## SEMESTER I

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LIST OF ELECTIVES

M.TECH. INDUSTRIAL SAFETY AND HAZARDS MANAGEMENT

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OBJECTIVE
To provide comprehensive knowledge on PHA, HAZOP, Thermal analysis and BAM testing.

UNIT I  HAZARD, RISK ISSUES AND HAZARD ASSESSMENT  10
Introduction, hazard, hazard monitoring-risk issue - Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, preliminary hazard analysis (PHA), hazard operability studies (HAZOP)

UNIT II  INSTRUMENTATION  8
Applications of Advanced Equipments and Instruments, Thermo Calorimetry, Differential Scanning Calorimeter (DSC), Thermo Gravimetric Analyzer (TGA), Accelerated Rate Calorimeter (ARC), Principles of operations, Controlling parameters, Applications, advantages.

UNIT III  TESTING  8
Explosive Testing, Deflagration Test, Detonation Test, Ignition Test, Minimum ignition energy Test, Sensitiveness Test, Impact Sensitiveness Test(BAM) and Friction Sensitiveness Test (BAM), Shock Sensitiveness Test, Card Gap Test.

UNIT IV  RISK ANALYSIS QUANTIFICATION AND SOFTWARES  9
Fault Tree Analysis & Event Tree Analysis, Logic symbols, methodology, minimal cut set ranking - fire explosion and toxicity index(FETI), various indices - Hazard analysis(HAZAN)-Failure Mode and Effect Analysis(FMEA)- Basic concepts of Software on Risk analysis, CISCON, FETI, ALOHA

UNIT V  CONSEQUENCES ANALYSIS  10
Logics of consequences analysis- Estimation- Hazard identification based on the properties of chemicals- Chemical inventory analysis- identification of hazardous processes- Estimation of source term, Gas or vapour release, liquid release, two phase release- Heat radiation effects, BLEVE, Pool fires and Jet fire- Gas/vapour dispersion- Explosion, UVCE and Flash fire, Explosion effects and confined explosion- Toxic effects- Plotting the damage distances on plot plant/layout.

TOTAL: 45 PERIODS

REFERENCES
3. Hazop and Hazon, by Trevor A Klett, Institute of Chemical Engineering.
4. Quantitative Risk assessment in Chemical Industries, Institute of Chemical Industries, Centre for Chemical process safety.
OBJECTIVE
To train in computer programming and use of software tools for solving chemical engineering problems.

PART - A
DEVELOPMENT OF COMPUTER PROGRAMS
1. Simple problems
2. Mathematical series (Taylor series), random number generation
3. Solution of equation of states for non-ideal gas mixtures (van der Waals, Virial and RKS equations)
4. Solution of thermodynamic equilibrium (UNIQUAC, UNIFAQ, NRTL) models
5. Solution of conductive heat transfer through composite walls
6. Solution of diffusive mass transfer through a stagnant gas film

PART – B
USE OF SOFTWARES
7. Determination of Laplace transform
8. Solution of algebraic equations
9. Solution of ordinary differential equations (ODE)
10. Numerical integration
11. Regression analysis
12. Design of CSTR and PFR
13. Design of double pipe heat exchanger
14. Design of binary distillation column

TOTAL : 60 PERIODS

REFERENCES
OBJECTIVE
To impart the necessary skills and knowledge about handling hazardous chemicals and safety auditing.

UNIT I  CONCEPT OF SAFETY AND SAFETY AUDITING  4
Introduction to the concept of safety- safety scenario-need for awareness creations and sensitising workers-safety audit and its importance.

UNIT II  HAZARDOUS CHEMICALS-PRECUATIONS IN HANDLING  12
Handling hazardous chemicals-pyrophoric nature of chemicals-methods of extinguishing chemical fires-precautions to be observed in handling alkali metals- Explosives – causative factors of explosions-need to monitor temperature during niturations-handling ether-necessity to remove peroxides-preparation of thiophene free benzene-precautions to be observed.

UNIT III  TOLERANCE LIMITS OF INDUSTRIAL EMMISIONS  10
Poisonous gases –their ill effects on the health-tolerance limits of various industrial emissions-first aid procedures-for acid , alkali and mercury poisoning- antidotes for various poisons-plumbosolvency, Paints-hazardous nature of lead containing paints-safe alternatives

UNIT IV  CARCINOGENS-HEALTH HAZARDS OF INSECTICIDES  10
Carcinogenic nature of chemicals- potential carcinogens-dangers of exposure to high ionizing radiations-ill effects on health’s-chemical pesticides and their health hazards-dangers of using phosphorus containing insecticides-introduction to biofertilizers and biopesticides-concepts of eco-friendly organic farming-preparation of a biopesticides-detailed methodology

UNIT V  DRINKING WATER STANDARDS  9
Drinking water standards-permissible levels of various substances in drinking water as W.H.O-concept of biological oxygen demand and chemical oxygen demand-method of reducing biological oxygen demand.

TOTAL : 45 PERIODS

REFERENCES

OBJECTIVE
To provide basic concepts of Probability and Reliability.

UNIT I
Random variable – Two dimensional random variables – Standard probability distributions – Binomial, Poisson and Normal distributions - Moment generating function.
UNIT II  
Special distributions – Uniform, Geometric, Exponential, Gamma, Weibull and Beta distributions – Mean, Variance, Raw moments from moment generating functions of respective distributions.

UNIT III  
Sampling distributions – Confidence interval estimation of population parameters – Testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test.

UNIT IV  
Curve fitting - Method of least squares - Regression and correlation – Rank correlation – Multiple and partial correlation – Analysis of variance - One way and two way classifications – Time series analysis.

UNIT V  

TOTAL : 60 PERIODS

REFERENCES

IH8201  ENVIRONMENTAL POLLUTION CONTROL AND INDUSTRIAL HYGIENE

OBJECTIVE
To provide advanced concepts of EIA and EMS.

UNIT I  

UNIT II  
Rapid and Comprehensive EIA – Legislative and Environmental Clearance procedure in India – Prediction tools for EIA.

UNIT III  

UNIT IV  
Socio cultural environment – Public participation – Resettlement and Rehabilitation.
UNIT V  
Documentation of EIA – Environmental management plan – Post project monitoring – Environmental Audit- Life cycle assessment – EMS – case studies in EIA.

REFERENCES  

TOTAL : 45 PERIODS

IH8202  INDUSTRIAL SAFETY AND HAZARDS MANAGEMENT  L T P C
3003

OBJECTIVE  
To provide comprehensive knowledge of safety and hazards aspects in industries and the management of hazards.

UNIT I  FIRE AND EXPLOSION  10

UNIT II  RELIEF SYSTEMS  8
Preventive and protective management from fires and explosion-inerting, static electricity passivation, ventilation, and sprinkling, proofing, relief systems – relief valves, flares, scrubbers.

UNIT III  TOXICOLOGY  10
Hazards identification-toxicity, fire, static electricity, noise and dust concentration; Material safety data sheet, hazards indices- Dow and Mond indices, hazard operability (HAZOP) and hazard analysis (HAZAN).

UNIT IV  LEAKS AND LEAKAGES  12
Spill and leakage of liquids, vapors, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and dispersion. Naturally buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mitigation measures for leaks and releases.

UNIT V  CASE STUDIES  5
Flixborough, Bhopal, Texas, ONGC offshore, HPCL Vizag and Jaipur IOC oil storage depot incident; Oil, natural gas, chlorine and ammonia storage and transportation hazards.

REFERENCES  

TOTAL : 45 PERIODS

IH8203 PROCESS SIMULATORS

OBJECTIVE
To train on process simulators and CFD software for solving complex Engineering problems.

1. Introduction to process simulators and CFD software - ASPEN PLUS, HYSYS and FLUENT
2. Simulation of a batch reactor
3. Simulation of a chemostat
4. Simulation of a shell and tube heat exchanger
5. Simulation of a condenser
6. Simulation of a pump/compressor
7. Simulation of a fixed bed absorber
8. Simulation of a staged distillation column
9. Simulation of flow in channels and pipes
10. Simulation of flow in sudden expansion/contraction systems
11. Simulation of flow in a square cavity
12. Process simulation study (flow sheeting) - Production of hydrogen by Stream reforming
13. Process simulation study (flow sheeting) - Production of vinyl chloride monomer flowsheet.
14. Process simulation study (flow sheeting) - Production of nitric acid from anhydrous ammonia

TOTAL: 45 PERIODS

REFERENCES
IH8204 REGULATION FOR HEALTH, SAFETY AND ENVIRONMENT

OBJECTIVE
To impart knowledge about regulations for health, safety and environment.

UNIT I
Factories act and rules; Workmen compensation act.

UNIT II
Indian explosive act - Gas cylinder rules - SMPV Act - Indian petroleum act and rules. Environmental pollution act

UNIT III
Manufacture, Storage and Import of Hazardous Chemical rules 1989

UNIT IV
Indian Electricity act and rules.

UNIT V
Overview of OHSAS 18000 and ISO 14000

TOTAL : 45 PERIODS

REFERENCES
7. ISO 9000 to OHSAS 18001, Dr. K.C. Arora, S.K. Kataria & Sons, Delhi

IH8205 SAFETY IN ENGINEERING INDUSTRY

OBJECTIVE
To ensure that safety in Engineering industry.

UNIT I SAFETY IN METAL WORKING MACHINERY AND WOOD WORKING MACHINES
General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes- saws, types, hazards.
UNIT II  PRINCIPLES OF MACHINE GUARDING  

UNIT III  SAFETY IN WELDING AND GAS CUTTING  
Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – explosive welding, selection, care and maintenance of the associated equipment and instruments – safety in generation, distribution and handling of industrial gases-colour coding – flashback arrestor – leak detection-pipe line safety-storage and handling of gas cylinders.

UNIT IV  SAFETY IN COLD FORMING AND HOT WORKING OF METALS  
Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses, power press electric controls, power press set up and die removal, inspection and maintenance-metal sheers-press brakes. Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending of pipes, hazards and control measures. Safety in gas furnace operation, cupola, crucibles, ovens, foundry health hazards, work environment, material handling in foundries, foundry production cleaning and finishing foundry processes

UNIT V  SAFETY IN FINISHING, INSPECTION AND TESTING  
Heat treatment operations, electro plating, paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards, engineering and administrative controls, Indian Boilers Regulation. Health and welfare measures in engineering industry-pollution control in engineering industry-industrial waste disposal.

REFERENCES
5. Indian Boiler acts and Regulations, Government of India.

TOTAL : 45 PERIODS
OBJECTIVE
To provide comprehensive knowledge on analyzing instrument.

1. NOISE LEVEL MEASUREMENT AND ANALYSIS

2. VIBRATION MEASUREMENT AND ANALYSIS

3. FRICTION SENSITIVITY TEST

4. IMPACT SENSITIVITY TEST
   Measurement of impact sensitivity for unstable materials: Instrument – BAM fall hammer

5. THERMAL REACTIVITY TEST
   Measurement of thermal reactivity for unstable materials: Instrument – DSC/TGA

6. EXHAUST GAS MEASUREMENT AND ANALYSIS
   Measurement of Exhaust gas measurement of IC engines: Instrument – Gas analyzer

7. BREATHING ZONE CONCENTRATION
   Measurement of breathing zone concentration of dust and fumes: Instrument – personal air sampler

8. AMBIENT AIR MONITORING
   Measurement of respirable and non-respirable dust in the ambient air: Instrument – High volume sampler

9. CONSEQUENCE ANALYSIS
   Soft computing skills on developing effects of fire & explosion and dispersion: Software – PHAST 1 and ALOHA

10. STUDY OF PERSONAL PROTECTIVE EQUIPMENT
    Safety helmet, belt, hand gloves, goggles, safety shoe, gum boots, ankle shoes, face shield, nose mask, ear plug, ear muff, apron and leg guard.

11. STUDY OF FIRE EXTINGUISHERS
    Selection and demonstration of first-aid fire extinguishers: soda acid, foam, carbon dioxide (CO₂), dry chemical powder, halon.

TOTAL: 45 PERIODS
OBJECTIVE
To provide advanced concepts of momentum, mass and heat transfer operations.

UNIT I INTRODUCTION
Review of basic principles and equations of change in transport of momentum, heat and mass; Viscosity, thermal conductivity and diffusivity; Shell balance for simple situations to obtain shear stress, velocity, heat flux, temperature, mass flux and concentration distributions.

UNIT II EQUATIONS OF CHANGE
Equations of continuity, motion, mechanical energy, angular momentum, energy, and equation of continuity for multi component mixture. Use of the equations of change in solving problems of momentum, heat and mass transport, dimensional analysis of the equation of change.

UNIT III DISTRIBUTIONS WITH MORE THAN ONE INDEPENDENT VARIABLE
Unsteady state flow, heat and mass transfer problems, creeping flow around a sphere, flow through a rectangular channel, unsteady heat conduction in slabs with and without changing heat flux, heat conduction in laminar in compressible flow, potential flow of heat in solids, unsteady state diffusive mass transport, steady state transport of mass in binary boundary layers.

UNIT IV TRANSPORT OF MASS, MOMENTUM AND HEAT UNDER TURBULENT FLOW CONDITIONS
Velocity, temperature and concentration distributions in smooth cylindrical tubes for incompressible fluids, empirical equations for various transport fluxes and momentum.

UNIT V INTERPHASE TRANSPORT IN ISOTHERMAL AND NON-ISOTHERMAL MIXTURES
Definitions of friction factor and heat and mass transfer coefficients; Heat and mass transfer in fluids flowing through closed conduits and packed beds; Mass transfer accompanied with chemical reaction in packed beds; Combined heat and mass transfer by free and forced convection; Transfer coefficients at high net mass transfer rate. Macroscopic Balances-Momentum, heat and mass balances and their application, use of macroscopic balances in steady and unsteady state problems; Cooling and heating of a liquid in stirred tank, start-up of a chemical reactor.

TOTAL : 45 PERIODS

REFERENCES
IH8002 DESIGN OF AIR POLLUTION CONTROL SYSTEM L T P C
3 0 0 3

OBJECTIVE
To provide comprehensive knowledge on design of air pollution control system.

UNIT I AIR POLLUTION 10

UNIT II PARTICULATE POLLUTANTS AND CONTROL 12

UNIT III GASEOUS POLLUTANTS AND CONTROL 8
Gaseous Pollutant control: Gas absorption in tray and packed towers – Absorption with / Without chemical reaction – Removal of SO2 – Absorption in fixed blades- Breakthrough.

UNIT IV TOXIC POLLUTANTS REMOVAL 8
Removal of HCs / VOCs – NOx removal – Wet scrubbers.

UNIT V AIR POLLUTION CONTROL 7
Integrated Air pollution control systems.

TOTAL : 45 PERIODS

REFERENCES

IH8003 ELECTRICAL SAFETY L T P C
3 0 0 3

OBJECTIVE
To provide electrical protection and maintenance in working environment and ensure that electrical safety.

UNIT I BASIC ELECTRICAL 12

UNIT II STANDARDS AND REQUIREMENTS 10
Standards and statutory requirements – Indian electricity acts and rules – statutory requirements from Electrical inspectorate.
UNIT III     ELECTRICAL HAZARDS

UNIT IV     ELECTRICAL PROTECTION AND MAINTENANCE
Selection of Environment, Protection and Interlock – Discharge rods and earthing device – Safety in the use of portable tools - Preventive maintenance

UNIT V     CLASSIFICATION OF HAZARDOUS AREAS
Hazardous area classification and classification of electrical equipments for hazardous areas (IS, API and OSHA standards).

TOTAL : 45 PERIODS

REFERENCES
3. www.osha.gov

IH8004     FIRE ENGINEERING AND EXPLOSION CONTROL
L T P C
3 0 0 3

OBJECTIVE
To provide basic concepts of fire engineering and explosion control.

UNIT I
Fire chemistry – Dynamics of fire behavior – Fire properties of solid, liquid and gas – Fire spread – Toxicity of products of combustion

UNIT II
Industrial fire protection systems – Sprinkler – Hydrants- Stand pipe- Special fire suppression system like deluge and emulsifier.

UNIT III
Building evaluation for fire safety – Fire load – Fire resistance materials and fire testing – Structural Fire protection – Exits and egress.

UNIT IV
Explosion protection systems – Explosion parameters – Explosion suppression system based on CO2 and Halon – Hazards in L.P.G handling.

UNIT V

TOTAL : 45 PERIODS

REFERENCES
OBJECTIVE
To provide an understanding of sources of noise and industrial vibration control.

UNIT I  INTRODUCTION
Basic definitions and terminology used in Vibrations and acoustics – Mathematical concepts and degrees of freedom in vibratory systems – Natural frequencies and vibration modes – continuous systems and wave theory concept – wave equation and relation to acoustics – theory of sound propagation and terminology involved – Plane wave and spherical waves – Concepts of free field and diffuse field, nearfield and farfield – frequency analysis and vibration and noise spectrum – Signature analysis and condition monitoring.

UNIT II  INSTRUMENTATION AND AUDITORY
Sensors used in vibration and measurements – Frequency and spectrum analysers – Weighting networks – Hearing mechanism – relation between subjective and objective sounds – Auditory effects of noise and audiometric testing – Speech interference levels and its importance.

UNIT III SOURCES OF NOISE AND RATINGS
Mechanism of noise generation and propagation in various machinery and machine components, vehicles etc. – Directivity index – Concept of Leq and estimation – Noise ratings and standards for various sources like industrial, construction, traffic, aircraft community etc. – industrial safety and OSHA regulations – Noise legislations and management.

UNIT IV NOISE CONTROL

UNIT V  ABATEMENT OF NOISE
Active noise attenuators and scope for abatement of industrial noise.

TOTAL : 45 PERIODS

TEXT BOOKS
IH8006  MODELING AND SIMULATION OF CHEMICAL ENGINEERING SYSTEMS  

OBJECTIVE
To provide basic concepts of modeling and simulation of chemical engineering systems.

UNIT I  INTRODUCTION  5
Introduction to process modeling and simulation

UNIT II  MODELS  8
Models, need of models and their classification, models based on transport phenomena principles, scaling, alternate classifications of models, population balance, stochastic, and empirical models. Unit models of simple chemical engineering systems and their block diagrams.

UNIT III  MODELING OF CHEMICAL ENGINEERING SYSTEMS  10
Reactors - fixed bed, fluidized bed and bioreactors (aerobic and anaerobic); Evaporators, cyclone separators, electrostatic precipitators; Stack dispersion modeling; Modeling of safety systems.

UNIT IV  PROCESS SIMULATION  12

UNIT V  NUMERICAL SIMULATION  10
Finite difference approximation of partial differential equations and their solutions.

TOTAL : 45 PERIODS

REFERENCES

IH8007  PRINCIPLES OF TECHNICAL ANALYSIS  

OBJECTIVE
The elective is aimed to instill in the students a good grasp of the fundamentals and generalizations underlying technical analysis

UNIT I  QUANTITATIVE ESTIMATION - PRINCIPLE  8
Types of Analysis- Principles underlying Quantitative estimation- Purity of simple sugars- Principle underlying BERTRAND’S method- Estimation of percentage purity of phenol (By tribromo phenol formation method)- Estimation of percentage purity of glycerol- Principles underlying above estimations.
UNIT II  ANALYSIS OF COAL AND FERTILIZER  8
Analysis of Coal: Suitability for thermal power plants- Proximate and ultimate analysis of coal -
underlying principles- Correlation between thermal energy and fixed carbon- Estimation of
nitrogen in ammonical fertilizers and soil- Principles underlying Kjeldahl’s method.

UNIT III  STANDARD AND RAPID METHODS OF ANALYSIS OF CEMENT  10
Types of analysis of cement- Standard and rapid methods- Fundamentals generalizations
underlying the above estimations- Quality assessment of Cement.

UNIT IV  PURITY INDEX OF OIL  9
Estimation of freshness and purity of a vegetable oil- Principles underlying estimation of free
acid value, Saponification value and iodine value- Causative factors of rancidity of oil.

UNIT V  QUALITY STANDARDS OF DINKING WATER  10
Estimation of Chloride, Sulphate, Total Dissolved Solids and Dissolved Oxygen in the given
sample of water- Principles underlying estimation of chemical oxygen demand (COD) -
Principles underlying water purification strategies- World Health Organization prescribed
standards of drinking water.

TOTAL : 45 PERIODS

REFERENCES
1. Commercial methods of Analysis by Fosterdee Snell and Frank Moody Bifeen- Chemical
2. Technical Analysis Lab Manuals- Volume I and II by Dr.K.Srinivasan and
   Dr.P.Gnanasundaram, Anna University, Chennai.

IH8008  PROCESS SAFETY MANAGEMENT IN INDUSTRY  L T P C
3 0 0 3

OBJECTIVE
To ensure that potential hazards are identified and mitigation measures are in place to prevent
accidents. Also to know how to monitor the safety performance importance of training.

UNIT I  CONCEPTS  5
Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions
for safety- Safety Committee- budgeting for safety.

UNIT II  TECHNIQUES  8
Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey,
safety inspection, safety sampling, Safety Audit.

UNIT III  ACCIDENT INVESTIGATION AND REPORTING  12
Concept of an accident, reportable and non reportable accidents, unsafe act and condition –
principles of accident prevention, Supervisory role- Role of safety committee – Accident
causation models - Cost of accident. Overall accident investigation process - Response to
accidents, India reporting requirement, Planning document, Planning matrix, Investigators Kit,
functions of investigator, four types of evidences, Records of accidents, accident reports-Class
exercise with case study.
UNIT IV  SAFETY PERFORMANCE MONITORING  10
permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, accident rate, safety “t” score, safety activity rate – problems.

UNIT V  SAFETY EDUCATION AND TRAINING  10

TOTAL : 45 PERIODS

REFERENCES

IH8009  SAFETY IN CONSTRUCTION  L T P C
3 0 0 3

OBJECTIVE
To ensure that safety in Construction Industry during material handling, inspection and maintenance.

UNIT I  INTRODUCTION  10

UNIT II  FOUNDATION  8

UNIT III  MATERIALS AND STRUCTURES  8

UNIT IV  INSPECTION IN HUGE STRUCTURES  10
Safety in typical civil structures – Dams-bridges-water Tanks-Retaining walls-Critical factors for failure-Regular Inspection and monitoring.

UNIT V  MAINTENANCE  9
Maintenance – Training-Scheduling-Preventive maintenance-Lock out of Mechanical and Electrical maintenance-ground maintenance-hand tools-Gasoline operating equipment.

TOTAL : 45 PERIODS

REFERENCES
IH8010          SAFETY IN MATERIAL HANDLING          L T P C
                                      3 0 0 3

OBJECTIVE
To ensure that safety in ergonomics of conveying and hoisting mechanisms and handling of heavy equipments.

UNIT I       MATERIAL HANDLING          8
General safety consideration in material handling - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears – Prime movers.

UNIT II      ERGONOMICS OF CONVEYING MECHANISMS          10
Ergonomic consideration in material handling, design, installation, operation and maintenance of Conveying equipments, hoisting, traveling and slewing mechanisms.

UNIT III     ERGONOMICS OF HOISTING MECHANISMS          8
Ergonomic consideration in material handling, design, installation, operation and maintenance of driving gear for hoisting mechanism – Traveling mechanism

UNIT IV      HANDLING OF HEAVY EQUIPMENTS          9
Selection, operation and maintenance of Industrial Trucks – Mobile Cranes – Tower crane – Checklist - Competent persons.

UNIT V      STORAGE OF GOODS AND EQUIPMENTS          10
Storage and Retrieval of common goods of various shapes and sizes in a general store of a big industry.

TOTAL : 45 PERIODS

REFERENCES

IH8011          SAFETY IN ON AND OFF SHORE DRILLING          L T P C
                                      3 0 0 3

OBJECTIVE
To ensure that safety in on and off shore drilling operation, extraction and transportation.

UNIT I       PETROLEUM PRODUCTS          10

UNIT II      ON AND OFF SHORE OPERATION          10
On and off shore oil operation – Construction of Installation – Pipe line Construction – Maintenance and repair activities – Safety and associated hazards
UNIT III  DRILLING  9
Drilling oil – Technique and equipment - Work position –Working condition – safety and associated hazards- lighting and its effects

UNIT IV  EXTRACTION AND TRANSPORTATION  9
Petroleum Extraction and transport by sea – Oil field products – Operation – Transport of crude by sea – Crude oil hazards.

UNIT V  STORAGE AND CLEANING  7
Petroleum product storage and transport –Storage equipment –Precaution –Tank cleaning

TOTAL : 45 PERIODS

REFERENCE

IH8012  SAFETY MANAGEMENT  L T P C  3 0 0 3

OBJECTIVE
To provide a structured management approach to control safety risks in operations. Effective safety management must take into account the organisation’s specific structures and processes related to safety of operations.

UNIT I  CONCEPTS  8

UNIT II  TECHNIQUES  5
Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, Safety Audit.

UNIT III  ACCIDENT INVESTIGATION AND REPORTING  12

UNIT IV  SAFETY PERFORMANCE MONITORING  10
ANSI (Z16.1) Recommended practices for compiling and measuring work injury experience – permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – problems.

UNIT V  SAFETY EDUCATION AND TRAINING  10
Importance of training-identification of training needs-training methods – programmes, seminars, conferences, competitions – method of promoting safe practice - motivation
communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

TOTAL : 45 PERIODS

REFERENCES