

M.E. (PETROLEUM ENGINEERING)

512115

Elective III

Teaching Scheme:
Lectures: 5 Hours/Week

Examination Scheme:
In semester assessment 50 Marks
End semester assessment 50 Marks
Credits: 5

Group III Subsea Engineering, Elective June 2014

Unit 1

One Credit

Oil & Gas Introduction

(5 hours)

Importance, oil & gas reservoir formation, Survey, exploration, drilling, production system, refining, process overview, Overview of Offshore facilities (platform, drilling rigs, FPSO, subsea production systems, pipelines)

Subsea System description

(10 hours)

Overall System and Interface description, (Wellhead, casing strings, production tubing, tree with valves, structure to position and support equipment, manifold for gathering or distributing various fluids, production control system, umbilicals, connection jumpers, flow-lines, processing systems, risers for production / injection fluids, workover / intervention systems),

System configuration, (Single satellites, clusters, daisy chains, templates),

Subsystem interfaces (Standards for different systems, code breaks, and weak links),

Design Parameters and criteria (Depth, region, climatic conditions, seabed conditions, reservoir conditions, fluid properties: composition, physical properties, and chemical properties),

Field Development (System definition, installation, intervention, simultaneous operations, environmental considerations),

System design (System engineering aspects, overall design, barrier philosophy),

Manufacturing and Testing (Quality control and assurance, Factory acceptance test, System integration test, storage preservation methods, transportation and handling, tagging),

Installation, commissioning and decommissioning Documentation for operations and maintenance

Unit II

Two credits

Subsea Structures and Manifolds

(24 hours)

Overview of Subsea structures. Manifold functional consideration (Overview, Manifold system requirement, system interfaces, Cluster Manifold requirement, Template system requirement)

Design considerations (System design, Loads, Piping design, Structural design, Foundation design, and component overview)

Design Validation (Design documentation, design reviews, FAT) Design Verification (Qualification testing, SIT)

Materials requirement (Pipe and pipe fittings, Forged components, Mechanical testing requirement, NDT, Fastener material, Bending and forming operations)

Installation requirements & Lifting considerations

Operations requirements & Maintenance considerations

Transportation requirements, ROV / ROT aspects

Tie-in connection

(6 hours)

Functional requirement (Overview, vertical connection system, horizontal connection system, connection design requirements, Pressure & temperature ratings)

Connection types (Single bore, Multibore, seal design)

Type of connectors (Bolted flange, Clamp hub, Proprietary connectors)

Flow line types (Flexible, Rigid)

Tie-in connection loads (Overview, considerations)

Material requirement (Pressure containing parts)

Unit III

Two Credits

Subsea wellhead and tree

(12 hours)

Subsea wellhead (Overview, external loadings, well intervention requirement, wellhead rating, Design & performance requirements)

Subsea tree assemblies (Specific design requirements, tree P&ID overview, sealing requirements, Installation requirement, transportation requirement, testing requirements)

Subsea tree valves & Flow control module (Overview of main valves, chock & chock actuator, flow measuring devices)

Materials and corrosion Protection

(8 hours)

Introduction to Materials (C-Mn steels, Stainless steels, Ni alloys, Co alloys, Ti alloys: their importance)

Non-metallic materials, Composites Relation to oil & gas industry)

Corrosion Protection (Internal: material selection, coatings, corrosion inhibitors External: material selection, coatings, Cathodic protection)

Design limitations for materials (sour service, erosion, corrosion, HISC, high pressure high temperature, compatibility of non-metallic towards production / process fluids, broad range of temperature (-18 °C to +121 °C), etc.)

System Engineering; Flow assurance considerations

(10 hours)

Hydrate / wax / Asphaltene formation, foaming, scale formation, sand production – erosion, emulsions, multiphase flow / slugging,

Design measures to avoid flow assurance issues (dead legs / piping routing, sand sieves, insulation, materials selection / erosion allowance, pipe dimensional design)

Operational measures to avoid flow assurance issues (injection / pigging /milling philosophy)

Books

1. Yong Bai and Qiang Bai, 2012, Subsea Engineering Handbook, Gulf Professional Publishing is an imprint of Elsevier, Second edition, 908 pp.
2. Young Boi, Subsea Pipelines and Risers. Volume 3. Elsevier Ocean Engineering Book Series, 2001
3. Chakraborty S.K.: Handbook of offshore engineering volume I and II, Elsevier, 2006, 1213 pp.
4. Various ISO/API/ASTM codes