safety in material handling: hazards and safe Practices, safety with storage of materials, Electrical hazards: classification, safe work practices, Chemical hazards: laboratory safety, bulk handling of chemicals, Fire and explosion hazards, Fire detection, Prevention ,control, and extinguishments, Industrial layout, Industrial waste management.

Unit III: Industrial Hygiene (15 Lectures)

Industrial Hygiene: Environmental stresses: physical, chemical, biological and ergonomic stresses, Principles of industrial hygiene, Overview of control measures. Permissible limits. Stress, Exposures to heat, Heat balance, Effects of heat stress, WBGT index measurement, Control Measures. Chemical agents, IS/UN classification, Flammables, Explosives, Water sensitive chemicals, Oxidants, Gases under pressure, Chemicals causing health hazards: irritants, asphyxiates, anaesthetics, systemic poisons and carcinogens, Chronic and acute exposure, Routes of entry, Types of airborne contaminants, Introduction to air sampling and evaluation methods, Occupational exposure limits, Engineering control measures, Principles of ventilation.

Unit VI: Occupational Health (15 Lectures)

Occupational Health: Concept of health and occupational health, Spectrum of health, Occupational and work related diseases, Levels of prevention, History of occupational health, Characteristics of occupational diseases, Essentials of occupational health service, personal protective equipments (respiratory and non-respiratory)

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ISM 102: CONTROL OF WORKPLACE HAZARDS

Unit I: Control of Physical Hazards: (15 Lectures)

Purpose of lighting. Advantages 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, Lighting and colour, Purpose of ventilation. Classification of Ventilation as General Ventilation (Natural and Mechanical modes), Local Exhaust Ventilation,Special methods for Thermal Stress control such as Air conditioning , Radiant Heat Control. Engineering Control of noise, Vibration damping, Noise isolation, Noise bsorption. Silencers. Case studies on impact of noise from compressors and generators. Vibration: Effects, measurement and control.

Unit II: Control of Chemical Hazards (15 Lectures)

Hazardous properties of chemicals and appreciation of information provided in Material safety data sheets. Classification of dangerous materials with pictorial symbols, common hazard and common precautions for each class. Safety in transportation of dangerous materials by road, rail, ships and pipelines. Safety in bulk storage of hazardous substances. Safety in shelf storage of hazardous substances. Safety in handling of chemicals in the plant by pipelines. Hazards of chemical reactions, and possibilities of reactions going out of control. Common hazards of important chemical reactions and their control. Common hazards of important unit operations and their control. Safety considerations in process control instrumentation. Safe start up, shut down and emergency shut down procedures. Safety in sampling and gauging. Safety aspects of plant modifications. Proper identification of plants and equipments. Maintenance of component failure history Corrosion prevention for safety. Preventive maintenance of vulnerable equipments. Safe entry into confined spaces. Permit to work system for safety in chemical plants. NDT in chemical Plants

Unit III: Control of Electrical Hazards: (15 Lectures)

Dangers from electricity. Safe limits of amperages, Voltages Safe distance from lines. Capacity and protection of conductors, Joints and connections, Means of cutting of power overload and short circuit protection. Earth fault protection. Earth insulation and continuity tests. Protection against over-voltage. Hazards arising out of 'borrowed' neutrals. Other precautions. Portable electrical apparatus. flame proof electrical apparatus. flame proof electrical equipments, Precautions in their selection, installation, maintenance and use. Control of hazards due to static electricity.

Unit IV: Control of Fire Hazards: (15 Lectures)

Statutory provisions regarding fire safety. Factors contributing towards fire. Chemistry of fire. Classification of fires. Common causes of industrial fires. Determination of fire load. Fire resistance of building materials. Design of building plant, exits, etc. for fire safety. Prevention of fire. Portable extinguishers. Water systems, carbon-di-oxide systems. Foam extinguisher system. Dry chemical extinguishing system. Industrial fire detection and alarms. Sprinkle systems. Special precautionary measures in handling/processing flammable liquids, gases, vapours, mists and dusts. BLEVE(Boiling Liquid Expanding Vapour Explosion). Fighting fires involving pesticides. Emergency action plan. EAC or Hazchem Code.

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ISM 103: SAFETY LEGISLATIONS & MANAGEMENT

Unit I: Industrial Safety Legislations: (15 Lectures)

Legislative measures in industrial safety: Factories Act, 1948, Workman's Compensation Act, 1943, Employees State Insurance Act, 1948. Mines Act , Air (Prevention and control) Pollution Act, 1981, Water (Prevention and Control) Pollution Act, 1974,Boiler Vessels Act. Child Labour and Women Employee Act. The factories rules, History, Provisions under the factories Act and rules made there under with amendments, Functions of safety management.

ILO Convention and Recommendations in the furtherance of safety, health and welfare.

Occupational Safety, Health and Environment Management: 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, EPA Standards, Performance measurements to determine effectiveness of PSM

Unit II: Industrial Safety Management (15 Lectures)

Management: Concept, definition, nature and importance, Role and functions of a manager, Elements and functions of Management.

Management Principles: Authority, responsibility & power of Management, Span of Control. Delegation and decentralisation of authority. General principles of Management.

Industrial Safety: History of Safety Movement in India and abroad. The Accident Problem, Nature & size need for safety, legal, humanitarian, economic and social considerations.

Safety Management: Role of management in Industrial Safety. Safety Management- Principles & Practices.

Safety Organization: Role of safety committee and its formation, Safety awareness programme: motivation, education and training, Appraisal of plant safety and measurement of safety performance, Total loss control concept, Introduction to productivity, Quality, Reliability, and Safety (PQRS) theory.

Unit III: Safety Awareness & Training: (15 Lectures)

Training for Safety: Assessment of needs. Design & development of training programme. Training methods and strategies. Training of manager ,supervisors & workers. evaluation of training programmes. **Training Programme**: In-Plant training programmes. Out-of-plant training programmes. Seminars, Conferences & Workshop , Programmes for new workers. Job instructions Vs Safety instructions.

Employee Participation: Purpose, nature, scope and methods. Safety committee and union participation.

Trade Unions: History of trade unions in India. Role of trade unions in safety and health. Collective bargaining and safety.

Safety Promotion & Publicity: Safety suggestion schemes. Safety competitions, Safety incentive Schemes. Audio Visual Publicity, other promotional methods.

Human behavior and safety: Human factors contributing to accidents. Individual differences. Behaviour as function of self and situation. Perception of danger and acceptance of risks. Knowledge and responsibility vis-a-vis safety performance. A.Maslow's, Herzberg's, Douglas Mcgregore's and Adam's equity theories of motivation and their application to safety. Role of management , Supervisors and safety department in motivation.

Unit IV: Plant design & housekeeping: (15 Lectures)

Concept of workplace and its design. Improving safety and productivity through work place design control measures. Technical and engineering control measures. Control measures against human error. Preventive maintenance. Role of Preventive maintenance in safety and health. Standards and code of practices for plant and equipment. Standardization and its benefits, Purchasing policy. Safety and good housekeeping. Need for planning and follow-up. Typical accidents due to poor housekeeping. Disposal of scrap and other trade wastes. Prevention of spillage. Marking of gangways and other locations. Use of colour as an aid for good housekeeping. Clean-up campaigns. Cleaning methods, employee assignment. Inspections and check-list. Result of good housekeeping. 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 & system safety.

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ISM 104: PRACTICAL COURSE

Experiments:

1. Measurement of illumination level by Photo Meter.
2. Measurement of Sound Levels.
4. Determination of concentration of inflammable vapours.
5. Measurement of Static Charge/Electricity with the help of Static Charge Meter.
6. Determination of Fire Load in a given work place.
7. Measurement of Vibrations of Machines and equipment.
8. Measurement of Insulation Resistance.
9. Continuity test for Electrical Circuits.
10. Earthing continuity test.
11. Calibration of Rotameter by Wet Test Meter.
12. Detection of Carbon Monoxide, NOx Hydrogen Sulphide, Ammonia, Aromatic Hydrocarbons, SO_2 by Gas Detectors and other direct reading instruments.
13. Measurement of Concentration of Dust using Personal Sampler by Gravimetric Method.
14. Sampling and analysis of Ammonia.
15. Estimation of Hydrogen Sulphide in Air.
16. Estimation of Chlorine in Work Environment.
17. Estimation of Mercury concentration in working atmosphere.
18. Sampling and analysis of SO_2 using Colorimetric method.
19. Assessment of Heat Stress in Work Environment.
20. Plotting of an Audiogram by Audiometer.
21. Carrying out Lung Function Test by Spirometer.
22. Assessment of fire & explosion potential and their prevention.
23. Any other experiment as per the syllabus of theory courses and approval of the faculty.

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ISM 105: RESEARCH PROJECT

Topics for Project:

1. Safety audit
2. HAZOP study
3. Preparation of emergency plan.
4. Design of management information system
6. In-plant safety inspection
7. Preparation of safety report
9. Safety organization and management
10. Study of employee's participation in safety.
11. Safe guarding of machinery
12. Material handling study.
13 Design of work place study
14. House keeping study
15. Lighting study
16. Ventilation study.
17. Fire hazard study
18. Electrical hazards study.
19. Noise control study.
20. Job safety analysis study.
21. Fault tree analysis study.
22. Hazards identification study.
23. Accident investigation and reporting study.
24. Measuring safety performance.
25. Study of cases under Factories Act.
26. Any other topic as per the syllabus of theory courses and approval of the faculty

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REFERENCE BOOKS

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, NewYork .
3. Frank P. Lees, Loss of prevention in Process Industries , Vol. 1 and 2, Butterworth- Heinemann Ltd., London (1991).
4. Industrial Safety -National Safety Council of India.
5. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai
6. Grimaldi and Simonds , Safety Management, AITBS Publishers , New Delhi (2001)
7. Industrial Safety and pollution control handbook: National Safety Council and Associate publishers Pvt. Ltd, Hyderabad(1993).
8. Handbook of Environmental Health and Safety: Herman Koren and Michel Bisesi, Jaico Publishing House, Delhi (1999).
9. Handbook of Environmental Risk Assessment and Management: Peter Calow, Blackwell Science Ltd. USA (1998).
10. Risk Assessment and Environmental Management: D. Kofi Asvite-Dualy, John Willey & Sons, West Sussex, England (1998).
11. Introduction to Environmental Engineering & Science:Gilbert M. M., Pearson Education, Singapore (2004).
12. Safety A personal Focus David L Bever
13. Fire Equipment David L. Bever
14. Industrial Safety National Safety Council of India
15. Engineering Chemistry, Jain & Jain
16. Industrial Management Jain & Bawa
17. Hand book of Hazardous Air pollutions, Dennis P Nolan P.E
18. Remediation and Treatment Technologies. Dennis P Nolan P.E
19. Fire Technology, R.S. Gupta
20. Major hazard control, Inter National Labor Office
21. Encyclopedia of occupational health and safety, Inter National Labor Office
22. Safety, health and working condition in the transfer of technology, Inter National Labor Office
23. Radiation protection, Inter National Labor Office
24. Fire service Manual (4 volumes)
25. Publications from Inter National standard organizations like ISO, OSHA, IOSH, NEBOSH etc.

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