

20PEB422					HEALTH, SAFETY AND ENVIRONMENT					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

### COURSE OBJECTIVES

- Describe the various hazard associated with oil and gas industry.
- Demonstrate the requirement for safety
- Perform case studies on hazards and risk analysis
- Develop the skills to address Safety issue.

#### Unit I

Hours: 10

Physical Hazards Noise, Heat, Vibration, Illumination, Radiation, extreme climatic conditions etc, Chemical Hazards Hydrogen sulfide gas, Hydrocarbons, Ammonia, Chlorine, Formaldehyde, Hydrochloric Acid, Methanol, Sulphur, Sulphuric acid, Sodium Hydroxide, etc. Biological Hazards, Psychological Hazards, Ergonomic Hazards, Injuries, Burns etc Prevention & Remedial controls of Occupational Hazards In Oil & Gas Industry for each type of Hazards Engineering Control, Administrative Control, Medical Control, Use of Personal Protective Equipment (PPE) Understanding Fire: Fire triangle/tetrahedron, Stages of development of fire Flammability, Concept of flash / Fire point, volatility, Flammable Limits, Fire Detection; Fire signature, Smoke, Heat, Flame, Combustible Gas Detection Fire Prevention, Fire suppression, Process Safety: Safety Analysis Table, Safety Analysis Checklist & SAFE Chart( ref API 14 C)

#### Unit II

Hours: 10

##### Hazard & Risk Analysis

Risk Matrix, HAZID, HAZOP, QRA (API 14 J, OISD), Safe Work Practices: PTW, MOC, SIMOPS etc. (ref API RP 75, OISD, OMR), Electrical Safety; Classification of Hazardous locations, use of electricity I Hazardous area (Ref IER, OISD, OMR, API RP 500 & 14 F) Accident Investigations: Study of major Accidents like Piper Alpha, Flixborough, Bhopal etc., Investigation techniques Emergency Response planning Audits & Inspection. Audit methodology, protocol, typical check lists for Drilling rigs, Work over activities, logging, etc. (ref OISD Standards)

#### Unit III

Hours: 9

##### HSE Management System

OISD, API RP 75, ISO 14000, ISO 9000, OSHAS 18000 Standards, OMR and Petroleum Rules (by PESO).

#### Unit IV

Hours: 10

##### Environment

**Environment Concepts:** Effect on eco-system; Air, Water, & Soil of HC"s. Impact of Exploration & Exploitation of Hydrocarbon on Environment Environmental studies (Off shore & On Shore) - Environmental Impact Assessment Oil Spills Control and their management. State, Government of India and international Maritime Environmental Rules & Regulations. Drilling / Oil Storage / Effluent water / waste (solid & sludge) treatments their disposal and remediation of soil etc. **Upstream safety:** Implementing Agency OISD (for on-land blocks) Directorate of Mine Safety (for Off Shore Blocks), Safety in Rig operation; Safety in Exploration and Production. **Downstream Safety:** Implementing Agency PNGRB; Safety Regulations (Technical Standard, Specification and Safety Standards T4S), Emergencies, Mutual Aida; Emergency Response and Disaster Management Plan ERDMP)

### COURSE OUTCOMES

On completion of the course, student will be able to

- CO1- Understand the various hazard associated with oil and gas industry.
- CO2- Apply the control methods & safety measures for preventing hazards and risk.
- CO3- Analyse the various risk matrixes, safe work practices and accident investigations.
- CO4- Implement the standards of HSE management systems.
- CO5- Evaluate the various environmental issues in oil and gas industry and safety regulations.
- CO6- Demonstrate the various safety issues during drilling and refinery operations.

### TEXT / REFERENCE BOOKS

1. Less, F. P., Loss Prevention in the Process Industries, 2nd ed., Butterworth Heinemann, UK.
2. Peavy, H. S., Rowe, D. R. and Tchobanoglous, G., Environmental Engineering, McGraw Hill, New York.
3. Sanders, R. E., Chemical Process Safety, Butterworth Heinemann, UK, Year.
4. NFPA, API 14 G & OISD Standards.
5. Marchell, V. and Ruchemann, S., Fundamentals of Process Safety, Institution of Chemical Engineers, Warwickshire, UK

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: Part A/Question: <Short Notes, Problems, Numericals>

20 Marks

PART B:<Justification, Criticism, Long answers, Interpretation >

80 Marks